

BOOK OF ABSTRACTS

■
II INTERNATIONAL SYMPOSIUM AND
XVIII SCIENTIFIC CONFERENCE OF AGRONOMISTS OF
REPUBLIC OF SRPSKA

March 26-29, 2013
Trebinje, Bosnia and Herzegovina
■

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**March 26-29, 2013
Trebinje, Bosnia and Herzegovina**

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XVIII Scientific Conference of Agronomists
of Republic of Srpska

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March 26-29, 2013



IMPRESSUM

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Faculty of Agriculture
University of Banjaluka

in cooperation with

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SYMPOSIUM PROGRAMME

Spoken by the Association
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PROGRAMME OF THE WORKING SESSIONS

Session	Date and time	Hall	Working Committee:
Plenary session	Wednesday 27.03. 11:30 – 14:00	Big hall, HET company	A. Ostojić, M. Cvetković, S. Mirjanić
Agroecology and organic agriculture	Wednesday, 27.03. 15:00 – 18:00	Big hall, Leotar hotel	I. Maksimović, T. Predić, H. el Bilali
Genetic resources	Wednesday, 27.03. 16:00 – 18:00	Small hall, Leotar hotel	V. Meglič, A. Ibraliu, M. Vasić
Agricultural economics and rural development	Thursday, 28.03. 09:00 – 13:30	Big hall, HET company	Ž. Vaško, Z. Vasiljević, N. Novković
Fruit growing and viticulture	Thursday, 28.03. 09:00 – 12:00	Big hall, Leotar hotel	M. Cvetković, T. Milošević, T. Jemrić
Vegetable growing	Thursday, 28.03. 10:00 – 13:00	Small hall, Leotar hotel	R. Pavlović, L. Krasteva, M. Dardić
Animal husbandry	Thursday, 28.03. 15:00 – 18:00	Small hall, Leotar hotel	M. Đukić-Stojčić, D. Kirovski, D. Falta
Crop production	Thursday, 28.03. 15:00 – 18:00	Big hall, Leotar hotel	B. Ćupina, V. Milić, D. Kondić

IMPORTANT NOTICE FOR POSTER SESSION

Agroecology and Organic Agriculture

All authors within Agroecology and Organic Agriculture session are invited to exhibit their posters at the designated poster area on Wednesday 27th March 2013 until the beginning of the session (until 15:00 hours). Authors are kindly requested to remove their posters immediately after discussion (no later than 19:00 hours). Posters that are not removed timely will be removed by the organizer.

Genetic Resources

All authors within Genetic Resources session are invited to exhibit their posters at the designated poster area on Wednesday 27th March 2013 until the beginning of the session (until 16:00 hours). Authors are kindly requested to remove their posters immediately after discussion (no later than 19 hours). Posters that are not removed timely will be removed by the organizer.

Agricultural Economics and Rural Development

All authors within Agricultural Economics and Rural Development session are invited to exhibit their posters at the designated poster area on Wednesday 27th March 2013 (until 19:00 hours) and on Thursday 28th March 2013 until the beginning of the session (until 09:00 hours). Authors are kindly requested to remove their posters immediately after discussion (no later than 14:00 hours). Posters that are not removed timely will be removed by the organizer.

Fruit Growing and Viticulture

All authors within Fruit Growing and Viticulture session are invited to exhibit their posters at the designated poster area on Wednesday 27th March 2013 (after 19:00 hours) and on Thursday 28th March 2013 until the beginning of the session (until 09:00 hours). Authors are kindly requested to remove their posters immediately after discussion (no later than 14:00 hours). Posters that are not removed timely will be removed by the organizer.

Vegetable Growing

All authors within Vegetable Growing session are invited to exhibit their posters at the designated poster area on Wednesday 27th March 2013 (after 19:00 hours) and on Thursday 28th March 2013 until the beginning of the session (until 10:00 hours). Authors are kindly requested to remove their posters immediately after discussion (no later than 14:00 hours). Posters that are not removed timely will be removed by the organiser.

Animal Husbandry

All authors within Animal Husbandry session are invited to exhibit their posters at the designated poster area on Thursday 28th March 2013 from 14:00 till 15:00 hours).

Crop Production

All authors within Crop Production session are invited to exhibit their posters at the designated poster area on Thursday 28th March 2013 from 14:00 till 15:00 hours).

SYMPORIUM PROGRAMME

Tuesday, March, 26th, 2013

Arrival and registration of participants

Wednesday, March, 27th, 2013

	Big Hall, HET Company
10⁰⁰ – 11⁰⁰	Opening ceremony
	Welcome address by organizers
	Welcome address by Ministry of Science and Technology of Republika Srpska
	Welcome address by Minister of Agriculture, Forestry and Water Management of Republika Srpska
	Welcome address by guests
11⁰⁰ – 11³⁰	Cocktail
	Plenary Sessions
11³⁰ – 12⁰⁰	U. Koester Determinants of agricultural growth: how can it be promoted?
12⁰⁰ – 12³⁰	Žaklina Stojanović, Jasna Milošević-Đorđević, Dominique Barjolle Food consumption in the Western Balkans: current state and perspectives
12³⁰ – 13⁰⁰	B. Ćupina Cover crops for enhanced sustainability of cropping system in temperate regions
13⁰⁰ – 13³⁰	M. Marković, E. Erjavec, Tina Volk, M. Rednak Challenges in agricultural sector of the potential candidate and the candidate countries for EU membership
13³⁰ – 14⁰⁰	Discussion
14⁰⁰	Lunch
	Parallel Working Sessions



Session 1. Agroecology and Organic Agriculture

Oral presentations

15⁰⁰ – 15¹⁰	M. Marković, H. Čustović, Iskra Mihić, B. Marković Priprema državnog akcionog programa Bosne i Hercegovine uskladenog sa 10-godišnjom UNCCD strategijom Preparation of the BiH national action programme aligned to the UNCCD 10-year strategy
15¹⁰ – 15²⁰	Capone, R., El Bilali, H., Dernini, S., Debs, P., Cardone, G., Berjan, S. Exploring the environmental, health and economic sustainability of the current food consumption patterns: the mediterranean dietary paradox
15²⁰ – 15³⁰	F. J. Martínez-Cortijo Effect of some metals like the Cr, Mn, Ni and Pb in the crop of rice irrigated with urban residual waters in albufera of Valencia (Spain)
15³⁰ – 15⁴⁰	Božana Kučuk Agricultural land in B&H, wealth or poverty?
15⁴⁰ – 15⁵⁰	Abazi, U., Shumeli, A., Laze, P. Ecological parameters of surface water in northwestern Albania
15⁵⁰ – 16⁰⁰	Predić, T., Tatjana Cvijanović, Tatjana Docić Kojadinović, Bojana Radanović, Duška Jokić, Tanja Malčić Kontrola sadržaja nitrata i ostataka pesticida u zelenoj salati (<i>Lactuca sativa</i>) Control of nitrate content and pesticide residues in lettuce (<i>Lactuca sativa</i>)
16⁰⁰ – 16¹⁰	Jelena Savić Agrofitocenoze u baštenskoj organskoj proizvodnji Agrofitocenosis in organic gardening
16¹⁰ – 16²⁰	Ninković, S. Mogućnost razvoja organske poljoprivrede u Hercegovini The possibility of development of organic agriculture in Herzegovina

16²⁰ – 16³⁰	Jasmina Đoković, Ninković, S. Mogućnost udruživanja proizvođača lekovitog bilja i pčelara koji se bave organskom proizvodnjom meda u opštini Trebinje The possibilities of joint action of producers of medicinal herbs and honey producers in the municipality of Trebinje
16³⁰ – 16⁴⁰	Snežana Trmčić, Dimić, G., Trmčić, M. Mogućnost produkcije energetskih zasada na deponiji The possibility of the production of energy crops in the landfill
16⁴⁰ – 17⁰⁰	Discussion on oral presentations
17⁰⁰ – 18⁰⁰	Discussion on poster presentations Moderator: Ivana Maksimović

Poster session

I-1	Jugović, M., Radivojević, D., Koprivica, R., Lalović, M., Tanja Jakišić Uporedne eksploracione karakteristike nekih tipova mašina u spremanju sjenaze Comparative exploitation characteristics of some types of machines in making haylage
I-2	Marina Putnik-Delić, Ivana Maksimović, Tijana Zeremski, Ana Marjanović-Jeromela Uticaj teških metala na hemijski sastav i rast Camelina sativa L. Effect of heavy metals on chemical composition and growth of Camelina sativa L.
I-3	Nada Šumatić, Zorana Hrkić Ilić, Marijana Kapović, Sunčica Stevanović Sadržaj kadmijuma i nikla u ljekovitim biljkama Potentilla heptaphylla L. i Potentilla erecta (L.) Raeusch. na serpentinskim zemljištima u zapadnom dijelu Republike Srpske The content of cadmium and nickel in medicinal plants Potentilla heptaphylla L. and Potentilla erecta (L.) Raeusch. on serpentine soils in the western part of the Republic of Srpska
I-4	Erinda Zharra, Abazi, U. Evaluation of the vegetable water produced from olive oil technology
I-5	Milana Mišić, Čustović, H., Melisa Ljuša, Čivić, H., Marković, B. Hemijske osobine zemljišta na lokalitetu rekavice i prijedlog meliorativnih mjera za njihovo poboljšanje Chemical properties of the soil at the rekavice locality and the amelioration measures proposal for their improvement

I-6	Abazi, U. Water pollution of Tirana and Lana rivers in terms of sustainability of ecological balance
I-7	Vučković Biljana, Mitić, S., Kecman, A. Značaj određivanja minimalne letalne doze herbicida (MLDH) kao osnove za racionalnu primjenu herbicida The importance of determination minimum lethal doses of herbicides (MLHD) as the basis for the rational application of herbicides
I-8	Maličević, Z., Railić, B., Mitić, S., Dijana Mihajlović, Babić, M. Ekonomsko-ekološka analiza prednosti aplikacije pesticida kalibriranim i precizno podešenim atomizerom Economical and environmental benefits of application of pesticides with calibrated sprayer
I-9	Tatyana Bileva Influence of green algae Chlorella vulgaris on infested with Xiphinema index grape seedlings
I-10	Malić, N., Marković, M., Lakić, Ž. Promjene hemijskih svojstava u deposolima u postupku rekultivacije zasnivanjem travnjaka Changes in the chemical properties of the deposol in the reclamation process establishing of the grassland
I-11	Filipović, V., Tatjana Marković, Jevđović, R., Ugrenović, V., Ivana Simić Obuka zainteresovanih i nosilaca organske proizvodnje u okviru dunavskog regiona na teritoriji republike Srbije Training of interested carriers of organic production in the Danube region of Republic of Serbia
I-12	Savić, R., Pejić, B., Ondrašek, G., Milica Vranešević, Bezdan, A. Iskorišćenost prirodnih resursa Vojvodine za navodnjavanje Utilisation of natural resources for irrigation in Vojvodina (Serbia)
I-13	Ćosić, M., Đurović N., Stričević, R., Mužević, V. Uticaj mulčiranja na temperaturu biljnog pokrivača paprike i paradajza u uslovima više varijanti navodnjavanja Influence of mulching on canopy temperature of peppers and tomato in terms of several variants of irrigation
I-14	Kopali, A., Rota, E., Krasniqi, S., Zhupaj, A. Research on the use of bio-indicators to assess the environmental qualities of agro-ecosystems
I-15	R. Stepić, Vera Milošević, Vera Rašković, M. Dugonjić, I. Milovanović Korovska flora i vegetacija kukuruza na području Posavotamnave Weed flora and vegetation in the maize in the area of Posavotamnava

I-16	Vera Milošević, Stepić R., Rašković Vera, Veselić M., Dugonjić M. Životni oblici korovskih biljaka u usevu pšenice na području Donjeg Srema i sliva Kolubare Life forms of weed plants in wheat crop in the Donji Srem and the Kolubara river basin
I-17	Jevđović, R., Filipović, V., Todorović, G., Jasmina Marković, Ugrenović, V., Snežana Trmčić, Ozirislava Milinković pH vrednost zemljišta, faktor prinosa nekih lekovitih biljaka pH value of the soil, yield factor of some medicinal plants
I-18	Škondrić, S., Janković, D., Šumatić, Nada Melliferous plants of Dugo Polje (Modriča, Republic of Srpska) Medonosna flora Dugog Polja (Modriča, Republika Srpska)
I-19	Kovačević, Z. Association Diplotaxietum muralis (ass. new) in weed vegetation of vineyard in the region of Herzegovina Asocijacija Diplotaxietum muralis (ass. nova) u korovskoj vegetaciji vinograda rejona Hercegovina



Session 2. Genetic Resources

Oral presentations

16⁰⁰ – 16¹⁰	Kompan, D. Slovenački put u zaštiti animalnih genetičkih resursa Slovenian way of conservation of farm animal genetic resources
16¹⁰ – 16²⁰	Meglič, V., Vida Todorović, Barbara Pipan, Jelka Šuštar Vozlič, Maras, M., Jelena Vasić, Mirjana Vasić Genetic diversity of autochthonous phaseolus beans originating from Republic of Srpska
16²⁰ – 16³⁰	Ana Marjanović-Jeromela, Jovanka Atlagić, Terzić, S., Marinković, R., Milovac, Ž., Mitrović, P. Korišćenje alternativnih uljanih biljaka u oplemenjivanju i proizvodnji – mogućnosti i perspektive The use of alternative oil crops in breeding and production - possibilities and perspectives

16³⁰ – 16⁴⁰	Mirjana Vasić, Zorica Nikolić, Mirjana Milošević, Aleksandra Savić, Terzić, S., Anamarija Petrović, Jelica Gvozdanović Varga, Čosić, D. Kvalitet semena uzoraka sakupljenih za genetsku kolekciju The quality of seed samples collected for genetic collection
16⁴⁰ – 17⁰⁰	Discussion on oral presentations
17⁰⁰ – 18⁰⁰	Discussion on poster presentations Moderator: V. Meglič

Poster session

II-1	Jemrić, T. Martina Skendrović Babojelić, Fruk, G., Šindrak, Z. Fruit quality of nine old apple cultivars on MM106 rootstock
II-2	Karapetrović, B., Radoš, Lj. Karakteristike autohtone kruške (<i>Pyrus communis</i>) cv. Karamut Characteristics of autochthonous pear (<i>Pyrus communis</i>) cv. Karamut
II-3	Đina Božović, Jaćimović, V. Klijavost polena genotipova džanarike, drijena i trešnje sa područja sjeverne Crne Gore Pollin germination of myrobalan, cornel and sweet cherry genotypes in north Montenegro area
II-4	Liliya Krasteva, Neykov, S., Nikolaya Velcheva Inventory and collection of local genetic resources from vegetable crops for their conservation and targeted use
II-5	Nikolaya Velcheva, Liliya Krasteva, Chavdarov, P., Neykov, S. Application of statistical methods for evaluation of local <i>Phaseolus vulgaris</i> L. experimental data
II-6	Ibraliu, A., Gixhari, B., Najada Kadiasi, Elezi, F. Crops wild relatives: surveying and conserving in Alps of Albania
II-7	Ibraliu, A., Abazi, U., Najada Kadiasi, Elezi, F. Evaluation of morphological traits of <i>S. officinalis</i> L. in north of Albania
II-8	Ivana Koleška, Bosančić, B., Marina Radun, Oljača, R. Udio roda <i>Aegilops</i> L. u nastanku roda <i>Triticum</i> L. <i>Aegilops</i> ssp. participation in development of <i>Triticum</i> ssp
II-9	Plaku, F., Salillari, A., Kamëz, K. T., Elezi, F. Morphological characterization of oregano populations in Albania
II-10	Elezi, F., Kamez, K., Plaku, F., Kamëz, K. T., Hajkola, K., Ibraliu, A. Biomorphological characterization of maize landraces from Albania
II-11	Marina Radun, Travari, J. Gordana Đurić Inventarizacija samoniklih vrsta voćaka park šume Starčevica Inventory of wild fruit trees in Starcevica forest park

-
- II-12** Jasmina Zdravković, Zdenka Girek, Pavlović, R., Gordana Aćamović-Doković, Jelena Mladenović, Zdravković, M.
Stare sorte i populacije paradajza kao potencijal u oplemenjivanju na povećan sadržaj likopena i β-karotina
Old tomato populations as a potential in breeding for increased lycopene and β-carotene content
-
- II-13** Ljiljana Došenović, Mirjana Sekulić, Jelena Davidović
Razvoj objekata hortikulture u strukturi urbane matrice Banjaluke
Development of horticultural objects in the structure of urban matrix of Banja Luka
-
- II-14** Dekić, R., Ivanc, A., Erić, Ž., Svetlana Lolić, Maja Manojlović, Nina Janjić
Morfometrijske karakteristike Telestes metohiensis iz različitih vodotoka Dabarskog polja
Morfometric characteristics of Telestes metohiensis from different watercourses of Dabar field
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18⁰⁰ – 19³⁰ Dinner

20⁰⁰ – 21¹⁵ Concert, Hall of Culture, Trebinje

21³⁰ Entertaining evening, hotel Leotar

Thursday, March, 28th, 2013

Parallel working sessions



Session 3.
Agricultural Economics and Rural Development

Oral presentations

09⁰⁰ – 09¹⁰ El Bilali, H., Zorica Vasiljevic, Capone, R., Driouech, N., Vittuari, M., Berjan, S.
Governance of agricultural and rural development in Serbia:
actors, policies and measures

09¹⁰ – 09²⁰	Vaško, Ž., Mirjanić, S. Osnovni indikatori razvoja poljoprivrede u Bosni i Hercegovini - retrospektiva od 1950. do 2010.godine Key indicators of agricultural development in Bosnia and Herzegovina- retrospective from 1950 to 2010
09²⁰ – 09³⁰	Cvijanović, D., Mihailović, B., Gorica Cvijanović Analiza razvoja tržišne infrastrukture i agrotehničke opremljenosti u opštini Obrenovac Development analysis of market infrastructure and agro-technical equipment in the municipality Obrenovac
09³⁰ – 09⁴⁰	Novković, N., Beba Mutavdžić, Ilin, Ž., Ivanišević, D. Predviđanje proizvodnje krompira Forecasting of potato production
09⁴⁰ – 09⁵⁰	Svetlana Turudija Živanović Kretanje cena lekovitog i aromatičnog bilja u vrednosnom lancu Price trends for medicinal and aromatic plants in the value chain
09⁵⁰ – 10⁰⁰	Somogyi, S., Ricz, A. Pouke o kreativnoj ekonomiji Lessons concerning creative economy
10⁰⁰ – 10¹⁰	Gordana Rokvić, Mirjanić, S. Ruralni razvoj BiH prema stepenu ruralnosti područja Rural development in Bosnia and Herzegovina by degree of areas rurality
10¹⁰ – 10²⁰	Zorica Vasiljević, Popović, N. Proizvodnja heljde kao izvor povećanja dohotka i zaposlenosti na porodičnim gazdistavima brdsko-planinskih regiona Buckwheat production as a source of an income and employment increase on the family farms in the hilly-mountainous regions
10²⁰ – 10³⁰	Kavčić, S. Rabbit production as opportunity for additional source of income on family farms
10³⁰ – 11⁰⁰	Coffee break
11⁰⁰ – 11¹⁰	Slavica Samardžić, Ivanković, M., Bajramović, S., Ostojić, A., Sarić, Z., Anka Popović-Vranješ Tipični proizvodi kao predmet intelektualnog vlasništva kroz istorijski i geografski pregled Typical products as subject of intellectual property through historical and geographical overview

11¹⁰ – 11²⁰	Jovanović, D., Jelena Petrović Promocija agroindustrijskih proizvoda sa zaštićenim geografskim poreklom Promotion of agricultural products with protected geographical origin
11²⁰ – 11³⁰	Blesić, M., Neda Ostojić, Vanja Biletić Status i primjena propisa o zaštiti geografskog porijekla i označavanju vina u Bosni i Hercegovini Status and implementation of regulations for protection of geographical origin and wine labelling in Bosnia and Herzegovina
11³⁰ – 11⁴⁰	Gordana Radović, Pejanović, R., Adriana Radosavac Uloga države u razvoju ruralnog turizma u Republici Srpskoj Role of the state in rural tourism development in the Republic of Srpska
11⁴⁰ – 11⁵⁰	Vesna Mrdalj, Todic, D. Procesi promjena agrarnog pejzaža u Republici Srpskoj - primjer opštine Novi Grad The process of changing the agricultural landscape in the Republic of Srpska case study of municipality Novi Grad
11⁵⁰ – 12⁰⁰	Kristina Košić, Pejanović, R., Gordana Radović Importance of messuages for rural tourism of Vojvodina
12⁰⁰ – 12³⁰	Discussion on oral presentations
12³⁰ – 13³⁰	Discussion on poster presentations Moderator: Ž. Vaško
14⁰⁰	Lunch
	Poster session
III-1	S. Berjan, Vesna Milić, R. Capone, M. Vittuari, H. El Bilali, N. Driouech Exploring the effects of the global economic crisis on agriculture and rural areas in Bosnia and Herzegovina
III-2	Ostojić, A., Ljiljana Drinić, Mirjanić, S., Vaško, Ž., Gordana Rokvić, Vesna Mrdalj, Aleksandra Figurek Promet poljoprivrednih proizvoda na zelenim i stočnim pijacama u Republici Srpskoj Trade in agricultural products on green and livestock markets in Republic of Srpska

III-3	Vico, G., Rajić, Z., Ralević, N., Živković, D., Peševski, M. Značaj modela u agroekonomskim istraživanjima govedarske proizvodnje The importance of models in agro economical research of cattle production
III-4	Mitrović, M., Snežana Trmčić, Mitrović, U. Značaj klasterizacije preduzeća u oblasti agroindustrije The importance of clustering of enterprises in the field of agroindustry
III-5	Grejsa Meta, Stela Meta, Engjellushe Ibraliu Cost analysis, the highlight of business management
III-6	Branka Kalanović-Bulatović, Dimitrijević, B., Bulatović, R. Donošenje poslovnih odluka u proizvodnji voća Decision making in fruit production
III-7	Natalia Rastorgueva, Tatiana Polutina Internal and external migration in agriculture
III-8	Vico, G., Rajić, Z., Arsenović, Đ., Sorajić, B. Model za maksimizaciju korišćenja poljoprivrednog zemljišta na govedarskoj farmi Model for maximizing the use of agricultural land for cattle farms
III-9	Jelena Cvijanović, Mirjanić, S., Gordana Rokvić Mogućnosti za održivo upravljanje zemljišnim resursima na području opštine Prnjavor Opportunities for sustainable management of land resources in the municipality Prnjavor
III-10	Aleksandar Maksimović Mogućnost korištenja EU fondova za razvoj agro-turizama u Brčko Distriktu Possibilities use EU funds for development of agro-tourism in District Brcko



Session 4. Fruit Growing and Viticulture

Oral presentations

09⁰⁰ – 09¹⁰	Jemrić, T., Fruk, G. Effect of duration of hot water dip and length of storage on chemical and sensory quality of nectarine cv. 'Venus'
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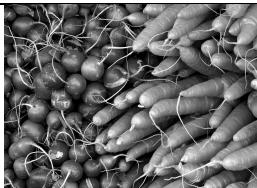
09¹⁰ – 09²⁰	Petrović Mirjana, Cvetković M. Pomološke karakteristike novih sorti nektarine u agroekološkim uslovima Potkozarja Pomological characteristics of new varieties of nectarine in Potkozarje agroecological conditions
09²⁰ – 09³⁰	Milošević, N., Ivana Glišić Fenološka i morfološka varijabilnost nekih autohtonih sorti šljive Phenological and morphological variability of some autochthonous plum varieties
09³⁰ – 09⁴⁰	Milošević, T., Milošević, N., Glišić, I., Radmila Nikolić Uticaj podloge na vegetativni rast, rodnost i fizičko-hemiske osobine ploda kruške (<i>Pyrus communis</i> subsp. <i>Communis</i> L.) Impact of rootstock on vegetative growth, yield and physico-chemical properties of the pear fruit (<i>Pyrus communis</i> subsp. <i>Communis</i> L.)
09⁴⁰ – 09⁵⁰	Cvetković M., Stojnić S., Mićić N. Stanje i trendovi u proizvodnji jabuke State of the art and trends in the production of apples
09⁵⁰ – 10⁰⁰	Đorđević, B., Vulić, T., Veličković, M., Oparnica, Č., Snežana Đurović Fenološke osobine sorti crne ribizle (<i>Ribes nigrum</i> L.) Phenological properties of black currant cultivars (<i>Ribes nigrum</i> L.)
10⁰⁰ – 10²⁰	Coffee break
10²⁰ – 10³⁰	Dalia Perišić, Vidaković, Ž. Pomološke osobine sorti jagode u uslovima sjevernog dijela Crne Gore Pomological features of strawberry varieties in agroecological conditions of north Montenegro
10³⁰ – 10⁴⁰	Paunović Gorica, Bošković-Rakočević Ljiljana, Veljković Biljana, Đurić Milena Mogućnost gajenja aktinidiije u agroekološkim uslovima Čačka The possibility of kiwifruit growing in agroecological conditions of Čačak municipality
10⁴⁰ – 11⁰⁰	Discussion on oral presentations
11⁰⁰ – 12⁰⁰	Discussion on poster presentations Moderator: M. Cvetković
14⁰⁰	Lunch
	Poster session

IV-1	Martina Skendrović Babojelić, Viktorija Strugar, Jemrić, T., Šindrak, Z. The effect of pollenizers on the fruit set of apple cultivars 'Julyred', 'Elstar' and 'Golden Delicious clone B'
IV-2	Đurović, D., Evica Mratinić, Đorđević, B., Milatović, D., Zec, G., Snežana Đurović Uticaj difenilamina i momenta berbe na kvalitet čuvanja plodova jabuke Influence of diphaenilamine and harvest date on quality of apple fruit storage
IV-3	Lukić, M., Slađana Marić Efekat metaksenije na pomološke i produktivne osobine jabuke sorte 'Rajka' Metaxenia effect on pomological and productive features of the 'Rajka' apple cultivar
IV-4	Zorić, B., Pašalić, B. Uticaj 1 - metilciklopropena na dinamiku promjene osnovnih fizičko-hemijskih parametara ploda jabuke tokom skladištenja Influence of 1-methylcyclopropene on the dynamics of change in the basic physiological-chemical parameters of apple fruit during storage
IV-5	Sanja Savić, Pašalić, B. Genotipske specifičnosti biohemijsko-fizioloških parametara plodova jabuke u zavisnosti od pozicije i ekspozicije ploda na stablu Genotype specificity of biochemical and physiological parameters of apple fruits depending on the fruit position and exposition on the tree
IV-6	Cvetković M., Mićić N. Pomotehnika jabuke pri rekonstrukciji uzgojne forme: 1 – pomotehnički pristup u programu rekonstrukcije Pomotechnical treatments of apple trees in reconstruction of training form 1 – Pomotechnical approach in reconstruction process
IV-7	Cvetković M., Mićić N. Pomotehnika jabuke pri rekonstrukciji uzgojne forme: 2 – pomotehnička analiza habitusa stabla Pomotechnical treatments of apple trees in reconstruction of training form 2 – Pomotechnical analysis of habit of trees
IV-8	M. Žujić, Gordana Đurić, B. Pašalić, Mirjana Žabić Fizičko-hemijske karakteristike autohtonih sorti jabuka Physico-chemical properties of autochthonous apple cultivars
IV-9	Mijatović, D., Zorić, B., Pašalić, B. Uticaj 1-metilciklopropena na skladišnu sposobnost kruške Influence of 1-methylcyclopropene on the storing ability of pear

IV-10	Marina Rodić, Mirjana Žabić, B. Pašalić, Gordana Đurić Bioaktivne komponente i antioksidativna aktivnost autohtonih sorti krušaka Bioactive compounds and antioxidant activity of autochthonous pear cultivars
IV-11	Nada Zavišić, Misimović, M., Dragana Drobnjak, Rosić, Ž. Morfološke karakteristike sijanaca različitih genotipova divlje kruške (<i>Pyrus communis L.</i>) Morphological characteristics of seedling of various wild pera (<i>Pyrus communis L.</i>) genotypes
IV-12	Ivana Glišić, Milošević, N., Svetlana Paunović Novi rezultati u oplemenjivanju šljive (<i>Prunus domestica L.</i>) U institutu za voćarstvo - Čačak New results in plum (<i>Prunus domestica L.</i>) breeding in Fruit research Institute -Čačak
IV-13	Jaćimović, V., Marija Radović, Bogavac, M., Đina Božović Značaj pčela u oprašivanju i povećanju prinosa starih sorti šljive i jabuke Significance honey bee in pollination and increase of old cultivars of plum and apple yields
IV-14	Sandra Bijelić, Branislava Gološin, Cerović, S., Bogdanović, B., Bojić, M., Milka Vujaković Proizvodnja sadnica selekcionisanih genotipova drena (<i>Cornus mas L.</i>) kalemlijenjem Seedlings production of selected cornelian cherry genotypes (<i>Cornus mas L.</i>) by grafting
IV-15	Mirjana Stojanović, Milatović, D., Kulina, M., Zlatka Alić-Džanović Osetljivost sorti trešnje na pucanje plodova u uslovima Sarajeva Susceptibility of sweet cherry cultivars to rain induced fruit cracking in the region of Sarajevo
IV-16	Dorđević, B., Veličković, M., Đurović, D., Zec, G. Vulić, T. Fenološke osobine sorti crvene i bele ribizle (<i>Ribes rubrum L.</i>) Phenological properties of red and white currant cultivars (<i>Ribes rubrum L.</i>)
IV-17	Jasminka Milivojević, Nikolić, M., Radivojević, D. Uticaj zakidanja vrhova izdanaka na proizvodna svojstva remontantnih sorti maline The influence of cane pinching on production traits of primocane fruiting raspberry cultivars
IV-18	Paunović Gorica, Cvetković M. Proizvodnja sadnog materijala aktinidije Production of actinidia nursery tree

IV-19	P. Ilić, N. Mićić Proizvodne karakteristike ploda lijeske (<i>Corylus avellana L.</i>), kod sorti gajenih u uslovima Banjalučke regije Production characteristics of the fruit of hazel (<i>Corylus avellana L.</i>), cultivars grown in terms of Banja Luka region
IV-20	Zorica Ranković-Vasić, Vesna Pajić, Ana Vuković, Mirjam Vujsadinović, Branislava Sivčev, Atanacković, Z. Pokazatelji kvaliteta grožđa sorte Burgundac crni gajene u gročanskom vinogorju u Srbiji Indicators of grape quality of Pinot noir cultivar grown in the wine growing region of Grocka in Serbia
IV-21	Marković, N., Atanacković, Z. Variranje rodnosti sorte Prokupac pod uticajem različitih loznih podloga Fertility variation of Prokupac cultivar under influence of different rootstocks
IV-22	Radojević Ivana, Mijatović Dragutin, Nikolić Dragan, Tatjana Jovanović-Cvetković Rodni potencijal sorte Prokupac u uslovima niškog vinogorja Yield potential of Prokupac variety in the conditions of Niš vineyard area
IV-23	Jovanović-Cvetković Tatjana, Stanković Snežana, Mijatović D. Kvalitet vina interspecies hibrida u uslovima niškog vinogorja Wine quality of interspecies hybrids cultivated in Niš vineyard area
IV-24	Mijatović D., Jovanović-Cvetković Tatjana Ekološki uslovi u funkciji predviđanja datuma početka cvetanja sorte Žilavka u mostarskom vinogorju The ecological conditions used to predict the beginning of flowering of Žilavka variety in Mostar vineyard area
IV-25	Petrović A., Kalušević Ana, Jović S., Nedović V. The influence of different strains of yeast on wine with residual sugar
IV-26	Stanković Snežana, Mošić Ivana, Jović, S., Petrović, A., Ivana Radojević Uticaj primene niskih temperatura na hromatsku strukturu i kopigmentaciju antocijana u crvenom vinu Game crni Effect of low temperature treatment on chromatic structure and copigmentation of anthocyanins in red wine Gamay noir
IV-27	Katarina Gašić, Ivanović, M., Andelka Prokić, Kuzmanović, N., Obradović, A. Isolation and specificity of <i>Erwinia amylovora</i> bacteriophages
IV-28	Ivanović, M., Gašić, K., Prokić, A., Kuzmanović, N., Obradović, A. Studying <i>Erwinia amylovora</i> strains from Serbia for streptomycin and kasugamycin resistance and copper sulfate sensitivity in vitro

IV-29	Duška Delić, Zorica Đurić, Jelena Jović, Biljana Lolić, Toševski, I., Ana Karačić Fitoplazma "crno drvo" i vrste iz serije Auchenorrhyncha u vinogradima Bosne i Hercegovine "Bois noir" phytoplasma and Auchenorrhyncha species in Bosnia and Herzegovina vineyards
IV-30	Brankica Tanović, Slavica Gašić, Jovana Hrustić, Milica Mihajlović, Marija Srejanović, Mila Grahovac Effect of emulsifiable concentrate (EC) of thyme essential oil on <i>Monilinia fructicola</i>
IV-31	Katerina Bandžo, Melpomena Popovska, Bandžo, S. Praćenje dinamike leta Rhagoletis cerasi l. i uticaj brojnosti imaga na zarazu kod različitih sorata trešnje Flight dynamics of Rhagoletis cerasi L. and influence of the adult abundance on the infestation of the cherry varieties



Session 5: Vegetable Growing

Oral presentations

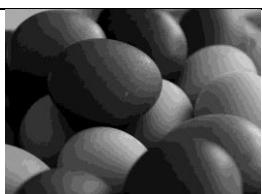
11³⁰ – 11⁴⁰	Moravčević, Đ., Dubravka Savić, Jelica Gvozdanović Varga, Beatović, D., Slavica Jelačić Uticaj prihranjivanja na kvalitet rasada krastavca Effect of fertilization on cucumber nursery plant quality
11⁴⁰ – 11⁵⁰	Ćota, J., Dardić, M., Milana Šilj Genotipske specifičnosti prinosa konzumnih krtola krompira Genotypic specificity of yield of consumption potato tubers
11⁵⁰ – 12⁰⁰	Sretenka Marković, Marković, D., Nataša Čereković, Dijana Mihajlović Uticaj vrste sustrata na efikasnost primjene npk hraniva u proizvodnji karfiola (<i>Brassica oleracea</i> var. <i>botrytis</i> L.) na hidroponski način Influence of type of substrate on npk nutrients efficiency in cauliflower (<i>Brassica oleracea</i> var. <i>botrytis</i> L.) hydroponic production
12⁰⁰ – 12¹⁰	Trkulja, V., Jelena Mihić Salapura, Kovačić, D., Bojana Ćurković, Gordana Babić, Jelena Vasić, Stojčić, J., Bojana Vuković Rezultati monitoringa na prisustvo karantinskih patogena krompira u Republici Srpskoj u 2011. i 2012. godini Results of potato quarantine diseases surveys in Republic of Srpska in 2011 and 2012

Symposium programme

BOOK OF ABSTRACTS

12¹⁰ – 12²⁰	Sanja Radonjić, Snježana Hrnčić Tetranihidne grinje na povrtarskim kulturama u plastenicima u južnom dijelu Crne Gore Tetranychid mites on vegetable crops in greenhouses in southern part of Montenegro
12²⁰ – 12⁵⁰	Discussion on oral presentations
12⁵⁰ – 13⁵⁰	Discussion on poster presentations Moderator: R. Pavlović
14⁰⁰	Lunch
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Poster session	
V-1	Mirjana Mojević, Đorđević, S., Zorica Jovanović, Radmila Stikić Uticaj regulisanog deficitia navodnjavanja (RDN) na rast biljaka i vodni režim krompira gajenog u poljskim uslovima The effect of regulated deficit irrigation (RDI) on plant growth and water regime in potato under field conditions
V-2	Jovović, Z., Tatjana Popović, Ana Velimirović, Vesna Milić, Dolijanović, Ž., Milana Šilj Efikasnost hemijskog suzbijanja korova u krompiru (<i>Solanum tuberosum L.</i>) Efficacy of chemical weed control in potato (<i>Solanum tuberosum L.</i>)
V-3	Aleksandra Govedarica Lučić, Perković, G. Uticaj sorte i načina proizvodnje na sadržaj nitrata u salati The effect of variety and production methods on the nitrate content in lettuce
V-4	Ivana Tošić, Ilin, Ž., Ivana Maksimović, Darinka Bogdanović, Vojin, S., Stana Kričković Uticaj malčovanja i prekrivanja na sadržaj nitrata u salati (<i>Lactuca sativa L.</i>) Influence of mulching and cover on nitrate content in lettuce (<i>Lactuca sativa L.</i>)
V-5	Jasmina Zdravković, Pavlović, R., Gordana Aćamović-Đoković, Jelena Mladenović, Zdravković, M. Antimikrobnna aktivnost etanolnih ekstrakata nekih sorti paradajza Antimicrobial activity of ethanol extracts of some tomato cultivars
V-6	Nikolina Shopova, Cholakov, D. Effect of the age and planting area of tomato seedlings for late field production on the physiological behaviors of plants
V-7	Panayotov, N., Dochka Dimova Assessment of yield and stability of perspective Bulgarian breeding lines pepper with conic shape
V-8	G. Perković, Aleksandra Govedarica-Lučić, A. Životić The effect of different production methods on yield of pepper

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- V-9** Chavdarov, P., Liliya Krasteva, Nikolaya Velcheva, Neykov, S.
Phytopathogens causing wilt in pepper - distribution, symptoms and identification
- V-10** Latinović, N., Danijela Šuković, Jelena Latinović, Tatjana Perović
Najznačajniji štetni organizmi u gajenju povrća u plastenicima u Crnoj Gori i analiza ostataka pesticida
The most important harmful organisms in vegetable production in greenhouses in Montenegro and pesticides residue analysis
- V-11** Moravčević, Đ., Dubravka Savić, Jelica Gvozdanović Varga, Beatović, D., Slavica Jelačić
Uticaj gustine useva i hibrida na kvalitet kukuruza šećerca
Effect of crop density and hybrids on the quality of sweet maize
- V-12** Vida Todorović, Jelica Gvozdanović-Varga, Mirjana Vasić, Ivana Kecman, Nataša Kleut
Reakcija različitih genotipova proljećnog bijelog luka na uslove uspijevanja
Reactions of different genotypes of spring garlic on the growth conditions
- V-13** Dimka Haytova
Influence of the foliar fertilizers on the some physiological parameters of zucchini squash (*Cucurbita pepo* L. var. *giromontia*)
- V-14** Nataša Čereković, Todorović, M., Snyder, R.
Effect of mulch and non-mulch on melon (cv. Campero) crop coefficient and duration of the growing season measured with two weighing lysimeters
- V-15** Agic, R., Zvezda Bogevska, Afrodita Ibusoska
Comparison of some watermelon (*Citrullus lanatus* Thunb.) hybrids in Republic of Macedonia
- V-16** Nada Parađiković, Svjetlana Zeljković, Monika Tkalec, Irma Dervić, Milica Marić
Razmnožavanje žalfije (*Salvia officinalis* L.) zelenim reznicama
Propagation sage (*Salvia officinalis* L.) with green cuttings
- V-17** Slavica Jelačić, Beatović, D., Moravčević, Đ., Dubravka Savić, Zarić, V.
Uticaj biostimulatora na kvalitet rasada miloduha (*Hyssopus officinalis* L.)
Influence of biostimulators to the quality of hyssop nursery plants (*Hyssopus officinalis* L.)
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Session 6. Animal Husbandry

Oral presentations

Symposium programme

BOOK OF ABSTRACTS

15⁰⁰ – 15¹⁰	Mirjana Đukić Stojčić, Milošević, N., Lidija Perić, Bjedov, S. Proizvodni rezultati pilića gajenih u sistemima slobodnog ispusta i ekstenzivno u živinarniku Production parameters of chickens reared extensively in the poultry house and in traditional free range
15¹⁰ – 15²⁰	Lidija Perić, Mirjana Đukić Stojčić, Milošević, N., Bjedov, S. Klanične karakteristike pilića iz alternativnih sistema gajenja Carcass characteristics of chicken reared in alternative housing systems
15²⁰ – 15³⁰	Novakovic, Z., Mekic, C., Sočo, I., Podkonjak, A. Influence of coccidian medicines on health and production results in broiler fattening production
15³⁰ – 15⁴⁰	Bjedov, S., Puvača, N., Žikić, D., Lidija Perić, Mirjana Đukić- Stojčić, Živković, G. Uticaj prostirke na pojavu pododermatitsa brojlerskih pilića Litter influence on occurrence of footpad dermatitis of broiler chickens
15⁴⁰ – 15⁵⁰	Danijela Kirovski, Šamanc, H., Vujanac, I., Prodanović, R., Sladojević, Ž., Savić, Đ. Procena energetskog bilansa krava na osnovu hemijskog sastava pojedinačnih uzoraka mleka Prediction of energy balance of early lactating dairy cows from milk composition measures at individual cow level
15⁵⁰ – 16⁰⁰	Ajda Kermauner, Janja Urankar The performance of Slovene rabbit line Sika for meat production
16⁰⁰ – 16¹⁰	Marković, D., Radmila Cvijić, Bojić, M. Kvalitet kukuruzne silaže na porodičnim gazdinstvima na području regije Doboј The quality of corn silage on family farms in the Doboј region
16¹⁰ – 16³⁰	Coffee break
16³⁰ – 16⁴⁰	Mekić, C., Perišić P., Novaković, Z., Petrović, P. M. Fertility and milking traits of Sanska goat in first three lactations
16⁴⁰ – 16⁵⁰	Savić, N., Mikavica, D., Biljana Rogić Karakteristike rasta mlađi dužičaste pastrmke (<i>Oncorhynchus</i> mykiss wal.) sa različitim lokaliteta The growth characteristics of rainbow trout fry (<i>Oncorhynchus mykiss wal.</i>) from different localities

16⁵⁰ – 17⁰⁰	Stojanov, I., Pušić, I., Ratajac, R., Dragica Stojanović, Nada Plavša, Jasna Prodanov-Radulović Praćenje prisustva Nosema spp. i problem nestajanja pčelinjih društava Monitor the presence of Nosema spp. and the problem of disappearing bee colonies
17⁰⁰ – 17¹⁰	Glavić, M., Hasić, A., Zenunović, A., Mahmutović, V. Zaštita i dobrobit životinja u praksi na farmama za proizvodnju mlijeka u regionu sjeveroistočna BIH Protection and animal welfare in farming practices for milk production in region northeastern BIH
17¹⁰ – 17²⁰	Savić, Ž., Đurić, V. Dinamika titracione i aktivne kiselosti (pH) tokom čuvanja i zrenja sjeničkog sira proizvedenog u industrijskim uslovima The dynamics of active and titratable acidity (pH) during storage and ripening of sjenicko cheese produced in industry conditions
17²⁰ – 17⁴⁰	Discussion on oral presentations
17⁴⁰ – 18⁴⁰	Discussion on poster presentations Moderator: Mirjana Đukić-Stojčić

Poster session

VI-1	Zlatković, N., Trajčev, M., Hristov, S. Uticaj temperaturno vlažnog indeksa na količinu kravljeg mleka The influence of temperature humidity index of the amount of cow's milk
VI-2	Savić, Đ., Jotanović, Stoja, Kirovski, Danijela, Vekić, M. Kretanje i odnos koncentracija organskih sastojaka mlijeka tokom različitih perioda standardne laktacije Changes of concentration of organic milk ingredients and their ratios during different periods of standard lactation
VI-3	Žarković, I., Stančić, I. Uticaj sezone i kategorije na masu uterusa kod postizanja puberteta u nazimica Effect of season and category on uterine weight reaching sexual maturity in gilts
VI-4	Jana Javorová, Falta, D., Milena Velecká, Andryšek, J., Studený, S., Chládek, G. Relationship between qualitative characteristics and somatic cell count of bulk milk samples from Czech fleckvieh and Holstein dairy cows

VI-5	Milena Velecká, Falta, D., Jana Javorová, Večeřa, M., Andrýsek, J., Chládek, G. Effect of breed, milk composition and milk quality parameters on freezing point of milk
VI-6	Andrýsek, J., Chládek, G., Jana Javorová, Milena Velecká, Večeřa, M., Falta, D. Effect of number of lactation on milk quality and composition of Czech fleckvieh breed
VI-7	V.Turlyun Process optimization of the milk production from large-scale dairy farms in Russia
VI-8	Tatjana Pandurević, Mitrović, S., Vera Đekić Analiza proizvodnih i klaničnih osobina teškog linijskog hibrida kokoši Cobb 500 Analysis of production and slaughter traits of hard line hybrid chickens Cobb 500
VI-9	Marković, G., Jelena Pantović Flaxseed (<i>Linum usitatissimum</i> L.) oil as a substitute for fish oils in fish feeds
VI-10	Ratajac, R., Dragica Stojanović, Radica Vasić, Marina Žekić-Stošić, Stojanov, I., Pušić, I. Mogućnosti upotrebe etarskih ulja i njihovih sastojaka u lečenju mastitisa uzrokovanog Nocardiom Potential use of essential oils and their components in Nocardia mastitis treatment
VI-11	Savić, N., Dekić, R., Pavličević, J., Biljana Rogić, Maja Manojlović Koeficijenti organa i kondicije dužičaste pastrmke (<i>Onchorhyncus mykiss</i> Wal.) iz različitih matičnih jata Condition and body shape coefficients of rainbow trout (<i>Onchorhyncus mykiss</i> Wal.) from different parent flocks
VI-12	Božidarka Marković, Marković, M., Dušica Radonjić, Ivanković, A. Promjene u tjelesnoj razvijenosti Pivske pramenke tokom posljednjih 40 godina Changes in the body development of Pivska pramenka over the last 40 years
VI-13	Došen, R., Jasna Prodanov Radulović, Dragica Stojanović, Petrović, T., Pušić, I., Ratajac, R. Virusne bolesti respiratornog trakta svinja Viral respiratory diseases in pigs
VI-14	Pušić, I., Jasna Prodanov Radulović, Ratajac, R., Stojanov, I., Urošević, M., Dorotea Marčić Primena savremenih metoda dijagnostike u suzbijanju tuberkuloze goveda The use of different diagnostic techniques in cattle tuberculosis eradication

VI-15	Budimlić A., Pračić N., Muhamedbegović B., Omanović H., Mujić E. Unapređenje proizvodnje i kvaliteta sirovog mlijeka
VI-16	Pračić N., Jotanović Stoja, Šahinović R., Matarugić D., Mujić E., Vilić H. Uticaj sezone i nivoa mliječnosti kod krava na rezultate koncepcije na području Unsko- sanskog kantona



Session 7. Crop Production

Oral presentations

15⁰⁰ – 15¹⁰	Mihelič, R. Presentation of a novel soil conservation tillage system – the Composting tillage
15¹⁰ – 15²⁰	Knežević, D., Aleksandra Dragović, Veselinka Zečević, Danica Mićanović, Danijela Kondić Oplemenjivanje pšenice na poboljšanje kvaliteta Wheat breeding for quality improvement
15²⁰ – 15³⁰	Knežević, D., Paunović, A., Milomirka Madić, Snežana Tanasković, Jelica Živić, Stančić, I Variranje komponenti prinosa i kvaliteta kod genotipova pšenice Variation of yield and quality components of wheat genotypes
15³⁰ – 15⁴⁰	Radanović, S., Stojčić, J., Ostić, G., Šrbac, M., Supić, D. Višegodišnja pojава суše i njen uticaj na proizvodnju kukuruza u Republici Srpskoj Multiannual drought occurrence and its impact on maize production in Republic of Srpska
15⁴⁰ – 15⁵⁰	Lopandić, D., Filipović, Ž., Čamđija, Z., Crevar, M., Jovanović, Ž. Prinos i stabilnost prinosa komercijalnih ZP hibrida kukuruza u Bosni i Hercegovini Grain yield and yield stability of commercial ZP maize hybrids in Bosnia and Herzegovina
15⁵⁰ – 16⁰⁰	Danijela Kondić, Mićić, N. Konstituisanje ženskog gametofita kod tritikalea (\times triticosecale wittmack) The constitution of the female gametophyte of triticale (\times triticosecale wittmack)

16⁰⁰ – 16¹⁰	Simić, A., Geren, H., Vučković, S., Snežana Petrović, Moravčević, Đ. Prinos ploda i kvalitet navodnjavane krmne lubenice (Citrullus lanatus var. citroides) gajene u srbiji Fruit yield and quality of irrigated forage watermelon (Citrullus lanatus var. citroides) grown in serbia
16¹⁰ – 16²⁰	Lakić, Ž., Vojin, S., Misimović, M., Vuković, F., Malić, N. Ispitivanje različitih travnih smješa i načina zasnivanja travnjaka u međurednom prostoru voćnjaka Research of diverse grass mixtures and methods of establishing of grasslands in interlinear area of orchards
16²⁰ – 16⁵⁰	Discussion on oral presentations
16⁵⁰ – 18⁰⁰	Discussion on poster presentations Moderator: B. Ćupina

Poster session

VII-1	Knežević, D., Danijela Kondić, Kovačević, V., Sretenka Marković, Yan, Y. GMO- bezbednost i rizici GMO - safety and risks
VII-2	Marijenka Tabaković, Glamočlija, Đ., Sabovljević, R., Snežana Jovanović, Radmila Bojović Uticaj agroekoloških i zemljишnih uslova na osobine hibridnog semena kukuruza Effects of agroecological and soil conditions on traits of hybrid maize seed
VII-3	Sečanski, M., Todorović, G., Živanović, T., Vesna Dragičević, Protić, R., Snežana Jovanović Inbred linije donori poželjnih alela za popravku osobine broj zrna u redu F1 hibrida kukuruza Inbred lines as donors of favourable alleles for the improvement of the number of kernels per row of the F1 maize hybrid
VII-4	Monika Marković, Jasna Šoštarić, Josipović, M., Iljkić, D. Analiza korelacijske veze između uroda i parametara uroda hibrida kukuruza (Zea mays L.) Correlation analysis for yield and yield parameters of maize (Zea mays L.) hybrids
VII-5	Kovačević, V., Josipović, M., Jasna Šoštarić, Monika Marković Vremenske prilike u 2012. sa stajališta uzgoja kukuruza u Hrvatskoj Weather characteristics in the 2012 growing season with aspect of maize growing in Croatia

VII-6	Hristina Poposka, Mukaetov, D., Andreevski, M., Petkovski, D. Effects of foliar fertilization on corn grain quality
VII-7	Snežana Jovanović, Todorović, G., Marijenka Tabaković, Sečanski, M., Živanović, T., Kostić, M. Uticaj različitog tipa citoplazme na prinos zrna inbred linija kukuruza The influence of various types of cytoplasm on grain yield of maize inbreds
VII-8	Tomić, D., Stevović, V., Đurović, D., Vujišić, M., Vidojević, M. Folijarna primena tečnog organskog đubriva u proizvodnji krme crvene deteline (<i>Trifolium pratense L.</i>) Foliar application of liquid organic fertilizer on the forage production of red clover (<i>Trifolium pratense L.</i>)
VII-9	Jevđović, R., Todorović, G., Filipović, V., Kostić, M. Uticaj starosti i načina čuvanja na klijanje semena <i>Nigella sativa L.</i> The influence of age and ways to keep the seed germination <i>Nigella sativa L.</i>
VII-10	Djalovic, I., Seremesic, S., Milosev, D., Jockovic, Dj. Effect of crop rotation and fertilisation on maize yield and yield stability in a long-term experiment
VII-11	Đurić, B., Gatarić, Đ., Radić, V. Proizvodne osobine sorata krmnog boba (<i>Vicia faba L.</i>) u banjalučkoj regiji Production traits of faba bean varieties (<i>Vicia faba L.</i>) in the Banja Luka region
VII-12	Mihailović, V., Mikić, A., Vasiljević, S., Milošević, B., Katanski, S., Karagić, Đ., Pataki, I. Forage yield and quality of the Novi Sad cultivars of pea (<i>Pisum sativum L.</i>) and vetches (<i>Vicia spp.</i>)
VII-13	Pokorný, R., Streda, T. Air temperature in vertical profile of winter wheat canopy during three different years
VII-14	Marina Mačukanović-Jocić, Snežana Jarić, Mladenović, M. Doprinos zajednice <i>Lolio-plantaginetum majoris berger</i> , 1930. medenosnom potencijalu useva lucerke (<i>Medicago sativa L.</i>) Contribution of ass. <i>Lolio-plantaginetum majoris berger</i> , 1930. to melliferous potential of alfalfa crop (<i>Medicago sativa L.</i>)
VII-15	Bokan, N., Karagić, Đ., Mihailović, V., Tomić, D., Stevović, V. Uticaj agrekoloških uslova i đubrenja krečom na prinos zrna stočnog graška
VII-16	Dražić, S., Branka Žarković, Glamočlija, Đ., Milena Dražić, Zagorac, Đ., Kolarić, Lj., Živanović, Lj. Uticaj suše na prinos zrna kvinoje (<i>Chenopodium quinoa Willd.</i>) Effect of drought on quinoa grain yield (<i>Chenopodium quinoa Willd.</i>)

VII-17	Mihailović, V., Mikić, A., Karagić, Đ., Milošević, B., Katić, S., Milić, D., Živanov, D. Agronomic characteristics of the latest generation of the Novi Sad cultivars of protein pea (<i>Pisum sativum L.</i>)
VII-18	Ćupina, B., Mikić, A., Krstić, Đ., Antanasović, S., Vasiljević, S., Mihailović, V., Marjanović-Jeromela A., Pržulj, N. Intercropping legumes with cereals, brassicas and other legumes forage production
VII-19	Malić, N., Una Matko-Stamenković, Mandić, D. Neke kvantitativne osobine raži (<i>Secale cereale L.</i>) gajene na deposolu Some quantitative properties of rye (<i>Secale cereale L.</i>) grown in deposol
VII-20	Kashta, F., Harizaj, P., Canko, A., Bardhi, N. Effect of plant densities and planting time on grain yield and protein content of durum wheat
VII-21	Biberdžić, M., Jelić, M., Knežević, B., Barać, S., Maksimović, G., Dragana Lalević Neke morfološke i produktivne osobine tritikalea u zavisnosti od agroklimatskih uslova lokaliteta Some morphological and productive characteristics of triticale depending on agroclimatic conditions in the locality
VII-22	Tatjana Cvijanović, Mandić, D., Đurašinović, G. Praćenje prisustva i brojnosti insekata u usjevu pšenice Presence and abundance of insects in wheat crop
VII-23	Dolijanović, Ž., Snežana Oljača, Kovačević, D. The effects of microbiological fertilizers and soil conditioners on grain yield spelt (<i>Triticum aestivum ssp. spelta</i>)
VII-24	Barać, S., Biberdžić M., Vuković A., Bojana Milenković Rezultati ispitivanja kvaliteta rada vršećih uređaja kombajna žetvi raži i tritikalea The results of testing the harvesting device work quality of the combines in harvesting of rye and triticale

20⁰⁰ Official dinner

Friday, March, 29th, 2013

Day for farmers

Big Hall, hotel Leotar

10⁰⁰ – 10¹⁵	Mitrić, S., Univerzitet u Banjaluci, Poljoprivredni fakultet Karakteristike biljne proizvodnje u agroekološkom regionu Istočne Hercegovine
10¹⁵ – 10³⁰	Bašić, D., Kompanija „Popovo polje“ a.d. Integralna biljna proizvodnja u uslovima submediteranske klime Popovog polja
10³⁰ – 10⁴⁵	Jotov, A., Kompanija BASF Srbija Zaštita jabuke i vinove loze
10⁴⁵ – 11⁰⁰	Krdžić, A., Kompanija EKO Bel, Banja Luka Sistemi za navodnjavanje i ishrana biljaka fertirigacijom.
11⁰⁰ – 11¹⁵	Dončić, D., Kompanija Syngenta AGRO- BiH Savremena tehnologija zaštite povrtraskih biljaka i vinove loze
11¹⁵ – 11³⁰	Mesarović, S. Kompanija „YARA“ BiH Precizna ishrana biljaka
11³⁰ – 11⁴⁵	Nježić, B., Univerzitet u Banjaluci, Poljoprivredni fakultet Stanje prisustva i brojnosti fitofagnih nematoda na području Istočne Hercegovine
11⁴⁵ – 12⁰⁰	Vujanović, M., Kompanija „Agrimatco“- BiH Savremena rješenja u primjeni insekticida i nematocida
12⁰⁰ – 12¹⁵	Rilak, S., Galenika Fitofarmacija a.d., Zemun Preporuke za zaštitu vinove loze
12¹⁵ – 12³⁰	Spremo Božana, Kompanija Lallemand Analize uticaja specifičnog živog kvasca (Levucell SC) na mlijeko, mlječne komponente i djelotvornost u ishrani životinja.

13⁰⁰ Conclusions and closing of Symposium

PLENARY SESSION

**DETERMINANTS OF AGRICULTURAL GROWTH: HOW CAN IT BE
PROMOTED?**

Ulrich Koester

Christian-Albrechts-Universität zu Kiel, Germany

Agricultural growth is on the agenda of international and national decisionmakers worldwide. FAO published the report on ‘The State of Food and Agriculture’ late in 2012. It is highlighted that agricultural growth is needed to feed the growing population in the coming decade and at the same time to reduce poverty worldwide. FAO recommends increasing drastically investment into the agricultural and agribusiness sector. Indeed, many countries – even in Africa – have started to increase the budget outlays for the agricultural sector aiming at a share of 10 percent of the total budget spent for agriculture. Countries in the Balkan region likely agree that they need more agricultural growth to fight poverty and to improve well-being of farmers. However, the question remains whether an increase in governmental expenditure would likely be the first best alternative to promote agricultural growth. The paper discusses the main drivers of agricultural growth. Overall economic growth and reduction of unemployment in the overall economy are of most importance. Public expenditure for provision of public goods may improve private profitability and stimulate private investment. However, it depends very much what kind of public goods are financed. Take the case of research: There is ample evidence that support of agricultural research was the engine of growth worldwide and in some countries. However, there is also evidence that there is a significant variance concerning the impact across countries. Just spending more money may not help much if the preconditions for efficient research are not existent in the country under consideration. Hence, public expenditure should be allocated first to institute the research capability, even if it may take some years for seeing the results in agricultural growth. The presentation provides some criteria for selecting the areas where public expenditure may lead to higher agricultural growth in the future. The aim should be to spend public money in order to promote private investment. It is of outmost importance to contribute to a stable environment which lowers uncertainty for the private sector. There is a widely held view that investment should focus on smallholder agriculture because poverty is the most serious in rural areas. However, provision of cheap credit to smallholders will most likely be inefficient. Policies are needed to improve the profitability of the farm sector, including farms of all sizes. How can small farms escape the rationale of the subsistence farm is an urgent policy question? The presentation discusses how to overcome this problem.

Plenary session

BOOK OF ABSTRACTS

FOOD CONSUMPTION IN THE WESTERN BALKANS: CURRENT STATE AND PERSPECTIVES

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Traditional products constitute an important element of European culture, identity and heritage. It is recognized as a typical food of a certain locality. From the consumer science point of view, some of their most important characteristics are their local origin and their way of producing: home-made or on-farm products (Ricketts et al., 2006; Vogt and Kaiser, 2008; Wilson and Fearne, 2000; Hamermesh, 2007). Simultaneously, the current urban diet patterns change the occasions and the frequency of consumption of the traditional food. Consequently, the novel food, produced by new technologies or/and with new ingredients can be seen as an opposite to the traditional food. It may be considered as a much more global, industrially produced food, relying on consumers needs in urban areas. An increasing importance of health aspects in the food choices is evident (Diplock et al 1999; Sijtsma et al. 2003, De Jong et al 2003; Niva and Mäkelä 2005). Therefore, the paper basically aims to discuss the new consumption patterns based on a consumer survey conducted in the Western Balkans. A descriptive statistical analysis is conducted with the aim to investigate all statistically significant differences between consumers' group profiles. Consumer quantitative survey was performed on general population 18+ in six Western Balkans countries (Bosnia and Herzegovina, Croatia, FYR Macedonia, Montenegro, Serbia and Slovenia) at the end of September – beginning of October 2010. The research was founded by the FP7 Project FOCUS-BALKANS. The instrument used in this survey was a structured questionnaire consisting of several separate sections, including motivation toward food in general (Food Choice Questionnaire - FCQ), the specific questions about chosen food groups (fruit, organic, traditional and functional food) and consumer socio-economic and demographic characteristics. The stratified three-staged random representative sample was applied (N=3085; around 500 per country). The main results address factors behind food consumer choice, consumption of four food categories included in the analysis and identification of food consumers' profiles in the Western Balkans. Finally, the paper shed light on transition of food consumption in the region giving particular importance to the following research question does tradition keep dominance over new trends in food consumption? Overall, the research supports farmers, food industry and policy makers with a consumer driven approach both for public policy and individual food stakeholders decision making in the Western Balkans.

Keywords: food (fruit, organic, traditional, functional), FCQ, consumption, consumer profile, the Western Balkans.

JEL classification: Q13, M31, I18.

STANJE I TRENDJOVI U POTROSNJI HRANE U ZEMLJAMA ZAPADNOG BALKANA

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Tradicionalni proizvodi predstavljaju bitan element evropske kulture, identiteta i nasledja. Oni su prepoznati kao tipična hrana određenog lokaliteta. Posmatrano iz ugla nauke o potrošačima, najvažnije karakteristike tradicionalnih proizvoda su njihovo lokalno poreklo i način proizvodnje: napravljeni kod kuće ili proizvodi sa farme (Ricketts et al., 2006; Vogt and Kaiser, 2008; Wilson and Fearne, 2000; Hamermesh, 2007). Istovremeno, promene načina ishrane u urbanim sredinama menjaju i frekvenciju potrošnje tradicionalne hrane. Kao rezultat, hrana proizvedena korišćenjem novih tehnologija i/ili sastojaka može biti posmatrana kao oposit tradicionalnoj hrani. Ova hrana je svakako više globalnog i industrijskog karaktera, orijentisana ka zadovoljenju potreba urbanih potrošača. Povećanje značaja zdravstvenih aspekata u izboru hrane je takođe evidentno (Diplock et al 1999; Sijtsema et al. 2003, De Jong et al 2003; Niva and Mäkelä 2005). Imajući sve u vidu, rad ima za cilj da analizira nove putanje potrošnje na osnovu kvantitativnog istraživanja potrošača na teritoriji Zapadnog Balkana. Deskriptivna statistika je korišćena sa ciljem istraživanja svih značajnijih razlika između različitih profila potrošača. Kvantitativno istraživanje je realizovano na populaciji 18+ u šest zemalja Zapadnog Balkana (Bosna i Hercegovina, Hrvatska, Makedonija, Crna Gora, Srbija i Slovenija) krajem septembra - početkom oktobra 2010. godine. Istraživanje je finansirano sredstvima FP7 Projekta FOCUS-BALKANS. Korišćen je strukturirani upitnik koji se sastoji iz nekoliko delova, uključujući opšte motive za potrošnju hrane (Food Choice Questionnaire - FCQ), specifična pitanja za izabrane grupe proizvoda (voće, organska, tradicionalna i funkcionalna hrana) i socio-ekonomiske i demografske karakteristike potrošača. Primenjen je troetapni stratifikovani slučajni uzorak (N=3085; oko 500 u svakoj zemlji). Glavni rezultati adresiraju faktore koji stoje iza potrošačkog izbora, potrošnju četiri kategorije hrane uključene u analizu i identifikaciju profila potrošača hrane na teritoriji Zapadnog Balkana. Konačno, analiza osvetljava i tranziciju potrošnje hrane u regionu dajući tako poseban značaj sledećem istraživačkom pitanju: da li tradicija i dalje dominira u odnosu na nove trendove u potrošnji hrane? Iznad svega, istraživanje zasnovano na pristupu koji polazi od stavova potrošača daje osnovu za odlučivanje kako na nivou farme i prehrambene industrije, tako i na nivou nosioca politike javnog zdravlja na teritoriji Zapadnog Balkana.

Ključne reči: hrana (voće, organska, tradicionalna i funkcionalna hrana) FCQ, potrošnja, profil potrošača, Zapadni Balkan.

JEL klasifikacija: Q13, M31, I18.

**COVER CROPS FOR ENHANCED SUSTAINABILITY OF CROPPING SYSTEM
IN TEMPERATE REGIONS**

Branko Ćupina

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The main aim of cover crops growing is protection of agro-ecological system. Increased usage of cover crops, particularly legumes and their mixtures can provide high quality food and feed, reduce the energy and greenhouse gas impacts of agriculture, improve soil fertility, reducing of nutrients leaching, prevention of soil erosion, reducing the needs for pesticides, water quality protection and help safe guard personal health. Benefits vary by location and season, but at least two or three occur with any cover crop. Cover crops are used to design new strategy that preserves farm natural resources while remaining profitable. Key to this approach is to see a farm as an agro ecosystem a dynamic relationship of the mineral, biological, weather and human resources involved in producing crops or livestock. This review aims to facilitate integration and progress in cover crops research and development in West Balkan countries, and the efficient tackling of problems, so that cover crops contribute to meeting environmental and health challenges.

Keywords: Cover crops, Ecosystem services, Greenhouse effect, Soil fertility

**CHALLENGES IN AGRICULTURAL SECTOR OF THE POTENTIAL
CANDIDATE AND THE CANDIDATE COUNTRIES FOR EU MEMBERSHIP**

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First part of this paper is related to the Common Agricultural Policy of EU as a moving target for the acceding countries to EU. Special emphasis is put on the latest reforms and new elements of the CAP for the period 2014-2020. Second part starts with overview on the common characteristics and weaknesses of the agricultural sector in Western Balkan countries with status of the potential or candidate countries for EU membership. Then their tasks and duties on EU path are underlined in order to provide access to the EU without turbulences or so called soft lending. The preparation is discussed at several levels: a) formulation of the appropriate strategy for development of agriculture and rural areas with gradual introduction of the CAP instruments; b) harmonisation of legislation with the Acquis; and c) capacity building in the widest sense. Third part is related to the role of the academic institutions in the creation and monitoring agripolicy, and in the main phases of negotiations with EC, having in mind latest EU prospective for agricultural knowledge and innovation system. As a conclusion, importance of the agriculture and necessity to engage the available human resources in its preparedness for EU membership are underlined.

Keywords: Common Agricultural Policy, European Union, accession, potential candidate and candidate countries, Agricultural Knowledge and Innovation System

IZAZOVI U POLJOPRIVREDNOM SEKTORU ZEMALJA POTENCIJALNIH KANDIDATA I KANDIDATA ZA ČLANSTVO U EU

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U prvom dijelu rad se bavi Zajedničkom poljoprivrednom politikom (CAP) EU kao pokretnom metom za zemlje koje se pridružuju EU. Poseban je akcenat stavljen na najnovije reforme i novine koje se uvođe u CAP za programski period 2014-2020. Drugi dio, uz prikaz zajedničkih karakteristika poljoprivrede zemalja Zapadnog Balkana koje su potencijalni kandidati ili kandidati za članstvo u EU, ukazuje na obaveze koje je potrebno ispuniti kako bi se sektor poljoprivrede pripremio za članstvo u EU. Pripreme su posmatrane u više nivoa: izrada strateškog okvira za razvoj poljoprivrede i ruralnih područja uz postepeno uvođenje principa CAP-a u nacionalne agrarne politike, harmonizacija zakonodavstva sa Acquis-em EU i jačanje ljudskih resursa u najširem smislu. Treći dio rada odnosi se na ulogu akademskih institucija u kreiranju i praćenju agrarne politike, kao i u podršci administraciji u vođenju pregovora, imajući u vidu najnovije perspektive prenosa znanja i inovacija u EU. Na kraju se izvode zaključci koji naglašavaju važnost sektora poljoprivrede i potrebu angažovanja raspoloživih ljudskih resursa kako bi poljoprivreda imala što bolju startnu poziciju u EU.

Ključne riječi: Zajednička poljoprivredna politika, Evropska unija, integracioni procesi, zemlje potencijalni kandidati i kandidati za članstvo, transfer znanja i inovacije u poljoprivredi

ORAL PRESENTATION

Section 1. Agroecology and Organic Agriculture



PREPARATION OF THE BIH NATIONAL ACTION PROGRAMME ALIGNED TO THE UNCCD 10-YEAR STRATEGY

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Bosnia and Herzegovina (BiH) accessed the United Nations Convention to Combat Desertification/Land Degradation (UNCCD) on 26 August 2002. The Convention entered into force on 24 November 2002. BiH has the status of affected country party by degradation within the countries of Central and Eastern Europe, Annex 5 of the Convention. One of the primary obligations of BiH (RS, FBiH and Brčko District) arising from the ratification of UNCCD is the preparation and alignment of national action program (NAP) to combat desertification/land degradation, which will be a part of the national strategy to combat desertification/land degradation respectively sustainable land management (SLM), and along with it, important in the implementation of the Convention. Accordingly, the national action program is a key instrument for the implementation of the Convention. It is often supported with the action programs at the sub-regional (SRAPs) and regional (RAPs) level. The NAP is being developed through participatory approach involving various stakeholders, and among them, relevant government institutions, scientific institutions and local communities. The NAP explains in detail the practical actions and measures to be taken to combat desertification/land degradation in specific ecosystems. In decision 3 of the Conference of the Parties 8, paragraph 5. (3/COP.8, paragraph 5.) country parties are urged to align their action programmes and other relevant implementation activities related to the Convention with the 10-year Strategy by, inter alia, addressing the outcomes under the five operational objectives. The necessity of NAP preparation in BiH was emphasized in the First National Report of BiH (I NR), 2007, and continued through subsequent reporting on the implementation of the Convention in BiH toward the UNCCD Secretariat. The implementation of the project funded by the Global Environment Facility (GEF) entitled: "Support to Bosnia and Herzegovina for development of National Action Programmes aligned to the UNCCD 10-Year Strategy and Reporting Process under UNCCD" has been started in January 2013 by UNEP. The paper presents the obligations of BiH under the UNCCD, related primarily to the preparation of NAP, reasons for the necessity of its alignment and guidelines for the alignment of NAP BiH with five operational objectives. Expected outcomes of these five operational objectives are also analyzed. The paper also gives the proposal of the BiH NAP contents.

Keywords: UNCCD, BiH, national action program, alignment, 10-year strategy

Oral presentation

Section 1. Agroecology and Organic Agriculture

BOOK OF ABSTRACTS

**PRIPREMA DRŽAVNOG AKCIONOG PROGRAMA BOSNE I HERCEGOVINE
USKLAĐENOG SA 10-GODIŠNjom UNCCD STRATEGIJOM**

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Bosna i Hercegovina je pristupila Konvenciji ujedinjenih nacija za borbu protiv dezertifikacije/degradacije zemljišta (UNCCD) 26. avgusta 2002. godine, a konvencija je stupila na snagu 24. novembra 2002. godine. BiH ima status članice ugrožene degradacijom u okviru zemalja centralne i istočne Evrope, Aneks 5. Konvencije. Jedna od osnovnih obaveza BiH (RS, FBiH i Brčko distrikta) koje proizilaze iz ratifikacije UNCCD je i izrada i uskladivanje državnog akcionog programa (NAP) za borbu protiv dezertifikacije/degradacije zemljišta, koji će nakon toga biti dio državne strategije za borbu protiv dezertifikacije/degradacije zemljišta, odnosno održivog upravljanja zemljištem (SLM), a sa njom zajedno važan u implementaciji Konvencije. Prema tome, državni akcioni program je ključni instrument za implementaciju Konvencije. On je često podržan i akcionim programima na sub-regionalnom (SRAPs) i regionalnom (RAPs) nivou. NAP se razvija kroz participativni pristup, koji uključuje različite zainteresovane strane, a u okviru njih i relevantne vladine institucije, naučne institucije i lokalne zajednice. U NAP-u se detaljno objašnjavaju praktične aktivnosti i mјere koje treba preduzeti u borbi protiv dezertifikacije/degradacije zemljišta u specifičnim ekosistemima. U odluci broj tri osme Konferencije zemalja potpisnica, u stavu 5. (3/COP.8, stav 5.) zemlje potisnice se pozivaju da usklade svoje akcione programe i druge, za implementaciju relevantne aktivnosti, koje se odnose na Konvenciju sa 10-godišnjom Strategijom, obraćajući pažnju prije svega na rezultate pet operativnih ciljeva Strategije. Aktuelnost neophodnosti izrade NAP-a Bosne i Hercegovine je naglašena još u prvom državnom izveštaju (I NR), 2007. godine, a nastavljena je i kroz naredna izvještavanja o implementaciji Konvencije u BiH prema sekretarijatu UNCCD. U januaru 2013. godine počela je od strane UNEP-a implementacija projekta finansiranog od strane Globalnog fonda za životnu sredinu (GEF) pod nazivom: "Podrška Bosni i Hercegovini za razvoj nacionalnih akcionalih programa uskladištenih sa UNCCD 10-godišnjom Strategijom i proces izveštavanja pod UNCCD". U radu se prikazuju obaveze BiH prema UNCCD, vezane prvenstveno za izradu NAP-a, razlozi neophodnosti njegovog uskladivanja i smjernice za uskladivanje NAP-a BiH sa pet operativnih ciljeva. Analiziraju se i očekivani rezultati tih pet operativnih ciljeva. Takođe je dat i prijedlog sadržaja NAP-a BiH.

Ključne riječi: UNCCD, BiH, državni akcioni program, uskladivanje, 10-godišnja strategija.

Oral presentation
Section 1. Agroecology and Organic Agriculture
BOOK OF ABSTRACTS

**EXPLORING THE ENVIRONMENTAL, HEALTH AND ECONOMIC
SUSTAINABILITY OF THE CURRENT FOOD CONSUMPTION PATTERNS:
THE MEDITERRANEAN DIETARY PARADOX**

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Changing unsustainable production and consumption patterns is one of the four objectives of the Mediterranean Strategy for Sustainable Development. Dietary patterns are a significant factor in a number of critical sustainability issues such as climate change; public health; social justice; biodiversity; and food and nutrition security. The review paper aims at highlighting the Mediterranean dietary paradox by exploring the environmental, health and economic sustainability of the current food consumption patterns. The Mediterranean is faced with a shocking paradox; while the Mediterranean Diet (MD) is considered a “nutritional standard” and analysed as a model of sustainable diets, the current food consumption patterns have high environmental, health and economic costs. Numerous studies showed that adherence to the MD is associated with a markedly reduced cardio-vascular diseases and cancers risk. The MD has also been analyzed for its low environmental impacts. Nevertheless, there is a decline in adherence to the MD in the Mediterranean due to different economic, technological, cultural and social drivers. In fact, there is a species of “Mediterraneisation” of diets in many non-Mediterranean countries while there is an ongoing “Westernisation” of Mediterranean dietary patterns. The share of plant-based energy in the diet is higher in Finland with respect to Italy. Malnutrition and diet-related non-communicable diseases are straining families and healthcare budgets. Overweight and obesity rates are high (e.g. 54.1 and 19.8% in Italy; 67.9 and 33.1% in Egypt). The regional ecological deficit is increasing as the biocapacity is dropping while the ecological footprint is increasing. Paradoxically countries such as Finland have an ecological reserve. The Italian water footprint of food supply is higher than the Finnish one. Almost 65% of water resources in the Mediterranean is allocated to irrigated agriculture. This calls in question the sustainability of a diet that is based on irrigated vegetable and fruit crops. Cereal imports and high fruit and vegetables prices are also calling the socio-economic sustainability of the Mediterranean diets in question. There is an urgent need to design and implement appropriate policies, supported by research activities, to foster the changes necessary to make the current Mediterranean food consumption patterns more sustainable.

Keywords: Mediterranean diet; paradox; sustainability; environment; health; economics

**EFFECT OF SOME METALS LIKE THE Cr, Mn, Ni AND Pb IN THE CROP OF
RICE IRRIGATED WITH URBAN RESIDUAL WATERS IN ALBUFERA OF
VALENCIA (SPAIN)**

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This study wants to establish the effects of urban waste water irrigation on the cultivation of rice for heavy metal contamination: in particular, Chromium (Cr), Manganese (Mn), Nickel (Ni) and Lead (Pb). The research studies the evolution along an irrigation line, so take nine plots along it, and the levels of these elements is checked, in root, stem and grain. It is compared with other irrigation waters from different sources, with the parallel study, which analyzed other soil and water in order to determine the interaction soil-plant-water. In the experiment is always considered the possibility of cultivating as a filter for heavy metals. The novelty of this study with respect to previous ones on the reuse of urban wastewater in agriculture and their effects on crops and the environment, is just follow the linear evolution (spatial) of the chemical parameters of flooded soils for growing rice. In the analysis not only considers the spatial evolution but also the temporal, comparing the results obtained from samples taken before and after harvest of rice cultivation for several campaigns. Finally, under the conditions of the experiment, basic soils and Mediterranean conditions, do not pass the point relevant quantities that could endanger the consumer.

AGRICULTURAL LAND IN B&H, WEALTH OR POVERTY?

Božana Kučuk

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One of the gaps in the development of modern intensive agricultural production in Bosnia Herzegovina is the fragmentation of land holdings. Sustainable agricultural development includes technically feasible, environmentally acceptable, socially responsible and economically efficient processes that will ensure and satisfy the human need for food while preserving natural resources, biological diversity and the overall ecological system in future. International experiences and practices in the EU indicate that proper management and its protection is one of the most important procedures for the protection and sustainability of the entire agro-ecosystems. In the territory of Bosnia Herzegovina, automorphic land, which solely depends on precipitation, represents 92.9 percent of its total. Hidromorfic land makes up the remaining 7.1 percent of it. Annual losses due to misuse amount to 3,000 hectares of land. There is a relatively small amount of top quality land in Bosnia Herzegovina. Soil which has an acidic base takes up an area of 2,256,272 hectares or 44.12 percent of the land. The main objectives of this paper are set as follows: - effects of urbanization, industrialization and mining damage to land and land space, - measures to protect of top- quality soil, - prevention and remediation of land damage, - soil protection through legislation. In order to protect the top-quality resource of land, it is particularly important to the following research methods: monitor changes in soil fertility, create of detailed prudential tickets, intensify measures for the reclamation of damaged lands, create of active and potential water erosion maps, adopt an uniform law for its protection, conduct regular testing which monitors the health of the land with a special emphasis on the issues of biological and chemical contamination, intensify the categorization of karst territory, which makes up a large amount of surface area in the region, insure the safe production of healthy food by paying special attention chemically contaminated lands.

Keywords: remediation, biological and chemical contamination, anthropogenic degradation, physical destruction, prevention, rehabilitation, Law on soil protection.

**ECOLOGICAL PARAMETERS OF SURFACE WATER IN NORTHWESTERN
ALBANIA**

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Lake Shkodra is located on the border between Montenegro and Albania at $40^{\circ}10'$ north altitude, $19^{\circ}15'$ East longitude. The largest inflow is the Moraca River (Montenegro), which provides more than 62 % of the lake water and the outflow is Buna River. The aim of this study is to determine the ecological parameters including OT, BOD, pH, N-NH₄, N-NO₃ and P- PO₄, from Drini rivers, Buna river and Shkodra Lake, in the northwestern part of Albania as well as to establish the quality of its immediate environment within its vicinity. Sampling was administered in the period June-September on an every fortnightly basis and the analysis was further pursued at the Fushe-Kruje Center for Technology Transfer. Water quality assessment is carried out based on the parameters as set out by the State Standards Catalogue concerning the quality of water. The findings relevant to this study demonstrate the variability of the values of parameters analyzed along the entire length of the study period but in the main based on the values contained including pH, OT and NBO₅ proving that the Drin and Buna river waters are classified as being of high quality and on an average basis respectively. The content of nutrient elements classifies the waters of Drin River as being on average good quality, but the waters of Buna river as being of bad quality, while the waters for Shkodra lake as being of on average good. As these water resources find themselves constantly under the influence of continuous pollution as a result of the discharge of urban and industrial wastes there is a need to carry on with a continuous monitoring process throughout the year in order to avoid (eliminate) pollution that can bring along a highly ecological risk to aquatic organisms that grow in these water resources.

Keywords: Ecological parameters; water pollution; water quality; rivers and lakes

**CONTROL OF NITRATE CONTENT AND PESTICIDE RESIDUES IN LETTUCE
(LACTUCA SATIVA)**

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Content of residues harmful to human health in the fruits and parts of plants used for food can be kept within tolerable concentrations, if the principles of good agricultural practice are followed. One of the ways to control agricultural product safety is their regular monitoring on the market. The RS Agricultural Institute in 2011/12 carried out a research on the concentration of nitrate and pesticide residues in samples of lettuce at the market of Banja Luka City. The random samples were taken from six shopping centers and the city market, once a month (December - May). A total of 42 samples were taken, of which 26 samples from domestic production (Herzegovina and Lijevče polje) and 16 samples of imported products (Italy). The nitrate content in fresh lettuce was determined by using Xylenol method and pesticide residues by QuEChERS multiresidue method. By using gas chromatography/mass spectrometry (GC/MS) 41 active substance of pesticides of different chemical groups. The content of nitrate above MRL (4500 mg/kg) was detected in two samples (4.7%) - one sample of domestic production (4900 mg/kg - Herzegovina) and one sample of imported (4700 mg/kg - Italy). Both defective samples were taken in February when in all tested locations the highest concentration of nitrate in lettuce leaves was found, averaging 3340 mg/kg, which is 25% lower than the MRL. In all other months (December - May) nitrate content was low, averaging at 263 mg/kg, which is by 93% lower than the MRL. Results of the analysis of pesticide residues indicate that of 42 samples of lettuce in 3 cases or 7.1% of the samples contained residues above the established MRL. All 3 samples are from domestic production, so the percentage of defected samples from domestic production is 11.5% (3 of 26 samples), which represents a very high percentage of defected samples of lettuce. The European average is about 4% of defect samples. In defected lettuce samples, one to two active pesticide substances were detected, as follows: one active substance was detected in two samples (Procymidone 6.13 and 7.20 mg/kg) and two active substances were detected in one sample (Iprodione 11.9 mg/kg and Fenarimol 0.04 mg/kg). Based on the obtained results it can be concluded that the concentration of nitrate in lettuce that was in the market of Banja Luka city during December - April, was far below the MRL, i.e., that the risk of increased nitrate content in lettuce in Banja Luka market during this period was low. Nitrates in lettuce were not harmful threat to human nutrition. However, from the point of pesticide residues, lettuce produced in the country was not safe for human consumption in a very high percentage of 11.5%. These data suggest the need to intensify the education of farmers for application of pesticides in lettuce production, i.e. educate farmers for application of Good Agricultural Practice. In addition, it is necessary, at the state level, to establish and carry out monitoring of pesticide residues in agricultural products and thus the monitoring of pesticide residues and nitrates in lettuce would be enhanced.

Keywords: lettuce, nitrate, pesticide residues, GC/MS, QuEChERS

KONTROLA SADRŽAJA NITRATA I OSTATAKA PESTICIDA U ZELENOJ SALATI (LACTUCA SATIVA)

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Sadržaj ostataka štetnih materija za ljudsko zdravlje u plodovima i dijelovima biljaka koji se koriste za ishranu moguće je održati u dozvoljenim koncentracijama ako se poštuju principi dobre poljoprivredne prakse. Jedan od načina kontrole bezbjednosti poljoprivrednih prizvoda je i njihov redovan monitoring na tržištu. Poljoprivredni institut RS je u 2011/12 godini sproveo istraživanje o koncentraciji nitrata i ostataka pesticida u uzorcima zelene salate na tržištu Grada Banjaluka. Iz šest tržnih centara i gradske tržnice, uzorkovanje je vršeno jednom mjesечно (decembar – maj) metodom slučajnog odabira. Ukupno je uzeto 42 uzorka, od čega 26 uzoraka iz domaća proizvodnja (Hercegovina i Lijevče polje) i 16 uzoraka iz uvoza (Italija). U svježoj salati sadržaj nitrata je određen Xsilenol metodom, a ostaci pesticida multirezidualnom QuEChERS metodom. Tehnikom gasno-masene hromatografije (GC/MS) analizirana je 41 aktivna materija pesticida različitih hemijskih grupa. Sadržaj nitrata iznad MRL (4500 mg/kg) utvrđen je kod dva uzorka (4,7%) – jedan uzorak iz domaće proizvodnje (4900 mg/kg - Hercegovina) i jedna uzorak iz uvoza (4700 mg/kg - Italija). Oba neispravna uzorka su uzorkovana u februaru kada je na svim ispitivanim lokacijama utvrđena najviša koncentracija nitrata u listu salate, u prosjeku 3340 mg/kg što je za 25% niže od MRL. U svim ostalim mjesecima (decembar – maj) sadžaj nitrata je bio nizak, u prosjeku 263 mg/kg što je za 93% niže od MRL. Rezultati analiza ostataka pesticida pokazuju da je od 42 ispitana uzorka salate u tri (3) uzoraka ili 7,1% uzoraka utvrđen sadržaj pesticida iznad MRL. Sva tri uzoraka su iz domaće proizvodnje, tako da je procenat nespravnih uzoraka iz domaće proizvodnje 11,5% (3 od 26 uzorka) što predstavlja vrlo visok procenat neispravnosti uzoraka salate. Evropski prosjek je oko 4 % neispravnih uzoraka. U neispravnim uzorcima salate detektovani su uzorci sa jednom i dvije aktivne materije pesticida i to: u dva uzorka je detektovna jedna aktivna materija (Prosimidon 6,13 mg/kg i 7,20mg/kg) u jednom uzorku dvije aktivne materije (Iprodion 11,9 mg/kg i Fenarimol 0,04 mg/kg). Na osnovu dobijenih rezultata može se zaključiti da je koncentracija nitrata u salati koja se nalazila na tržištu Grada Banjaluke u periodu decembar - april, bila daleko ispod MRL, tj. da je rizik od povećanog sadržaja nitrata u salati na tržištu Banjaluke u tom periodu bio nizak. Nitriti u salati nisu predstavljali opasnost u ishrani ljudi. Međutim, sa aspekta ostataka pesticida, salata iz domaće proizvodnje nije bila bezbjedna za ishranu ljudi i to u visokom procentu 11,5%. Ovi podaci ukazuju da je potrebno intenzivirati edukaciju poljoprivrednih proizvođača za primjenu pesticida u proizvodnji salate tj. vršiti edukacije za primjenu dobre poljoprivredne prakse. Pored toga potrebno je na nivou države uspostaviti i sprovoditi monitoring ostataka pesticida u poljoprivrednim proizvodima u okviru čega će biti pojačan monitoring ostataka pesticida i nitrata u salati.

Ključne riječi: zelena salata, nitrati, ostaci pesticida, GC/MS, QuEChERS

AGROFITOCENOSIS IN ORGANIC GARDENING

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Bio-garden is part of the land where are cultivated the selected types of plants (vegetables, fruits, flowers, medicinal-herb) grown in harmony with nature, and on the principles of organic agriculture. The organic gardens cropping practices aimed at increasing biodiversity agrofitocenosis in order to reduce the availability of ecological niches that are filled weeds, pests and disease prevention, better use of available resources (water, soil, nutrients, time and labor) as well as socio-economic and other benefits that are reflected to secure incomes, greater system stability, better and diverse nutrition human and animal. Research from 2010 in the bio-garden Lelea, which is in the Banat village Torak near Zrenjanin, shows that engineering of the organic garden is based on diversification of species and formation agrofitocenozas which are entering in the vegetable crop rotation. Bio-garden area of 10 acres is divided into 26 bed circular and rectangular, made up of different plant communities in which more than 80 plant species are represented.

Keywords: Agrofitocenosis; organic garden; organic agriculture

AGROFITOCENOZE U BAŠTENSKOJ ORGANSKOJ PROIZVODNJI

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Bio-bašta je kultivisani deo zemljišta gde se odabранe vrste (povrća, voća, cveća, lekovito-aromatičnog bilja) gaji u harmoniji sa prirodom, a na principima organske poljoprivrede. U organskim baštama agrotehničke mere su usmerene ka povećanju biodiverziteta agrofitocenoza u cilju redukcije slobodnih ekoloških niša koje popunjavaju korovi, sprečavanja bolesti i štetočina, boljeg korišćenja raspoloživih resursa (vode, zemljišta, hraniva, vremena i rada) kao i socioekonomskih i drugih prednosti koje se ogledaju u sigurnijim prihodima, većoj stabilnosti sistema, boljom i raznovrsnijoj ishrani ljudi i životinja. Istraživanje sprovedeno 2010. godine u bio-bašti Lelea u banatskom selu Torak kod Zrenjanina, pokazuje da osnovu inženjeringu baštenske organske proizvodnje predstavlja diverzifikacija vrsta i formiranje agrofitocenoza koje ulaze u povrtarski tropoljni plodored. Bio-bašta površine od 10 ari podeljena je u 26 leja kružnog i pravougaonog oblika, sačinjenih od različitih biljnih zajednica u kojima je preko 80 biljnih vrsta zastupljeno.

Ključne riječi: agrofitocenoze; bio-bašta; organska poljoprivreda

THE POSSIBILITY OF DEVELOPMENT OF ORGANIC AGRICULTURE IN HERZEGOVINA

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Exploring about possibilities of the development of organic agriculture is conducted in the areas of Herzegovina region, most of the research in the area of Trebinje. The research includes the environmental characteristics of the area (climate, relief and soil morphology). The aim of this research is to improve the existing agricultural sector, protection of indigenous breeds and protection of indigenous varieties. The introduction of standards and certification of organic production would be of great significance for the further development of agriculture in this region and preventing soil degradation and soil pollution. Plan launch and implementation of this project was presented in 9 steps that have a significant role in the revival of neglected and abandoned rural areas. The method of implementation of this project consists of the establishment of an association of organic producers, education interested manufacturers, analyzes rural areas (land and water), and finding markets for the safe product placement. The biggest problem is the lack of awareness of the rural population for the conservation of natural habitats, and every year we are witnessing uncontrolled deforestation and intentional arson. If we take into account all the characteristics of the area, it can be concluded that this is a very specific region and it would be able to achieve great aims in organic farming. Despite all the problems encountered in the implementation of this project, it is encouraging that the use of chemical pesticides and the use of fertilizers is still at an early stage. Development of organic agriculture will contribute to the development of organic livestock farming and medicinal plants.

Keywords: Organic agriculture; Herzegovina region

MOGUĆNOST RAZVOJA ORGANSKE POLJOPRIVREDE U HERCEGOVINI

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Istraživanje o mogućnostima razvoja organske poljoprivrede je sprovedeno u oblastima Hercegovačke regije, a najveći dio istraživanja na području opštine Trebinje. Istraživanjem su obuhvaćene ambijentalne karakteristike ovog područja (klima, reljef i morfologija zemljišta). Cilj ovih istraživanja je unapredjenje postojećeg poljoprivrednog sektora i zaštita jedinki autohtonih rasa, odnosno zaštita autohtonih sorti. Uvodjenje standarda i certifikacija organske proizvodnje bili bi od velikog značaja za dalje razvijanje poljoprivrede na ovom području i sprečavanje degradacije i zagadjenja zemljišta. Plan pokretanja i realizacije ovog projekta predstavljen je u 9 koraka koji imaju značajnu ulogu u oživljavanju zapuštenih i napuštenih ruralnih oblasti. Metod rada i realizacije projekta se sastoji od osnivanja udruženje organskih proizvodnja, stručne edukacije zainteresovanih proizvođača, analize ruralne sredine (zemljiše i voda) i pronašlaska tržišta za siguran plasman proizvoda. Najveći problem predstavlja nedovoljno razvijena svijest ruralne populacije za očuvanjem prirodnih staništa, i svake godine je sve više prisutna nekontrolisana sječa šume i namjerno izazivanje požara. Ako se u obzir uzmu sve karakteristike ove oblasti, dolazi se do zaključka da je ovo jako specifična regija i u njoj bi se mogli ostvariti veliki ciljevi u organskoj poljoprivrednoj proizvodnji. Pored svih problema na koje se nailazi pri realizaciji ovog projekta, ohrabrujuće je to što je upotreba hemijskih sredstava za zaštitu bilja i upotreba mineralnih djubriva još uvijek u početnoj fazi. Prednost kod organskih proizvodnja imalo bi organsko stočarstvo zbog većeg broja autohtonih jedinki i proizvodnja ljekovitog bilja.

Ključne riječi: Organska poljoprivreda; Hercegovačka regija

THE POSSIBILITIES OF JUINT ACTION OF PRODUCERS OF MEDICINAL HERBS AND HONEY PRODUCERS IN THE MUNICIPALITY OF TREBINJE

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The possibility of establishing associations of manufacturers of medicinal herbs and bee keepers in organic honey production was analysed in the municipality of Trebinje. Consideration was given to the conditions that the area has to offer in the implementation of the plan. The launching of a new system is based on collecting data on the performance of organic beekeeping and exploiting opportunities of less accessible land for planting herbs. Rural area of Donje Vrbno (Mosko) was used as the model for the application of this type of association. Total area of arable land in this region is 13 ha, only 3 of which are used as best arable land. There are 300 300 bee colonies in the area, which is satisfactory in relation to its population. The analysis of the total area of arable land revealed 4 ha of arable layer in thickness from 10 to 15 cm, unsuitable for crops, but favorable for the cultivation of medicinal plants. The aim of this study was to determine the possibilities of intensive production of a medicinal herb, e.g. sage (*Salvia officinalis*) and white wormwood (*Artemisia absinthium L.*) based on soil and climate conditions of this area, and connecting herb and honey producers thus creating a new type of production, based upon fusion of their activities for their mutual benefit. Sage is one of the most nectariferous plants. The yield of honey from 1 hectare is 600 kg, meaning 2400 kg of honey from 4 ha of land in Donje Vrbno. Since the price of honey is considerably higher in the area, compared with other regions, being 9 € per kg, significant profit can be made. Beekeepers should place their hives near fields under herbs, so that bees use the plants and thereby improve the quality and yield of honey. Manufacturers of medicinal plants should receive adequate financial compensation according to the number of colonies that feed on their fields.

Keywords: Medicinal herbs; honey; organic beekeeping

MOGUĆNOST ZDRUŽIVANJA PROIZVOĐAČA LEKOVITOG BILJA I PČELARA KOJI SE BAVE ORGANSKOM PROIZVODNJOM MEDA U OPŠTINI TREBINJE

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Na teritoriji opštine Trebinje analizirane su mogućnosti osnivanja udruženja proizvođača lekovitog bilja i pčelara koji se bave organskim pčelarstvom. Sagledani su uslovi koje ovo područje može da ponudi u realizaciji samog plana. Plan za pokretanje novog sistema udruživanja se sastoji od sakupljanja podataka o vršenju organskog pčelarstva i mogućnostima iskorištanja manje pristupačnih zemljišta za sadnju lekovitog bilja. Model primene ovakvog tipa udruživanja dat je na primeru ruralne sredine Donje Vrbno (MZ Mosko). Površina obradive zemlje ove sredine iznosi 23,5 hektara a od toga je iskorišteno svega 3 hektara najboljih oranica. Stanovnici ovog područja posedujuju 300 pčelinjih društava, što je zadovoljavajuće u odnosu na broj stanovnika. Analizom ukupne površine obradivog zemljišta utvrđeno je da 4 hektara sadrže obradivi sloj u debljini od 10 do 15 cm, nepovoljan za ratarske kulture, ali povoljan za uzgajanje lekovitog bilje. Cilj ovog rada bio je da se utvrdi mogućnos intezivne proizvodnje lekovite biljke, žalfije (*Salvia officinalis*) i belog pelena (*Artemisia absinthium L.*) na osnovu klimatskih i pedoloških uslova ovog područja, kao i povezivanje proizvođača lekovitog bilja sa proizvođačima meda i stvaranja novog vira proizvodnje, združivanjem ovih delatnosti na obostranu korist. Žalfija se ubraja u najmedonosnije bilje. Procena prinosa meda sa 1 ha je oko 600 kg, što bi na 4 ha iznosilo 2 400 kg meda. S obzirom da je cena meda viša u odnosu na druge krajeve i iznosi 9 € po kg, može se ostvariti velika dobit. Ovaj vid proizvodnje bi se mogao realizovati tako što bi se proizvođači meda i proizvođači lekovitog bilja udružili. Pčelari bi svoje košnice postavljali u neposrednoj blizini polja pod lekovitim biljem, tako da pčele koriste to bilje i time poboljšavaju kvalitet i prinos meda. Proizvođači lekovitog bilja bi prema broju pčelinjih društava koje se hrane na njihovim poljima od pčelara dobijali adekvatnu novčanu nadoknadu.

Ključne riječi: Lekovito bilje; med; organsko pčelarstvo

THE POSSIBILITY OF THE PRODUCTION OF ENERGY CROPS IN THE LANDFILL

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The paper points out the current and potential areas of research, in order to determine the possibility of establishing energy plantations in the dumps, other areas of degraded and unused lands. The establishment of plantations would help land reclamation landfill and biomass energy produced would be used as fuel. Predictions are that in the coming years *Miscanthus × giganteus* become an important raw material for second generation biofuels such as bioethanol. It is possible to establish the production of energy crops in the landfill, but also at other locations. The use of biomass as an energy source would result in reducing the dependence of companies from heat suppliers, and to achieve both ecological and economic benefits for the wider community.

Keywords: energy crops, waste, sustainable development, *Miscanthus × giganteus*

MOGUĆNOST PRODUKCIJE ENERGETSKIH ZASADA NA DEPONIJI

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U radu je ukazano na trenutne i potencijalne oblasti istraživanja, sa ciljem da se utvrdi mogućnost uspostavljanja energetskih zasada na deponijama, drugim degradiranim površinama i neiskorišćenim zemljištima. Uspostavljanje zasada pomoglo bi rekultivaciji zemljišta deponije, a proizvedena energetska biomasa koristila bi se kao emergent. Predviđanja su da će u narednim godinama *Miscanthus×giganteus* postati značajna sirovina za drugu generaciju biogoriva kao što je bioetanol. Moguće je uspostaviti produkciju energetskog zasada na deponiji, ali i na ostalim lokacijama. Korišćenje biomase kao energenta uticalo bi na smanjenje zavisnosti preduzeća od dobavljača toplotne energije, a postigli bi se i ekološki i ekonomski benefiti za širu društvenu zajednicu.

Ključne reči: energetski zasadi, deponije, održivi razvoj, *Miscanthus × giganteus*.

Section 2. Genetic Resources



**SLOVENIAN WAY OF CONSERVATION OF FARM ANIMAL GENETIC
RESOURCES**

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Slovenia has long tradition on conservation on farm animal genetic resources (FAnGR). One of the ancient examples we can find by the equine. The Lipizzan horse is one of the oldest culture horse breeds in the world. Its name is closely related to Lipica (Slovenia), the place of origin of the Lipizzaner breed, situated in the Slovene Karst (sl. Kras) region, founded since 1580. Very important is a initiative for protection of local bee breed *Apis Mellifera Carniolica* dated from year 1920. The conservation of FAnGR in the last century was sporadic and has a consequence on loss many of the breeds in Slovenia. Some activities and proposal for protection on some breeds was proposed by some institutions or some individual's from year 1983, but without of agro-political decisions, which frequently disagree with conservation old local breeds. The first regulation on this become in 2000 with Agricultural Act and especially in 2002 Animal breeding Act, where especial chapter dilling with Animal Genetic Resources for local breeds in year 2002. The special Rule on Conservation of Farm Animal Genetic Resources become in year 2004. In the last three decade Slovenia establish some programmes for research and support the program for conservation of local breeds. In the first period was yearly decided programs from year 1993 and later became the first (2001-2009) and second multiyear (2010-2016) program of work on Farm Animal Genetic Resources.

Keywords: local breeds; conservation; Slovenia

SLOVENAČKI PUT U ZAŠТИTI ANIMALNIH GENETIČKIH RESURSA

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Slovenija ima dugu tradiciju o zaštiti na farmi animalnih genetskih resursa (FAnGR). Jedan od starih primjera možemo naći kod Lipicanskog konja, koja je jedan od najstarijih kulturnih pasmina konja u svijetu. Ime je povezano sa Lipicom(Slovenija), mjesto podrijetla lipicanske pasmine, koja se nalazi u slovenačkom krasu. Pasmina je osnovana od 1580. Vrlo važno je inicijativa za zaštitu lokalne pčelinje pasmine Apis Mellifera Carniolica koja je na snagi očuvanja od 1920.Očuvanje FAnGR u prošlom stoljeću bila je sporadična i ima utjecaja na gubitak mnogih od pasmina u Sloveniji. Neke aktivnosti i prijedlog za zaštitu na nekim pasmina je predložio neke institucije ili neki pojedinac je iz godine 1983, ali bez agro-političkim odlukama, koje se često ne slažu s konzervatorskim starih lokalnih pasmina. Prvi propis o tome postaju u 2000 s Poljoprivrednog Zakona, a posebno u 2002 Zakonu stočarstvo, gdje naročiti poglavje dilling s animalnih genetskih resursa za lokalne pasmine u 2002.Posebna pravila o zaštiti farmskih animalnih genetskih resursa postaju u godini 2004. U posljednjem desetljeću tri Sloveniji donijeti neke programe za istraživanje i podržavaju program za očuvanje lokalnih pasmina. U prvom periodu godišnji je odlučio programe iz godine 1993, a kasnije je postao prvi (2001-2009) i drugi višegodišnji (2010-2016) program rada na očuvanju genetskih resursa u stočarstvu.

Ključne riječi: lokalne pasmine; očuvanje; Slovenija

**GENETIC DIVERSITY OF AUTOCHTONOUS PHASEOLUS BEANS
ORIGINATING FROM REPUBLIC OF SRPSKA**

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Analysis of genetic differentiation included 13 highly polymorphic SSR markers. Totally, 30 accessions were screened; 20 accessions from Republic of Srpska, Bosnia and Herzegovina (RS/BA) comparing with 10 reference accessions from Slovenian gene pool (SI). Set of applied SSR markers with different structure and repeat motifs was proven to be highly informative for genetic differentiation between included accessions. The average polymorphic information content was 0.716 where the probability of identity over all loci reached 1.919×10^{-14} . Average number of detected alleles per locus was 7.08. The most informative locus with 15 different alleles in analysis showed GATS91 and the least informative locus was ATA2 with 4 alleles detected. Shannon's information index which reflects genetic diversity within RS/BA accessions was higher ($I=1.56$) than within SI accessions ($I=1.43$). Higher genetic variability and introduction of new alleles into RS/BA germplasm was also confirmed with higher number of private alleles ($N_p=1.769$) comparing with SI reference accessions where N_p was 0.615. Chi-square tests for Hardy-Weinberg Equilibrium were not statistically significant ($p < 0.05$) on locus ATA5 within RS/BA gene pool, meanwhile five loci (ATA16, BM210, BM183, ATA9, GATS91) did not show statistically significant correlation within SI reference accessions. Analyses of molecular variance indicate common origin of RS/BA and SI accessions, since no genetic variability between these two gene pools were exposed. Generally, both the principal coordinate analysis and cluster analysis by using ad hoc statistic, divided included accessions into three genetic groups where germplasm from both gene pools is proportionally presented.

**THE USE OF ALTERNATIVE OIL CROPS IN BREEDING AND PRODUCTION -
POSSIBILITIES AND PERSPECTIVES**

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Collection of oil plant species grown at the Institute of Field and Vegetable Crops, Novi Sad, includes 16 species, with different number of varieties or landraces for castor, flax, chickpeas, safflower, false flax, caper spurge, lady's thorn, savory, coriander, dill, chard, pumpkin, oil pumpkin, okra, black mustard and white lupine. These species represent a potential source of protein and oils of different quality. In addition, these species can be used in various breeding programs as a source of beneficial genes. Having that in mind, oil and protein content of these species was tested in different years, as well as the oil composition for fatty acid content. We selected species that can be a source vegetable oils of specific quality for different purposes, particularly in the pharmaceutical and confectionery industries. Due to the growing interest in food produced from organic production and based on the preliminary results, part of the collection will be included in the experiment in which it will be subjected to different systems of crop production. To facilitate breeding and improvement of these species, during which it is necessary to make crosses between varieties and populations, and to produce seeds of required quality, pollen grain morphology (shape and size) and pollen viability is examined.

Keywords: alternative crops; protein content; oil content

KORIŠĆENJE ALTERNATIVNIH ULJANIH BILJAKA U OPLEMENJIVANJU I PROIZVODNJI – MOGUĆNOSTI I PERSPEKTIVE

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Kolekcija malo gajenih uljanih biljnih vrsta u Institut za ratarstvo i povrtarstvo, Novi Sad, obuhvata 16 biljnih vrsta, za različitim brojem sorti, odnosno lokalnih populacija ricinus, lan, naut, šafranjika, lanik, krtičnjak, gospin trn, čubar, korijander, mirodija, blitva, bundeva, uljana tikva, bamija, bela slačica i bela lupine. Ove vrste predstavljaju mogući izvor proteina ili ulja različitog kvaliteta. Osim toga ove vrste mogu se koristiti i u različitim programima oplemenjivanja kao izvor poželjnih gena. S tim ciljem ispitana je sadržaj ulja i proteina kod navedenih vrsta u različitim godinama, kao i sastav ulja, odnosno sadržaj masnih kiselina u ulju. Izdvojene su vrste koje mogu da budu izvor biljnih ulja specifičnog kvaliteta za različite namene, posebno u farmaceutskoj i konditorskoj industriji. Zbog sve većeg interesovanja za hranom dobijenom iz organske proizvodnje, deo vrsta iz kolekcije, na osnovu preliminarnih rezultata, biće uključen u oglede u kojima će se primeniti različiti sistemi biljne proizvodnje. Kako bi se olakšalo oplemenjivanje ovih biljnih vrsta, za koje je neophodno izvršiti ukrštanja između sorti, odnosno populacija, kao i proizvesti seme određenih semenskih i proizvodnih kvaliteta, ispituje se i morfologija polenovih zrna (njihov oblik i veličina) kao i vitalnost polena.

Ključne riječi: Manje gajene biljne vrste; sadržaj proteina; sadržaj ulja

THE QUALITY OF SEED SAMPLES COLLECTED FOR GENETIC COLLECTION

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The collection, storage and evaluation of genetic resources have been recognized as extremely important for all of humanity and its future. Local populations, ecotypes and old varieties, with wild plants and wild relatives are important genetic resources of flora. To prevent genetic erosion, particularly strong in the second half of the last century, collecting expeditions are mostly organized in the rural areas, relying on the local community. Species and cultivars that have almost ceased to be grown on large areas are often bred and kept in gardens. Growers supported collecting expeditions by ceding seed samples to expedition members. The aim of this paper is to present the quality of seed samples collected during the summer and autumn of 2012. in several villages in Fruška Gora. The largest number of seed samples was from a group of pulses, and seed quality has been tested on 6 samples of beans (*Phaseolus vulgaris*) and two samples of vegetable pea (*Pisum sativum*), faba bean (*Vicia faba*) and grass pea (*Lathyrus sativus*). Poppy (*Papaver somniferum*), 6 samples of lettuce (*Lactuca sativa*) and one flax sample (*Linum usitatissimum*) was also tested. Seed sample mass was measured, total number of seeds was counted and the 1000 seed weight was determined, while seed size was indirectly determined. Bean grain size is very significant for market quality and it showed the expected variability. However, the grain size variability was also large in the other studied species. Sowing qualities of collected samples were checked by determining germination energy, germination, content of seeds with atypical germs, dead and diseased seeds. In all species studied, there was a significant difference between samples for the percentage of energy and seed germination. Sample germination rate varied from remarkably high to nonexistent. Pathogens developed at some seed samples indicating improper seed storage. The results suggest that not all old variety owners know how to properly produce seeds and maintain their samples. Conservation, seed multiplication and regeneration are therefore safer in gene banks in some cases. When recommendations are given for on farm conservation, it is necessary to verify the farmer knowledge on certain plant species.

Keywords: landraces, collecting, samples, seed, quantity, quality

KVALITET SEMENA UZORAKA SAKUPLJENIH ZA GENETSku KOLEKCIJU

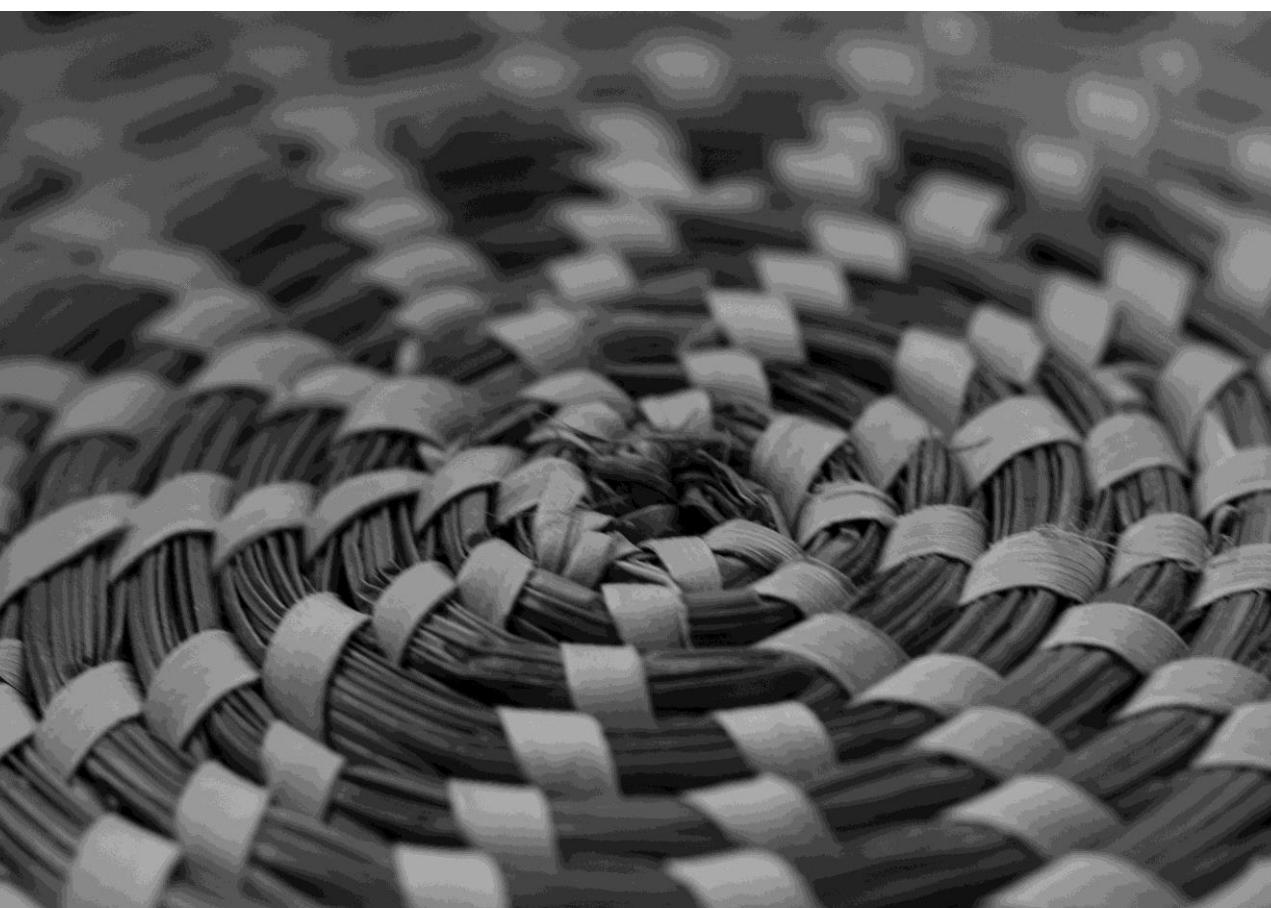
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Prikupljanje, čuvanje i ispitivanje genetskih resursa prepoznato je kao izuzetno važno za celokupno čovečanstvo i njegovu budućnost. Lokalne populacije, ekotipovi i stare sorte, uz samoniklo bilje i divlje srodnike čine najvažnije genetske resurse biljnog sveta. To je bogatstvo jednog područja, države. Briga o genetičkim resursima je briga o očuvanju biodiverziteta, o bezbednosti zemlje, o obezbeđenju hrane, o izvorima za oplemenjivanje biljaka. Da bi se sprečila genetička erozija, posebno izražena od druge polovine prošlog veka, organizuju se sakupljačke ekspedicije najčešće po ruralnim područjima sa osloncem na lokalne zajednice. U baštama se često gaje i čuvaju vrste i sorte koje su gotovo prestale da se gaje na većim površinama. Uzgajivači uzorke njihovog semena ustupaju članovima ekspedicije. Cilj ovog rada je da prikaže kvalitet semena uzoraka sakupljenih tokom leta i jeseni 2012. godine u nekoliko sela na teritoriji Fruške gore. Najveći broj uzoraka semena je grupe mahunjača (Fabaceae), pa je ispitankvalitet semena 6 uzoraka pasulja (*Phaseolus vulgaris*) i po dva uzorka povrtarskog graška (*Pisum sativum*), boba (*Vicia faba*) i sastrice (*Lathyrus sativus*). Takođe je ispitano po 6 uzoraka salate (*Lactuca sativa*) i maka (*Papaver somniferum*) i jedan uzorak lana (*Linum usitatissimum*). Izmerena je masa dobijenog uzorka, prebrojan ukupan broj semena i određena masa 1000 semena i preko toga krupnoća semena. Kod pasulja je krupnoća zrna vrlo značajan tržišni kvalitet te je pokazao očekivanu varijabilnost. Međutim varijabilnost krupnoće zrna je bila velika i kod ostalih ispitivanih vrsta. Provereni su i setveni kvaliteti sakupljenih uzoraka, energija kljianja, kljavost, sadržaj semena sa atipičnim klicama, mrvog i bolesnog semena. Kod svih ispitivanih vrsta postojala je velika razlika između ispitivanih uzoraka u procentu energije i kljavosti semena. Dobijeni su uzorci izvanredne kljavosti, kao i uzorci potpuno bez kljavosti. Na semenu pojedinih uzoraka razvili su se patogeni koji ukazuju na nepravilno čuvanje semena. Dobijeni rezultati ukazuju da ne umeju svi vlasnici starih sorata da u potpunosti pravilno i uspešno održavaju svoje uzorke i proizvode seme. Čuvanje, umnožavanje i obnavljanje semena je sigurnija u gen bankama. Prilikom preporuke za on farm konzervaciju potrebno je proveriti znanje održavaoca o proizvodnji semena pojedinih vrsta biljaka.

Ključne reči: lokalne sorte, sakupljanje, dobijeni uzorci, seme, količine, kvalitet

*Section 3. Agricultural Economics and Rural
Development*



GOVERNANCE OF AGRICULTURAL AND RURAL DEVELOPMENT IN SERBIA: ACTORS, POLICIES AND MEASURES

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Serbian agriculture represents approximately 10% of the country's GDP and about 24% of the total export. Over half of the population is rural and around one third of the active population is engaged in agriculture. The review paper provides an overview of agricultural and rural development (ARD) governance in Serbia focusing on the analysis of the actors and structures involved in decisions making and implementation. The paper (i) identifies the main ARD policies and the role of the key national (e.g. Ministry of Agriculture, Forestry and Water Management; Ministry of Economy and Regional Development; Rural Development Network of Serbia), regional (e.g. regional chambers of commerce; regional development agencies), provincial (e.g. Secretariat for Agriculture - Vojvodina) and local (e.g. local councils, associations, cooperatives) public and civil institutions; (ii) lists the major ARD projects implemented by bilateral and multilateral donors (e.g. European Union, FAO, SIDA World Bank, USAID, DANIDA, EBRD, KfW); (iii) analyses ARD budget; (iv) investigates Serbian ARD policy alignment with the European legal framework; and (v) analyses the Instrument for Pre-Accession Assistance for Rural Development management. The Law on Agriculture and Rural Development, adopted in 2009, sets the objectives of agricultural policy and provides a general framework for Serbian agriculture and rural policy. Specific measures are implemented by the Ministry of Agriculture through the Agricultural and Rural Development Strategy. Agricultural and rural development policy design and implementation in Serbia involves different international, national and sub-national actors. Agricultural budget - just over 2% of the total budget in 2010 and characterized by a large share of direct payments - provides limited support for further development of Serbian agriculture. Improving ARD governance in Serbia requires ensuring the participation and engagement of farmers, private sector and civil society in the whole policy cycle. The ARD policy framework needs further adjustments to be aligned with the EU acquis, including moving towards decoupled support measures. Administrative capacity needs to be strengthened and the fundamental instruments and institutions for managing the Common Agricultural Policy (CAP) established. Moreover, fostering integrated rural policy in Serbia requires changes in the relations between governance levels and among the involved actors.

Keywords: agriculture; rural development; Serbia; governance.

**KEY INDIKATORS OF AGRICULTURAL DEVELOPMENT IN BOSNIA AND
HERZEGOVINA – RETROSPECTIVE FROM 1950 TO 2010**

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The last twenty years of agriculture in Bosnia and Herzegovina is characterized by the transition from a planned socialist to capitalist market economy and reconstruction of the consequences of the civil war. Often, the achieved level of agricultural development in B&H was evaluated based on comparisons of certain indicators of its status with the countries of the region or the EU. In this paper, the chosen approach was comparing the development of agriculture in BiH with itself by monitoring development of agriculture in the sixty year period, starting from 1950 to 2010. For this retrospective, indicators for which it was possible to find comparable data for the entire period were selected: gross domestic product of agriculture, agricultural employment, the size and structure of agricultural and arable land, production and average yield of some key agricultural products and the number of livestock. The analysis of these indicators showed that, in the last sixty years, in B&H there was an increase in GDP of agriculture, despite the significant decrease of the agricultural population, reduction of cultivated land and changed structure of their use, the average yields increased, but not significantly, and that the number of livestock in some species reduced (cattle, sheep and horses) and increased in others (pigs and poultry). Based on the analysis of selected indicators, and bearing in mind the development of the productive funds, which happened in the meantime, the general conclusion is that there has been some, but insufficient, progress in the development of agriculture in B&H in the period from 1950 to 2010 year.

Keywords: Bosnia and Herzegovina, agriculture, development, development indicators.

**OSNOVNI INDIKATORI RAZVOJA POLJOPRIVREDE U BOSNI I
HERCEGOVINI - RETROSPEKTIVA OD 1950. DO 2010. GODINE**

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Zadnjih dvadesetak godina poljoprivrednu u Bosni i Hercegovini karakteriše tranzicija od socijalističke planske u kapitalističku tržišnu privrodu i obnova od posljedica građanskog rata. Često se dostignuti stepen razvoja poljoprivrede u BiH cjeni na bazi poređenja određenih indikatora njenog stanja sa zemljama regiona ili EU. U ovom radu je odabran pristup poređenja razvoja poljoprivrede u BiH sa samom sobom, odnosno praćenje razvoja njene poljoprivrede u šezdesetogodišnjem periodu, počev od 1950. godine, zaključno sa 2010. godinom. Za ovu retrospektivu odabrani su indikatori za koje je bilo moguće naći uporedne podatke za čitav period: bruto domaći proizvod poljoprivrede, poljoprivredna zaposlenost, veličina i struktura poljoprivrednih i obradivih površina, obim proizvodnje i prosječni prinosi nekih ključnih poljoprivrednih proizvoda i brojno stanje stoke. Analizom ovih indikatora utvrđeno je da je u proteklih šezdeset godina u BiH došlo do povećanja BDP poljoprivrede, usproks značajnom smanjenju poljoprivrednog stanovništva, da su smanjene obrađene površine i izmjenjena struktura njihove upotrebe, da su prosječni prinosi povećani, ali ne značajno, i da je broj stoke kod nekih vrsta smanjen (goveda, ovace i konji), a kod drugih povećan (svinje i živila). Na osnovu analize odabranih indikatora, a imajući u vidu razvoj proizvodnih snaga koji se u međuvremenu desio, generalni zaključak je da je ostvaren određeni, ali nedovoljan, pomak u razvoju poljoprivrede u BiH u periodu od 1950. do 2010. godine.

Ključne riječi: Bosna i Hercegovina, poljoprivreda, razvoj, indikatori razvoja.

DEVELOPMENT ANALYSIS OF MARKET INFRASTRUCTURE AND AGRO- TECHNICAL EQUIPMENT IN THE MUNICIPALITY OBRENOVAC

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Using the comparative advantages and tradition, which the municipality Obrenovac has in the field of agricultural production supposes a transformation of domestic agriculture and all forms of business entities in this field. The agriculture is traditional economic activity, which share in a structure of DP at the level of the municipality Obrenovac is around 16%. For development of agriculture there are good potentials, regarding that in the structure, agricultural land makes around 76% of the total land, so along with the municipality Zemun, Obrenovac is a city municipality with the largest agricultural and arable land in Belgrade area. Better exploitation of agriculture comparative advantages of the municipality Obrenovac requires a transformation, i.e. a turning point in business of all economic actors in agricultural sector. In other words, respecting the market approach, i.e. constant and intensive changes on the market, represents a first and a basic assumption on which would be rational formulation of new marketing strategies, different from the competitive exactly by inventiveness, technology and quality. New strategies, tentatively, must imply also a provision of financial resources' critical mass (from privatization, credit arrangements, foreign direct investments, cooperation with foreign investments), as well as a stimulating agrarian policy, without which is impossible to follow the modern market, technological and marketing trends. Improvement of the market infrastructure and agro-technical equipment of the municipality Obrenovac assumes the development of modern repurchase-distributive centres, with developed infrastructure and modern equipment for repurchase, selection, packing, storing and transport of agricultural products. Such centres would contribute to minimization or complete elimination of black economy, ensure efficient turnover of agricultural products, instigating a creation of long-term contracts on business-technical cooperation with agricultural producers, and finally would contribute to a faster introduction of safety and food control system. At the same time, developed machinery rings in area of the municipality Obrenovac would contribute to more efficient production of small and medium producers.

Keywords: market infrastructure, agricultural products, competitiveness, agro-technical equipment.

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ANALIZA RAZVOJA TRŽIŠNE INFRASTRUKTURE I AGROTEHNIČKE OPREMLJENOSTI U OPŠTINI OBRENOVAC

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Korišćenje komparativnih prednosti i tradicije, koju opština Obrenovac ima u oblasti poljoprivredne proizvodnje prepostavlja transformaciju domaće poljoprivrede i svih formi subjekata privređivanja u ovoj delatnosti. Poljoprivreda je tradicionalna delatnost privrede, koja u strukturi stvaranja nacionalnog dohotka na nivou opštine Obrenovac ima učešće od oko 16%. Za razvoj poljoprivrede postoje dobri potencijali, budući da u strukturi, poljoprivredno zemljište čini oko 76% ukupnog zemljišta, tako da je uz opštinu Zemun, Obrenovac gradska opština sa najvećim poljoprivrednim i oraničnim površinama na nivou grada Beograda. Bolja iskorišćenost komparativnih prednosti poljoprivrede opštine Obrenovac zahteva transformaciju, odnosno zaokret u poslovanju svih ekonomskih aktera u poljoprivrednom sektoru. Naime, uvažavanje tržišnog pristupa, odnosno konstantnih i intenzivnih promena na tržištu, predstavlja prvu i osnovnu prepostavku na kojoj bi bilo racionalno formulisanje novih marketing strategija, različitih od konkurenčkih upravo po inventivnosti, tehnologiji i kvalitetu. Nove strategije, uslovno rečeno, moraju podrazumevati i obezbeđivanje kritične mase finansijskih sredstava (iz privatizacije, kreditnih aranžmana, stranih direktnih investicija, kooperacija sa stranim investitorima), kao i stimulativnu agrarnu politiku, bez koje je nemoguće pratiti savremene tržišne, tehnološke i marketinške trendove. Unapređenje tržišne infrastrukture i agrotehničke opremljenosti opštine Obrenovac prepostavlja razvoj savremenih otkupno distributivnih centara, sa razvijenom infrastrukturom i modernom opremom za otkup, selekciju, pakovanje, skladištenje i transport poljoprivrednih proizvoda. Ovakvi centri doprinosili bi minimizaciji ili potpunom eliminisanju sive ekonomije, osiguravali bi efikasni promet poljoprivrednim proizvodima, podsticali uspostavljanje dugoročnih ugovora o poslovno-tehničkoj saradnji sa poljoprivrednim proizvođačima, a na kraju doprinosili bržem uvođenju sistema bezbednosti i kontrole hrane kod proizvođača. Istovremeno, razvijeni mašinski prstenovi na području opštine Obrenovac doprinosili bi efikasnijoj proizvodnji malih i srednjih proizvođača.

Ključne reči: tržišna infrastruktura, poljoprivredni proizvodi, konkurentnost, agrotehnička opremljenost.

Rad je deo istraživanja na projektu III - 46006 "Održiva poljoprivreda i ruralni razvoj u funkciji ostvarivanja strateških ciljeva Republike Srbije u okviru dunavskog regiona" finansiranog od strane Ministarstva prosvete, nauke i tehnološkog razvoja Republike Srbije.

FORECASTING OF POTATO PRODUCTION

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In the paper are analysed potato production in Serbia, Vojvodina region and Germany. For Serbia and Vojvodina are analysed areas, yields and production, and for Germany, only production of potato. The period 1991-2010 is analysed. Based on that data, using ARIMA model, the production parameters of potato were forecast, until to 2015. The result of forecasting show that in Serbia area has deceasing tendency, and it will be on the end of the period of forecast on the level of 60.000 hectares. Contrary, yield and total production show increasing tendency. The same tendency are present in the Vojvodina region. At the end of the forecast period area of potato in Vojvodina will be 12.700 ha, while production will be about 263.000 ton. Opposite of Serbia, in Germany production of potato show tendency of decreasing. At the end of forecast period, in 2015, expected production of potato in Germany is about 995.000 ton.

Keywords: potato; forecasting; area; production

PREDVIĐANJE PROIZVODNJE KROMPIRA

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U radu je analizirana proizvodnja krompira u Srbiji, Vojvodini i Nemačkoj. Za Srbiju i Vojvodinu su analizirane površine, ukupna proizvodnja i prosečni prinosi, a za Nemačku samo ukupna proizvodnja. Analizirani podaci odnose se na period 1991-2010. godina. Na osnovu podataka analiziranog perioda, primenom ARIMA modela predviđeno je kretanje posmatranih pojava do 2015. godine. Rezultati predviđanja pokazuju da će u Srbiji do kraja perioda predviđanja površine pod krompirom imati tendenciju stalnog smanjenja i da će biti na nivou od oko 60. 000 hektara. Za razliku od površina, proizvodnja i prinos imaće tendenciju porasta. Proizvodnja kropmira u Vojvodini pokazuje iste karakteristike kao i proizvodnja u Srbiji. Površine pod krompirom u Vojvodini konstantno će se smanjivati i na kraju perioda predviđanja iznosiće 12.700 hektara. Proizvodnju i prinos krompira u Vojvodini karakteriše tendencija porasta, pa će proizvodnja 2015. godine biti na nivou od 263.000 tona, a prinos na nivou od oko 23.000 tona po hektaru. Za razliku od Srbije i Vojvodine, proizvodnju krompira u Nemačkoj karakteriše tendencija smanjenja. Očekuje se da na kraju perioda predviđanja proizvodnja bude na nivou od oko 995.500 tona.

Ključne riječi: krompir; predvidjanje; povrsine; proizvodnja

**PRICE MOVEMENTS MEDICINAL AND AROMATIC PLANTS IN THE VALUE
CHAIN**

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Comparing the price of MAP in the value chain can be seen that the rates depend on the location in the value chain. The plant material (wild, cultivated on plantations) have the lowest price in the value chain. Retail and wholesale trade, selling primarily processed vegetable raw materials (commodities concizirana, pulvis) gets a price that is 2-4 times higher than the price that producers and pickers receive. Apparently, as the product moves through the value chain, costs are increased by the cost of processing, packaging, transportation, etc. margins. These figures show that primary producers, processors and wholesalers receive only a small part of the value chain. The highest price achieved in retail, where the retail price, depending on the type of products and sales channels, may be 10-15 times higher than the price that receive primary producers. Value chain can be very complex, with many participants, and is characterized by an imbalance prices in the markets of Serbia and the international market. Local and regional price fluctuations, as well as the lack of information affect the earnings of actors in the supply chain. Insufficient knowledge of the market, as well as difficulties in accessing the reason that primary producers are not getting higher prices. Market access of small producers is difficult, because it is necessary to connect and support local communities in order to encourage better marketing channels, price, and supply and demand for raw materials MAP and plant products.

Keywords: medicinal and aromatic plants (MAP), supply chain, prices

**KRETANJE CENA LEKOVTOG I AROMATIČNOG BILJA U VREDNOSNOM
LANCU**

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Poređenjem cena LAB-a u vrednosnom lancu može se videti da cene zavise i od mesta u vrednosnom lancu. Biljne sirovine (samonikle, plantažno gajene) imaju najmanju cenu u vrednosnom lancu. Maloprodaja i veleprodaja, prodajom primarno prerađenih biljnih sirovina (concirizirana roba, pulvis) dobija cenu koja je 2-4 puta veća od cene koju dobiju berači i proizvođači. Očigledno, kako se proizvod kreće kroz vrednosni lanac, troškovi se uvećavaju za cenu prerađe, pakovanja, transporta, marže itd. Ove cifre pokazuju da primarni proizvođači, prerađivači i veleprodaja dobija samo mali deo u vrednosnom lancu. Najveća cena se postiže u maloprodaji, gde maloprodajna cena, u zavisnosti od vrste proizvoda i kanala prodaje, može da bude veća 10-15 puta od cene koju dobiju primarnii proizvođači. Vrednosni lanac može biti veoma složen, s mnogo učesnika, i karakteriše ga neravnoteža cena, kako na tržištu Srbije, tako i na međunarodnom tržištu. Lokalne i regionalne fluktuacije cena, kao i nedostatak informacija utiču na zaradu aktera u lancu snabdevanja. Nedovoljno poznavanje tržišta, kao i teškoće u pristupu, razlog su da primarni proizvođači ne dobijaju veće cene. Pristup tržištu malih proizvođača je otežan, zato je neophodno povezivanje, kao i podrška lokalnih zajednica u cilju boljeg upoznavanja kanala marketinga, cena, kao i ponude i potražnje za LAB sirovinama i biljnim proizvodima.

Ključne reči: lekovito i aromatično bilje (LAB), lanac snabdevanja, cene

LESSONS CONCERNING CREATIVE ECONOMY

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The backwardness in the region's economic transition as well as the influence of the economic crisis suggest us the necessity of searching for new opportunities along with the operation and transformation of the current economic structure. Within this endeavour we discovered the terms of creative economy and creative industry, their rising economic power and labour engaging ability. We surveyed the first report on creative economy published by the United Nations in 2008 (Creative Economy Report, 2008) experiencing the importance of this question. It has been found that global and business competitiveness of Serbia as well as its innovative capacity falls far behind the neighbouring countries, except Bosnia-Herzegovina. Beyond the previously said, we do not even possess adequately prepared management layer capable of answering the requirements of the world market. The distribution of education level also indicates our difficult position. The indicators of the eight municipalities practically do not differ from the data for Vojvodina and Serbia. Based on our previous researches we want to underline: "The foundation of clusters and business incubators is a stopgap service for creative enterprises rich in ideas, but unable to realise them because of the lack of support. The business incubator and its innovative services will provide a stable background for local, in most of the cases start-up businesses, due to which, after the incubation period they will come out to the market strengthened and they will be able to hold on in the domestic and international competition." In the recommendations we mention the legal protection of intellectual property – supporting innovators in developing new inventions and results – for similar reasons.

Keywords: creative economy; tranzition; competitiveness; innovative capacity; clusters

RURAL DEVELOPMENT IN BOSNIA AND HERZEGOWINA BY DEGREE OF AREAS RURALITY

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The structure of the rural economy is conditioned by the natural resources, demographic structure, proximity to markets, the level of rural-urban relationships, the structure and size of rural households. All these factors make the possibility to create sources of income, employment, type of activity and the degree of diversification in some rural areas different. Demographic changes in rural areas are directly affected by the development opportunities, sources of income, management and prospects of rural areas. The course of demographic changes, except of uncontrolled environment influence, is greatly conditioned by internal factors that make the quality of life in rural areas, which are: the availability of infrastructure, public services, income, etc. The aim of this study was to analyze the degree of rurality and level of development of rural areas in BiH using internationally comparable indicators and research methods. Survey was conducted on a sample of households in 20 municipalities of the Republik of Srpska. In the area of selected municipalities, the survey was conducted in 10% of the total estimated number of households. All rural households were classified according to the municipality where they belong, then the municipality based on population density, awarded to degree of rurality, and in the end they all municipalities and their corresponding households were placed in three types of areas: predominantly urban, predominantly rural and semi-urban. All rural development indicators analyzed in the process of field research, were compared by degree of rurality areas in which households are located. Analysis of the situation based on rurality areas showed significant differences in the values of the indicators by type of area. So for the predominantly rural areas are found to be the least populated areas, with marked demographic problems. The age dependence is greatest in these areas and therefore the most common source of income is pension. Other sources of income are mostly from non-agricultural activities. Agriculture is an supporting activity in these areas, while households are mostly non-commercial. Diversification of revenue lies strongly on the side of rural tourism. Quality of life is at the lower level of development in comparison to other areas. In this sense, the choice of the rural development model in certain rural areas is directly influenced by the structure and quality of life of households in a given area, and can not be copied from one area to another.

Keywords: rural households; rural economy; agriculture; rural development model

RURALNI RAZVOJ BIH PREMA STEPENU RURALNOSTI PODRUČJA

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Struktura ruralne ekonomije uslovljena je prirodnim resursima, demografskom strukturom, blizinom tržišta, nivoom ruralno-urbane povezanosti, strukturom i veličinom ruralnih domaćinstava. Svi ovi faktori čine mogućnosti za stvaranje izvora prihoda, zaposlenje, vrste djelatnosti i stepen diverzifikacije u pojedinim ruralnim područjima različitim. Demografske promjene u ruralnom području utiču direktno na mogućnosti razvoja, izvore prihoda, način upravljanja i perspektivu ruralnih područja. Smjer demografskih promjena osim nekontrolisanih uticaja spoljne sredine u mnogome je uslovljen unutrašnjim faktorima koji čine kvalitet života u ruralnom području, a to su: dostupnost infrastrukture, javnih usluga, izvora prihoda i dr. Cilj istraživanja je bio u analizi stepena ruralnosti i nivoa razvijenosti ruralnih područja BiH korištenjem međunarodno uporedivih indikatora i metoda istraživanja. Istraživanje putem anketiranja je sprovedeno na uzorku domaćinstava u 20 opština Republike Srpske. Na području odabralih opština izvršena je analiza 10% od ukupno procijenjenog broja domaćinstava. Pri tome ruralna domaćinstva su klasifikovana prema opštini kojoj pripadaju, zatim je opštini na osnovu gustine naseljenosti dodjeljivan stepen ruralnosti, i na kraju su sve opštine i njima pripadajuća domaćinstva svrstavana u tri tipa područja: predominantno urbano, semiurban i predominantno ruralno. Svi indikatori ruralnog razvoja analizirani u procesu terenskog istraživanja, upoređivani su prema stepenu ruralnosti područja u kom se domaćinstva nalaze. Analiza stanja na osnovu ruralnosti područja pokazala je značajne razlike u vrijednostima indikatora prema tipu područja. Tako je za predominantno ruralna područja utvrđeno da su to najrjeđe naseljena područja, sa najizraženijim demografskim problemima. Starosna zavisnost je najveća u ovim područjima i zato je penzija najučestaliji izvor prihoda. Ostali izvori prihoda uglavnom potiču iz nepoljoprivredne djelatnosti. Poljoprivreda je sporedna djelatnost u ovim područjima, a domaćinstva su pretežno nekomercijalna. Diverzifikacija prihoda leži snažno na strani ruralnog turizma. Kvalitet života je na nižem stepenu razvoja u odnosu na ostala područja. U tom smislu i odabir modela ruralnog razvoja u pojedinim ruralnim područjima direktno je uslovljen strukturom domaćinstava i kvalitetom života u datom području, te se ne može preslikati iz jednog područja u drugi.

Ključne riječi: ruralna domaćinstva; ruralna ekonomija; poljoprivreda; model ruralnog razvoja

**BUCKWHEAT PRODUCTION AS A SOURCE OF AN INCOME AND
EMPLOYMENT INCREASE ON THE FAMILY FARMS IN THE HILLY-
MOUNTAINOUS REGIONS**

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The buckwheat is a very old crop that is grown today on all continents. It is well adapted to different soil and climatic conditions, so it could be successfully grown at the areas above 1,000 meters altitude. In addition, the buckwheat belongs to a group of the honey producing plants, so it could be excellent bee grazing, especially where there is no other honey producing plants. From 1 hectare of buckwheat it can be got 100-300 kg of honey if there are favorable temperature and moisture conditions. Between two world wars the buckwheat was the main "food of the poor". For the poor hilly-mountainous areas it represents the most important grain, since it has a short growing season. With an increase of living standard, the use of buckwheat seeds and flour has fallen, and this production has almost vanished. But with an increasing importance of healthy food and consumer perception has changed, so the buckwheat has been recently the respected product at demanding world markets. Today, in the world the buckwheat is grown on over 2.5 million hectares. The official statistics does not publish data on areas under buckwheat in Serbia. It is estimated that the buckwheat is grown on about 250-300 hectares. Since buckwheat can be grown successfully even on those farms which do not have favorable conditions for cultivation of other crops, buckwheat could represent a significant source of income for the family farms in the hilly-mountainous regions. Researches carried out at the family farm in Central Serbia in 2010 and 2011 show that buckwheat production is profitable, especially when there are applied appropriate agro-technical, technical and technological, as well organizational and economic solutions. Production of buckwheat honey, as a complementary one, increases income of the family farms that produce buckwheat. The market for products made from buckwheat exists, but one of the basic weakness is an absence of connections between the producers involved in this production, as well as the lack of information about opportunities and comparative advantages of this production and the complementary ones (such as buckwheat honey) in the hilly-mountainous and marginal regions.

Keywords: buckwheat; family farms; income; employment; hilly-mountainous regions

**PROIZVODNJA HELJDE KAO IZVOR POVEĆANJA DOHOTKA I
ZAPOSLENOSTI NA PORODIČNIM GAZDISTAVIMA BRDSKO-PLANINSKIH
REGIONA**

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Heljda je vrlo stara ratarska biljka koja se danas gaji na svim kontinentima. Dobro se prilagodjava različitim zemljишnim i klimatskim uslovima, tako da se uspešno može gajiti i u područjima iznad 1.000 m nadmorske visine. Pored toga, ona je i medonosna biljka, koja može da predstavlja odličnu pčelinju pašu, posebno kada nema drugim medonosnih biljaka. Sa 1 hektara heljde se može dobiti 100-300 kg meda ukoliko postoje povoljni uslovi u pogledu temperature i vlažnosti vazduha. Između dva svetska rata heljda je bila glavna "sirotinjska hrana". Ona je za siromašna brdsko-planinska područja predstavljala najvažnije žito, budući da ima kratak vegetacioni period. Sa porastom standarda stanovništva, korišćenje zrna heljde i heljdinog brašna je opalo, pa je ova proizvodnja gotovo zamrla. Sa porastom značaja zdrave hrane i percepcija potrošača se promenila, pa heljda već duže vremena predstavlja cenjen proizvod i na zahtevnim svetskim tržištima. U svetu se heljda danas gaji na preko 2,5 miliona hektara. S obzirom da zvanična statistika ne objavljuje podatke o površinama pod heljom u Srbiji, procenjuje se da se u Srbiji heljda gaji na oko 250-300 hektara. S obzirom da ova kultura može uspešno da se gaji i na onim gazdinstvima koja nemaju povoljne uslove za gajenje drugih biljaka, heljda može da bude značajan izvor dohotka porodičnih gazdinstava u brdsko-planinskim regionima. Istraživanja vršena na porodičnim gazdinstvima Centralne Srbije tokom 2010. i 2011. godine pokazuju da je proizvodnja heljde isplativa, pogotovo kada se primenjuju odgovarajuća agrotehnička, tehničko-tehnološka i organizaciono-ekonomska rešenja. Proizvodnja meda od heljde, kao komplementarna proizvodnja, povećava dohodak gazdinstava koja se bave proizvodnjom heljde. Tržište za proizvode od heljde postoji, ali je jedan od osnovnih problema nepovezanost proizvodjača koji se bave ovom proizvodnjom kao i nedovoljna informisanost o mogućnostima i komparativnim prednostima ove proizvodnje i komplementarnih proizvodnji (kao što je proizvodnja meda od heljde) u brdsko-planinskim i marginalnim regionima.

Ključne riječi: heljda; porodična gazdinstva; dohodak; zaposlenost; brdsko-planinski regioni

**RABBIT PRODUCTION AS OPPORTUNITY FOR ADDITIONAL SOURCE OF
INCOME ON FAMILY FARMS**

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Rabbit production on family farms is an activity that can be easily adjusted to labour available and does not depend on land and other sources so much than other livestock production. It can be organised as meat producing unit based on domestic forage production or on completely purchased feed. Expected technological parameters of both production types serve as background for gross margin calculations to estimate profitability of rabbit production, based on market prices in Slovenia. Obtained results highly depend on rearing performance (mortality, litter size and littering interval), feed conversion and product prices. With all these parameters above average rabbit production could be very promising activity on family farms. Commercial rabbit production on specialised (family) farms is, however, quite risky. Only most successful breeders have opportunity to achieve attractive financial result in marketing of rabbit weaners. Possibility of low or even negative income is not to be ignored. Opposite to this specialisation fattening units could achieve much better results if they manage to be part of well organised production chain.

**TYPICAL PRODUCTS LIKE SUBJECT OF INTELECTUAL PROPERTY
THROUGH HISTORICAL AND GEOGRAPHICAL OVERVIEW**

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Typical products are considered even from pre-Bible time like cultural heritage of people and countries what is evidenced by records found in several geographical locations. As such they are protected by legal means adequate time and space for their existence. The term of typical products such objects of intellectual property was first introduced in 1883, when has been signed the first multilateral treaty-Paris Convention for protection of geographical indications. Since then till nowdays it have been signed a series of documents governing the right to dispose and trade with typical products. All current variations and subvariations of metodes to protect geographical indications classifiy countries into three groups: (1) Countries that protect geographical indications by special law called. sui generis system, (2) Countries which protect geographical indications as trademarks, certification marks, collective marks, or other legal means, (3) countries that do not formally recognize and protect geographical indications. Globally, 111 countries, including 27 EU countries, protecting geographical indication of origin by sui generis system. 56 countries protects geographical indications through a trademark, certification marks, or collective marks, which include Australia, Canada, Japan and the United States. A number of countries, in addition to a sui generis system, has the additional option of protection geographical indications as trademarks as in the case of China.

Keywords: typical products; intelectual property; geographical indications

**TIPIČNI PROIZVODI KAO PREDMET INTELEKTUALNOG VLASNIŠTVA
KROZ ISTORIJSKI I GEOGRAFSKI PREGLED**

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Tipični proizvodi su još iz predbiblijskog vremena smatrani kulturnim blagom naroda i država o čemu svjedoče nađeni zapisi na više geografskih lokacija. Kao takvi su se štitili legalnim sredstvima adekvatnim vremenu i prostoru njihovog postojanja. Termin tipičnih proizvoda kao predmeta intelektualnog vlasništva prvi put je uveden 1883. godine kada je potpisana prva multilateralna sporazum-Pariska konvencija o zaštiti geografskih oznaka. Od tada do danas potpisana je niz dokumenata kojim se reguliše pravo raspolaganja i prometovanja tipičnim proizvodima. Sve aktuelne varijacije i podvarijacije načina zaštite geografskih oznaka mogu svrstati zemlje u tri grupe i to: (1) Zemlje koje štite geografske oznake posebnim zakonom tzv. sui generis sistemom, (2) Zemlje koje štite geografske oznake kao trgovačke marke, sertifikacijske marke, kolektivne marke, ili nekim drugim zakonskim sredstvom, (3) Zemlje koje formalno ne prepoznaju i ne štite geografske oznake. Na globalnom nivou, 111 zemalja, uključujući 27 zemalja EU, štiti oznake geografskog porijekla sui generis sistemom. 56 zemalja štiti geografske oznake putem trgovačkih marki, sertifikacijskih marki, ili kolektivnih marki, gdje spadaju Australija, Kanada, Japan i SAD. Veliki broj zemalja pored sui generis sistema ima dodatnu opciju zaštite geografskih oznaka kao trgovačkih marki kao što je slučaj Kine.

Ključne riječi: tipični proizvodi; intelektualno vlasništvo; geografske oznake

**PROMOTION OF AGRICULTURAL PRODUCTS WITH PROTECTED
GEOGRAFICAL ORIGIN AND RURAL DEVELOPMENT**

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Given the current development and current state of rural areas, the priority issue of prosperous rural and general development is the revival and renewal of rural settlements and territories. The economic structure of rural areas is still based on the exploitation of natural resources. It is believed that organic farming is the solution to the issue of food quality and food safety, environmental protection, agro ecosystems conservation, etc., and that it is potentially one of the most profitable businesses in the world. In addition, promotion of rural development involves the introduction of standardization and increased production of agro-industrial products with protected geographical indications. Also, increasing the production of agro-industrial products with protected geographical indications is one of the strategic priorities. It is necessary to expand the range of products in this sector food industry, have continued offer an adequate marketing. With good information and consumer education the consumption can be raised to a higher level.

Keywords: rural development; agribusiness; geographical indications; marketing

**PROMOCIJA AGROINDUSTRIJSKIH PROIZVODA SA ZAŠTIĆENIM
GEOGRAFSKIM POREKLOM**

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S obzirom na dosadašnji razvoj i postojeće ruralno stanje, prioritetno pitanje prosperitetnog ruralnog, ali i sveukupnog, razvoja jeste oživljavanje i obnavljanje ruralnih naselja i teritorija. Smatra se da je organska proizvodnja rešenje za pitanje kvaliteta i bezbednosti hrane, zaštite životne sredine, očuvanje agroekosistema itd., i da je ona potencijalno jedan od najisplativijih poslova u svetu. Pored toga, unapređivanje ruralnog razvoja podrazumeva uvođenje standardizacije i povećanja proizvodnje agroindustrijskih proizvoda sa zaštićenim geografskim poreklom. Takođe, povećanja proizvodnje agroindustrijskih proizvoda sa zaštićenim geografskim poreklom predstavlja jedan od strateških prioriteta. Neophodno je proširiti assortiman proizvoda iz ove oblasti prehrambene industrije, imati kontinuiranu ponudu i razvijati adekvatan marketing. Uz dobru informisanost i edukaciju potrošača moguće je potrošnju podići na viši nivo.

Ključne riječi: ruralni razvoj; agrobiznis; geografska oznaka porekla; marketing

**STATUS AND IMPLEMENTATION OF REGULATIONS FOR PROTECTION OF
GEOGRAPHICAL ORIGIN AND WINE LABELLING IN BOSNIA AND
HERZEGOVINA**

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The law on wine, brandy and other products from grape and wine is on power in Bosnia and Herzegovina since 2008. Due to its shortcomings and failure to enact implementing regulations the current wine legislation in Bosnia and Herzegovina does not provide satisfactory functioning of the market in wine. New regulatory provisions for wine sector are effective in the European Union for more than four years, including provisions on the protection of geographical origin of wine and wine labelling of protected designations of geographic origin. Reformed regulation of the European Union abandoned the old and in different countries different systems of protection of geographical origin of wine and went to the PDO and PGI concept of the protection of geographical origin of wine. The research tasks were analytical representation of the current legislation on geographical origin and wine labelling in Bosnia and Herzegovina and the European Union, with the checking of implementation of regulations through insight into the way of labelling of geographical origin and other mandatory labelling elements of 287 different brands of still wines offered in four supermarkets in the wider area of Sarajevo. The obtained results pointed out failings in the labelling of geographic origin and presence of sulphur dioxide on a significant number of checked wines. In particular, labelling of wines made in Bosnia and Herzegovina failed by omitting the number of a decision on the release of wine on the market with the name of a body that issued the decision. Other wine labelling elements were fairly presented to customers. The results of this study highlight once again the need for the adoption of new law and implementing regulations for the wine sector in Bosnia and Herzegovina which should be harmonised with the relevant EU legislation as much as possible.

Keywords: wine; wine labelling; geographical origin of wine; legislation

**STATUS I PRIMJENA PROPISA O ZAŠТИTI GEOGRAFSKOG PORIJEKLA I
OZNAČAVANJU VINA U BOSNI I HERCEGOVINI**

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U Bosni i Hercegovini na snazi je Zakon o vinu, rakiji i drugim proizvodima od grožđa i vina donesen 2008. godine koji zbog svojih nedostataka i nedonošenja podzakonskih propisa ne omogućava zadovoljavajuće funkcionisanje tržista vina. U Evropskoj uniji su već duže od četiri godine na snazi nove regulatorne odredbe za sektor vinsratva, uključujući i odredbe o zaštiti geografskog porijekla vina i označavanju vina zaštićenim oznakama geografskog porijekla. Reformisanom regulativom Evropske unije napuštaju se star i za različite zemlje različiti sistemi zaštite geografskog porijekla vina i prelazak na PDO i PGI koncept zaštite geografskog porijekla vina. Istraživanja je za zadatke imalo analitičko predstavljanje aktuelne legislative o geografskom porijeklu i označavanju i etiketiranju vina u Bosni i Hercegovini i Evropskoj uniji, uz provjeru provođenja propisa uvidom u označavanje geografskog porijekla vina i drugih obaveznih elemenata označavanja vina pregledom 287 različitih marki mirnih vina koja se nalaze u ponudi četiri supermarketa na širem području Sarajeva. Izvršenim provjerama utvrđeni su propusti prilikom označavanja geografskog porijekla i sadržaja sumpor dioksida kod znatnog broja vina, a za vina proizvedena u Bosni i Hercegovini propusti sa navođenjem broj rješenja o puštanju vina u promet sa nazivom tijela koje je rješenje izdalo. Drugi elementi označavanje vina uglavnom su bili korektno nevedeni. Rezultati ovog istraživanja još jednom ukazuju na neophodnost donošenja novih zakonskih i podzakonskih propisa za sektor vinarstva u Bosni i Hercegovini koje u najvećoj mjeri treba usaglasiti sa relevantnim propisima Evropske unije.

Ključne riječi: vino; označavanje vina; geografsko porijeklo vina; legislativa

**ROLE OF THE STATE IN RURAL TOURISM DEVELOPMENT
IN THE REPUBLIC OF SRPSKA**

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The aim of this paper is to present the role of the state in developing rural tourism in the Republic of Srpska. Rural tourism comprises all those activities in tourism which can be implemented in rural areas. Developing rural tourism cuts unemployment, facilitates valorisation of women's work in rural households, enhances the growth of local economies, which contributes to balancing the differences caused by uneven regional development. The conditio sine qua non for rural tourism development is strong strategic and financial support of the state, which is supposed to create favourable environment and promote the particular concept of development. As for the Republic of Srpska, the fact is that the normative assumptions for rural tourism development were brought, but the financial support coming from the state authorities and local economies did not suffice for a more significant development of this tourism industry.

Keywords: rural tourism, development, role of the state, the Republic of Srpska

ULOGA DRŽAVE U RAZVOJU RURALNOG TURIZMA U REPUBLICI SRPSKOJ

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Cilj rada je da predstavi ulogu države u razvoju ruralnog turizma u Republici Srpskoj. Ruralni turizam obuhvata sve turističke aktivnosti koje se mogu realizovati u ruralnim područjima. Razvojem ruralnog turizma smanjuje se nezaposlenost, omogućava valorizacija rada žena u seoskim domaćinstvima, omogućava razvoj lokalno-ekonomskih zajednica, a time i smanjuju razlike u regionalnoj razvijenosti. Prioritetan uslov za razvoj ruralnog turizma je snažna strateška i finansijska podrška države, koja treba da kreira potreban ambijent i promoviše određeni koncept razvoja. U proteklom periodu u Republici Srpskoj formirane su normativne pretpostavke za razvoj ruralnog turizma, a finansijska podrška republičkih i organa lokalno-ekonomskih zajednica bila je nedovoljna za snažniji razvoj ovog vida turizma.

Ključne reči: ruralni turizam, razvoj, uloga države, Republika Srpska

**THE PROCESS OF CHANGING THE AGRICULTURAL LANDSCAPE IN THE
REPUBLIC OF SRPSKA CASE STUDY OF MUNICIPALITY NOVI GRAD**

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The growing needs for food and raw materials of agriculture origin in the world is caused the intensive agricultural production, which resulted in major changes in the agricultural landscape, as a part of the cultural landscape in rural area. In the Republic of Srpska is less arable agricultural land, as irreplaceable natural resource. Villages for years lose the original elements of the basic function of the agricultural landscape. Despite the support of relevant institutions in the development of the agricultural sector, more and more agricultural land is converted to pasture, scrub or is degraded due to soil erosion. The new Law on Agricultural Land from 2006 was defined in intention of the protection, development and use of agricultural land in production. The law still has not fully taken hold in practice, precise in the part related to the transfer of non-arable agricultural land to commercial farmers. It is difficult to predict the future course of the change process of agriculture landscape in the Republic of Srpska and all consequences that carry these processes. Therefore, the aim of this work consists in analyzing of process changes of the agricultural landscape in the Republic Srpska , caused by influence of many factors. The relevant statistical data have been analyzed about the state of the agricultural sector in Municipality Novi Grad for the period 1961-2012. One part of the results presented in this paper were obtained on the basis of the survey on the socio-economic characteristics of households in the area of Municipality Novi Grad in 2003. In the paper are used the method of comparison and statistical analysis of time series.

Keywords: agricultural landscape; agricultural land; Republic of Srpska.

**PROCESI PROMJENA AGRARNOG PEJZAŽA U REPUBLICI SRPSKOJ -
PRIMJER OPŠTINE NOVI GRAD**

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Sve veće potrebe za hranom i sirovinama poljoprivrednog porijekla u svijetu uslovili su intenzivniju poljoprivodu proizvodnju, što je uticalo i na velike promjene agrarnog pejsaža, kao dijela kulturnog pejsaža u ruralnom prostoru. U Republici Srpskoj je sve manje obrađenog poljoprivrednog zemljišta, kao nenadoknadivog prirodnog resursa. Sela već godinama gube izvorne elemente osnovne funkcije agrarnog pejsaža. Uprkos podršci nadležnih institucija u oblasti razvoja agrarnog sektora, sve više je obradivog zemljišta pretvoreno u pašnjake, šikare, ili su degradirane zbog erozije zemljišta. Novi Zakon o poljoprivrednom zemljištu Republike Srpske iz 2006. godine je definisan u namjeri zaštite, uređenja i korišćenja poljoprivrednog zemljišta u proizvodnji. Zakon još uvijek u cijelosti nije zaživio u praksi, odnosno u dijelu koji se odnosi na ustupanje neobradivog poljoprivrednog zemljišta komercijalnim poljoprivrednim proizvodjačima. Teško je predvidjeti budući tok procesa promjena agrarnog pejsaža u Republici Srpskoj i svih posljedica koje s sobom nose ovi procesi. Stoga cilj ovog rada se sastoji u analizi procesa promjena agrarnog pejsaža u Republici Srpskoj, nastalih pod uticajem djelovanja brojnih faktora. Analizirani su relevantni statistički podaci o stanju agrarnog sektora na području novogradske opštine za period od 1961 do 2012. godina. Jedan dio rezultata prikazanih u ovom radu su dobijeni i na osnovu sprovedene ankete o socio-ekonomskim obilježjima domaćinstava s područja novogradske opštine u 2003. godini. U radu je korišten metod komparacije i statističke analize vremenskih serija.

Ključne riječi: agrarni pejsaž; poljoprivredno zemljište; Republika Srpska.

IMPORTANCE OF MESSUAGES FOR RURAL TOURISM OF Vojvodina

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The aim of this paper is to point out the importance of messuages for developing the tourism offer of Vojvodina - for the development of rural tourism, in the first place. Messuages represent genuine testimonials of the authentic way of life and work of the Vojvodinian peasants. According to the historical records, building of the messuages began in the mid 18th century. The great majority was built between the World War I and II. There were even 11.000 of them around Subotica at that time. Their accurate number is not known today, but the number is certainly lower. Those which stayed have been turned into real tourist resorts. In order to promote meassuage tourism offer as a special kind of rural tourism industry, this paper will present the very authentic Vojvodinian meassuages: Perkov Messuage around Neradin, Messuage Cvejin around Begeč, Babin Messuage close to Zrenjanin, Majkin Messuage around Palić, Dida Hornjakov Messuage around Sombor, as well as other messuages which adapted their offer to suit, what we call, the modern tourists.

Keywords: messuages, rural tourism, Vojvodina

ZNAČAJ SALAŠA ZA RURALNI TURIZAM VOJVODINE

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Cilj rada je da ukaže na značaj salaša za razvoj turističke ponude Vojvodine i to, pre svega, za razvoj ruralnog turizma. Salaši predstavljaju autentičan zapis nekadašnjeg načina života i rada vojvođanskih paora. Prema istorijskim podacima podizanje salaša na području današnje Vojvodine započelo je polovinom 18.veka, najviše ih je bilo između prvog i drugog svetskog rata, u okolini Subotice je bilo čak 11.000 salaša. Danas se ne zna njihov tačan broj, ali je evidentno da ih ima mnogo manje. Od preostalih salaša mnogi su pretvoreni u prave turističke oaze. U cilju afirmacije turističke ponude salašarskog, kao posebnog oblika ruralnog turizma, u radu će biti predstavljeni autentični vojvođanski salaši: Perkov salaš kod Neradina, Cvejin kod Begeča, Babin u blizini Zrenjanina, Majkin salaš u okolini Palića, kao i Dida Hornjakov salaš u okolini Sombora, ali i drugi salaši koji su svoju ponudu prilagodili savremenom turistu.

Ključne reči: salaši, ruralni turizam, Vojvodina

Section 4. Fruit Growing and Viticulture



**EFFECT OF DURATION OF HOT WATER DIP AND LENGTH OF STORAGE
ON CHEMICAL AND SENSORY QUALITY OF NECTARINE CV. 'VENUS'**

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The effect of hot water dip (48°C) duration (6 or 12 minutes) (HWD 48°C 6' and HWD 48°C 12') and length of storage at 0°C in normal atmosphere (two or four weeks) on chemical and sensory quality of nectarine (*Prunus persica* var. *nectarina* cv. 'Venus') was studied. Weight loss and titratable acids (TA) have been significantly lower after two weeks of storage, and treatment was significant factor only for weight loss. Soluble solids concentration (SSC) and TA ratio (SSC : TA) were significantly lower after four weeks of storage. After two weeks of storage, HWD-treated fruits had significantly lower weight loss and SSC compared to control. There was no significant difference between HWD 48°C 6' and HWD 48°C 12' – treated fruit. Sensory analysis showed ability of HWD 48°C 12' - treated fruit to maintain quality, but only after two weeks of storage. However, after four weeks of storage, control fruit received higher scores compared than HWD – treated fruit for all traits, except for aroma which was still higher for HWD 48°C 12' - treated fruit. Results showed that duration of hot water dip is significant factor for maintaining postharvest quality of nectarine fruit. Storage potential of cv. 'Venus' in normal atmosphere is no longer than two weeks, but only if HWD 48°C 12' is applied.

Keywords: nectarine; heat treatment; hot water dip; exposure; storage

**POMOLOGICAL CHARACTERISTICS OF NEW VARIETIES OF NECTARINE IN
AGROECOLOGICAL CONDITIONS OF POTKOZARJE**

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New varieties of nectarines possess positive biological features that should improve production as well as the length and uniformity of fruit supply during the summer months. Proper selection of varieties for specific agro-ecological conditions should take into consideration: production characteristics of the variety, market requirements and consumer expectations. Fruits of new varieties of nectarines are attractive and large, covered with an intense blush and well tolerated transportation. This paper presents the main characteristics of fruit of new varieties of nectarines grown in the ecological conditions Potkozarje. Performance testing of a new varieties of nectarines Nectarus, Stark Red Gold, Caldezi 2020 and Flavortop were conducted in the laboratory for pomology and post harvest treatment of fruit, Faculty of Agriculture, University of Banja Luka. Fruits for analysis were taken in 2011. from commercial orchard company Agroimpex (Jablanica-Gradiska) in the optimum time to maturity for each variety. The trees from which fruit were taken for analysis, are in the third year of fruiting. The analysis included a 50 fruits of each variety. From pomological and physiological characteristics of fruit examined were: fruit weight, fruit diameter, fruit height, stone weight, stone diameter, high of seeds, firmness of fruit, soluble solids content in the fruit flesh (% Brix) and fruit skin coloration. The best characteristics of fruit, based on preliminary tests conducted, were recorded in cv. Nectarus. Considerably uniform features a variety of fruits Stark Red Gold and Caldezi 2020. Weaker fruit characteristics were determined in the variety Flavortop. Performance testing as well as other biological and production characteristics of new varieties of nectarines, is necessary to continue in the future with absolute respect of soil and climatic conditions of the area, which may be a limiting factor in the production of nectarines in Potkozarje conditions.

Keywords: nectarine, fruit, pomological characteristics.

POMOLOŠKE KARAKTERISTIKE NOVIH SORTI NEKTARINE U AGROEKOLOŠKIM USLOVIMA POTKOZARJA

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Nove sorte nektarine poseduju pozitivne biološke osobine koje treba da unaprede proizvodnju, kao i dužinu i ravnomernost ponude plodova tokom letnjih meseci. Pravilan izbor sorte za određene agroekološke uslove mora uzeti u obzir proizvodne karakteristike sorte obzirom na namenu, zahteve tržišta kao i očekivanja potrošača. Plodovi novih sorti nektarina su atraktivni i krupni, prekriveni intenzivnim rumenilom i dobro podnose transport. U radu je dat prikaz osnovnih karakteristika plodova novih sorti nektarina gajenih u agroekološkim uslovima Potkozarja. Ispitivanja karakteristika plodova novih sorti nektarina Nektarus, Stark red gold, Kaldezi 2020 i Flavortop obavljeni su u laboratoriji za pomologiju i tretman plodova nakon berbe, Poljoprivrednog fakulteta, Univerziteta u Banjoj Luci. Plodovi za analizu su uzeti iz proizvodnog zasada firme Agroimpex (Jablanica-Gradiška) tokom 2011. godine u periodu optimalne zrelosti za svaku sortu. Stabla sa kojih su uzimani plodovi za analizu, nalaze se u trećoj godini plodonošenja. Analizom je obuhvaćeno po 50 plodova svake sorte. Od pomoloških i fizioloških svojstava ploda ispitivani su: masa ploda, prečnik ploda, visina ploda, masa koštice, prečnik koštice, visina koštice, tvrdoća mesa ploda, sadržaj rastvorljivih sivih materija u mesu ploda (%Brix) i obojenost pokožice ploda. Najbolje karakteristike plodova, na osnovu sprovedenih preliminarnih ispitivanja, zabeležene su kod sorte Nektarus. Dosta ujednačene karakteristike plodova imaju sorte Stark red gold i Kaldezi 2020. Nešto slabiji pokazatelji karakteristika plodova utvrđeni su kod sorte Flavortop. Ispitivanje karakteristika plodova, kao i drugih bioloških i proizvodnih osobina novih sorti nektarine, potrebno je nastaviti u narednom periodu uz apsolutno uvažavanje zemljjišnih i klimatskih uslova područja, koji mogu biti ograničavajući faktor proizvodnje nektarine u uslovima Potkozarja.

Ključne reči: nektarina, plod, pomološke karakteristike

**PHENOLOGICAL AND MORPHOLOGICAL VARIABILITY OF SOME
AUTOCHTHONOUS PLUM VARIETIES**

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Autochthonous varieties have a high proportion in plum assortment in Serbia. However, these varieties are usually grown in obsolete orchards under non cultural practices. Due to fruit quality attributes, cropping potential, tolerance to adverse environmental conditions and diseases resistance, some of these varieties could be a good basis for breeding and development of new plum varieties. During 2011 and 2012, phenological and morphological variability of 13 autochthonous varieties was evaluated using multivariate analysis, IBPGR, UPOV and standard methodology. Within the evaluated varieties flowering started between 7 April ('Šljiva Štrpci') and 17 April ('Cerovački piskavac') and ripening started between 2 August ('Dragačevka') and 2 September ('Belošljiva Čokešina'). Fruit mass varied between 10.60 ('Cerovački piskavac') and 29.55 ('Tip 3/83'). 'Belošljiva Čokešina', 'Tip 3/83' and 'Šljiva Štrpci' had the highest values of fruit physical properties. Predominant fruit skin colour, was dark blue, while predominant flesh colours were yellow-green and yellow. In most varieties, flesh was firm and not separated from stone. Multivariate analysis showed a high morphological variability among the genotypes evaluated, most of which can be used as an outstanding source of germplasm for further breeding work.

Keywords: Plum; autochthonous varieties; morfološke osobine; multivariate analysis

FENOLOŠKA I MORFOLOŠKA VARIJABILNOST NEKIH AUTOHTONIH SORTI ŠLJIVE

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Autohtone sorte imaju značajan udio u ukupnom sortimentu šljive u Srbiji. Međutim, njihovo gajenje se najčešće vezuje za zastarele šljivike u kojima su mere nege svedene na minimum ili se uopšte ne primenjuju. Veliki broj ovih sorti poseduje brojne pozitivne osobine, bilo da se radi o kvalitetu ploda, rodnosti ili tolerantnosti prema nepovoljnim ekološkim činocima ili najznačajnijim bolestima i kao takve mogu poslužiti kao veoma kvalitetan materijal za stvaranje novih sorti šljive. U radu su u toku 2011. i 2012. godine ispitivane fenološka i morfološka varijabilnost 13 autohtonih sorti šljive upotrebot multivarijacione analize, IBPGR, UPOV i standardne metodologije. Cvetanje ispitivanih sorti je počinjalo u periodu između 7. ('Šljiva Štrpci') i 17. aprila ('Cerovački piskavac'), dok je vreme berbe bilo između 2. avgusta ('Dragačevka') i 2. septembra ('Belošljiva Čokešina'). Masa ploda je varirala između 10,60 g ('Cerovački piskavac') i 29,55 g ('Tip 3/83'). 'Belošljiva Ljubić', 'Tip 3/83' i 'Šljiva Štrpci' su imale najveće vrednosti parametara fizičkih osobina ploda. Među 13 ispitivanih sorti, dominantna boja pokožice je bila tamno plava, a boja mezokarpa žutozelena i žuta. Mezokarp je kod većine genotipova bio čvrst i uglavnom se nije odvajao od koštice. Multivarijaciona analiza je pokazala veliku morfološku varijabilnost među ispitivanim sortama od kojih većina može poslužiti kao dobar izvor germplazme u daljem oplemenjivačkom radu.

Ključne riječi: Šljiva; autohtone sorte; morfološke osobine; multivariaciona analiza

**IMPACT OF ROOTSTOCK ON VEGETATIVE GROWTH, YIELD AND
PHYSICO-CHEMICAL PROPERTIES OF THE PEAR FRUIT (*PYRUS
COMMUNIS* SUBSP. *COMMUNIS* L.)**

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We investigated the effects of two vegetative rootstocks (Quince MA and Ba.29) on tree vigor, yield, physical (weight, linear dimensions, arithmetic and geometric mean diameter, sphericity, aspect ratio, surface area, volume and flesh firmness) and chemical fruit properties (soluble solids content, total acidity and ripening index) of three pear cultivars (Starking Delicious, Abbé cultivar) was found only for yield per tree and titratable acidity. Most vigorous trees, sphericity, aspect ratio and ripening index had Starking Delicious, and the highest yield per tree, yield coefficient, fruit weight, dimensions, surface area and fruit volume had Abbé×Fetel and Conference). The results showed that rootstock significantly affected tree vigour, sphericity, aspect ratio and ripening index, whereas cultivar affected yield, yield efficiency, fruit weight, length and width, surface area, fruit volume and flesh firmness. Conference had the highest soluble solids and titratable acidity contents, respectively. Deviation of these tendencies (interaction rootstock × Fetel. Conference cultivar had the highest soluble solids content and titratable acidity. Generally, cultivar per se (genotype) had the strongest effect on the evaluated properties.

Keywords: Tree vigor; yield efficiency; fruit size; pear; cultivar

UTICAJ PODLOGE NA VEGETATIVNI RAST, RODNOST I FIZIČKO-HEMIJSKE OSOBINE PLODA KRUŠKE (PYRUS COMMUNIS SUBSP. COMMUNIS)

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U radu je ispitivan uticaj dve vegetativne podloge (dunja MA i Ba.29) na bujnost stabla, rodnost, fizičke (masa, linearne dimenzije, srednji aritmetički i srednji geometrijski prečnik, sferičnost, odnos između širine i visine, površina, zapremina i čvrstina) i hemijske osobine (rastvorljive suve materije, ukupne kiseline i indeks zrenja) ploda tri sorte kruške (Starking Delicious, Abbé sorta) su jedino zapožena kod prinosa po stablu i sadržaja ukupnih kiselina. Najveću bujnost stabla, sferičnost, odnos između×Fetel, Conference). Rezultati su pokazali da je podloga značajno uticala na masu i visinu ploda, srednji aritmetički prečnik, zapreminu ploda i ukupne kiseline, dok je sorta značajno uticala na sve ispitivane osobine. Odstupanja od navedenih tendencija (interakcijski efekat podloga širine i visine ploda i indeks zrenja je imala sorta Starking Delicious, a najveći prinos po stablu, koeficijent rodnosti, masu, dimenzije, površinu i zapreminu ploda Abbé Fetel. Sorta Conference je imala najveći sadržaj rastvorljivih suvih materija i ukupnih kiselina. Generalno, sorta per se (genotip) je ispoljila najjači uticaj na ispitivane osobine.

Ključne riječi: Bujnost stabla; koeficijent rodnosti; krupnoća ploda; kruška; sorta

STATE OF THE ART AND TRENDS IN THE PRODUCTION OF APPLES

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World apple production is now more than 70 million tons. Apple ranks fourth among all cultivated fruit species in the world. Apple production in the last few years moved from the traditional production areas of Europe and the United States to countries of Asia and countries of the southern hemisphere. This paper presents an analysis of the status and trends in world production of apples, with emphasis on the general characteristics of the production in the Republic of Srpska. The world's largest producer of apples is China, which produces more than 40% of total production. The United States produces about 7%, Iran 4%, and Poland, Turkey, Italy and Russia for roughly 3% of world production of apples. Downward trend of apple production for the period 1990-2006. years, was recorded in France (-18%), Turkey (-17%), Russia (-12%), Italy (-7%) and the USA (-2%). The increase in apple production for the same period was recorded in Chile (+68%), India (+66%), Poland (+59%), China (+28%) and Iran (+24%). The modern apple production characterized by dynamic changes in the assortment, increasing participation clones of standard varieties (Golden Reinders, Golden Delicious Smoothee ®, Golden Leratess Pink Gold ®) and the introduction of club sorts in production (Ambrosia, Ariane, CIVG 198, Civni, Cripps Pink, Dalinbel , Dalinette, Milwa, Nicogreen, Nicotera, Scilla). Estimates of the share of certain varieties by 2015. The assortment of the world (excluding China), indicating that the decline in the share compared to 2000. one should have the Red Delicious variety ($22,27 \rightarrow 15,84\%$), Golden Delicious ($19,37 \rightarrow 17,88\%$), Džonagold ($4,36 \rightarrow 3,64\%$) and Granny Smith ($6,45 \rightarrow 5,97\%$). Increasing the representation of the percentage of the total world assortment should have varieties Gala ($7,45 \rightarrow 14,53\%$), Fuji ($4,89 \rightarrow 7,13\%$), Pink Lady ($0,41 \rightarrow 2,00\%$), Idared ($3,10 \rightarrow 3,77\%$), Breburn ($2,24 \rightarrow 3,35\%$) and Elstar ($1,72 \rightarrow 1,98\%$). Available analyzes of apple production in the Republic of Srpska in the previous period, indicating increased total production volume with a relatively satisfactory growing technology. Analysis in the presence of apple varieties, reflecting the dose of traditionalism among producers, given the high percentage Idared variety in the overall structure.

Keywords: apple, production, variety.

STANJE I TRENDLOVI U PROIZVODNJI JABUKE

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Svetska proizvodnja jabuke danas iznosi više od 70 miliona tona. Jabuka zauzima četvrto mesto među svim gajenim voćnim vrstama u svetu. Proizvodnja jabuke se poslednjih godina premešta iz tradicionalnih proizvodnih područja Evrope i SAD-a u zemlje Azije i zemlje južne hemisfere. U radu je izvršena analiza stanja i trendova u svetskoj proizvodnji jabuke, sa osrvtom na opšte karakteristike ove proizvodnje u Republici Srpskoj. Najveći svetski proizvođač jabuke je Kina, koja proizvode više od 40% ukupne proizvodnje. U SAD se proizvede oko 7%, Iranu i Poljskoj 4%, Turskoj, Italiji i Rusiji približno po 3% svetske proizvodnje jabuke. Trend pada proizvodnje jabuke za period 1990-2006. godina, evidentiran je u Francuskoj (-18%), Turskoj (-17%), Rusiji (-12%), Italiji (-7%) i SAD (-2%). Povećanje proizvodnje jabuke za isti period, zabeleženo je u Čileu (+68%), Indiji (+66%), Poljskoj (+59%), Kini (+28%) i Iranu (+24%). Savremena proizvodnja jabuke karakteriše se dinamičnom izmenom sortimenta, sve većim učešćem klonova standardnih sorti (Golden Reinders, Golden Delicious Smoothie®, Golden Leratess Pink Gold®) i uvođenjem klupske sorti u proizvodnju (Ambrosia, Ariane, CIVG 198, Civni, Cripps Pink, Dalinbel, Dalinette, Milwa, Nicogreen, Nicoter, Scilate). Procene o učešću pojedinih sorti do 2015. godine u svetskom sortimentu (izuzimajući Kinu), ukazuju da bi pad u zastupljenosti u odnosu na 2000. godinu trebale imati sorte Crveni delišes ($22,27 \rightarrow 15,84\%$), Zlatni delišes ($19,37 \rightarrow 17,88\%$), Džonagold ($4,36 \rightarrow 3,64\%$) i Greni smit ($6,45 \rightarrow 5,97\%$). Povećanje procentualnog učešća zastupljenosti u ukupnom svetskom sortimentu trebale bi imati sorte Gala ($7,45 \rightarrow 14,53\%$), Fudži ($4,89 \rightarrow 7,13\%$), Pink lejdi ($0,41 \rightarrow 2,00\%$), Ajdared ($3,10 \rightarrow 3,77\%$), Breburn ($2,24 \rightarrow 3,35\%$) i Elstar ($1,72 \rightarrow 1,98\%$). Dostupne analize stanja proizvodnje jabuke u Republici Srpskoj u predhodnom periodu, ukazuju na povećanje ukupnog obima proizvodnje uz relativno zadovoljavajuću tehnologiju gajenja. Analize zastupljenosti sorti u proizvodnji jabuke, odražavaju visoku dozu tradicionalizma među proizvođačima, imajući u vidu veliko procentualno učešće sorte Ajdared u ukupnoj strukturi sortimenta.

Ključne reči: jabuka, proizvodnja, sorta

PHENOLOGICAL PROPERTIES OF BLACK CURRANT CULTIVARS (RIBES NIGRUM L.)

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In this study were shown results of phenological properties of black currants in weather conditions of Obrenovačka Posavina. Observation were done in the collective orchard of 13 cultivars, cultivated in shrub form with planting distance from 1,8 x 0,8 m. During three-year studies (2007-2009 year) the following parameters of phenological phases were monitored: date of the first leaf emergence, date of inflorescence emergence, date of initiation and full flowering, date of the first berry set and date of berry ripening – fruit harvest. Phenological properties were determined by international descriptors for black currant (CPVO-TP/040/2 – UPOV, 2009). Black currant cultivars are characterized by a very early begining into the growing season, because of the short and unstable dormancy. They were started leaf emergence average on the 6th of March. The earliest cultivar was Molling Juel (2nd of March) and the latest was Titania (11th of March). Phenological phase of flowering were began in the end of March and beginning of April, average all cultivars on the 28th of March. According to the flowering time all cultivars were sorted to: early flowering – flowered before on the 26th of March (Čačanska crna, Molling Juel, Ben Lomond, Tsema and Bona), middle flowering – flowered between on the 27th of March and 1st of April (Ben Nevis, Triton, Titania, Ben Sarek, Ometa, Tenah i Silmu) and late flowering – flowered after the 2nd of April (Öjebyn). Berry ripening phase was beginning average on the 21st of June. The earliest cultivar was Bona (10th of June) and the latest was Ometa (3rd of July). The range between average date of the earliest and the latest ripening cultivar was 23 days. Average duration of phases of growth and development of berries of red and white currant cultivars was 68 days. Shortest duration of this phase had cultivar Bona - 60 days, the longest cultivar Ometa - 77 days. In addition of biological properties of cultivars, on the duration of the phase of growth and development of berries significant effect had a weather conditions in different years of study.

Keywords: currant, leaf emergence, flowering time, ripening berries

FENOLOŠKE OSOBINE SORTI CRNE RIBIZLE (RIBES NIGRUM L.)

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U radu su prikazani rezultati ispitivanja fenoloških osobina sorti crne ribizle u uslovima Obrenovačke Posavine (2007-2009). Osmatranja su vršena u kolekcionom zasadu 13 crnih sorti ribizle, sađenih u sistemu žive ograde sa rastojanjem od 1,8 x 0,8 m. Od fenoloških tačaka praćene su: početak listanja, pojava cvasti, cvetanje, zametanje i sazrevanje bobica. Fenološke osobine određivane su pomoću međunarodnog deskriptora za crnu ribizlu (CPVO-TP/040/2 – UPOV, 2009). Sorte crne ribizle odlikuju se vrlo ranim ulaskom u period vegetacije, zbog kratkog i nestabilnog zimskog mirovanja. Počinjale su da listaju u proseku 06.03. – od 02. 03. (moling džuel) do 11. 03. (titanijska). Fenološku fazu cvetanja započinjale su krajem marta i početkom aprila (u proseku 28. 03.). Prema vremenu cvetanja mogu se podeliti na: ranocvjetne – cvetale pre 26. 03. (čačanska crna, moling džuel, ben lemond, cema i bona), srednjecvjetne – cvetale od 27. 03. do 01. 04. (ben nevis, triton, titanijska, ben sarek, ometa, tenah i silmu) i pozncvjetne – cvetale posle 02. 04. (ojebin). Faza sazrevanja bobica prosečno je nastupala 21. 06. Najranije su sazrevali plodovi sorte Bona (10. 06), a najpoznije plodovi sorte ometsa (03. 07). Raspon između prosečnog datuma sazrevanja plodova najranije i najpozniye sorte iznosio je 23 dana. Prosečno trajanje faze rasta i razvića bobica sorti crne ribizle iznosio je 68 dana. Najkraće trajanje ove faze imala je sorta bona – 60 dana, a najduže sorte ometsa – 77 dana. Pored bioloških svojstava sorte, na trajanje faze rasta i razvića bobica značajno su uticale i meteorološke prilike u pojedinim godinama ispitivanja.

Ključne reči: ribizla, listanje, cvetanje, sazrevanje plodova

**POMOLOGICAL FEATURES OF STRAWBERRY VARIETIES IN
AGROECOLOGICAL CONDITIONS OF NORTH MONTENEGRO**

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This paper presents the result of two year research pomological features of twelve strawberry varieties. Within pomological characteristics were studied: ripening time, yield, physical, chemical and organoleptic features of the fruit. Varieties are grown in the open field in the village Potrk, municipality of Bijelo Polje to 980 m above sea level. The experiment was planted in two-line on black foil with the system for drip irrigation. Tests were conducted in 2010 and 2011. in the strawberry field, which is located at the experimental field of company "Ekoplant" The aim of the research is to explore the varieties in agroecological conditions of North Montenegro, as well as recommendations for their further expansion. The earliest ripening time was recorded in cv Favette (27.05), and the latest in cv Record (22.06). Variety Record had the best fruit weight (31 g), and the highest content of soluble solids had Roxana (10.1%). The highest yield had the variety Antea (1.23 kg / plant) and Queen Elisa (1.12 kg / plant). According to the most of studied parameters, the best varieties that have been proven in the field are Record, Queen Elisa, Asia, Antea and Arosa and they can be recommended for further expansion in the production in the North of Montenegro

Keywords: strawberry; variety; ripening time; fruit quality; yield

**POMOLOŠKE OSOBINE SORTI JAGODE U USLOVIMA SJEVERNOG DIJELA
CRNE GORE**

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Ekoplant doo, Podgorica, Crna Gora

Rad prikazuje rezultate dvogodišnjeg proučavanja pomoloških osobina dvanaest sorti jagode. U okviru pomoloških osobina ispitivani su vrijeme zrenja, prinos, fizičke, hemijske i organoleptičke osobine ploda. Sorte su gajene na otvorenom polju u selu Potrk, opština Bijelo Polje na 980 m nadmorske visine. Zasad je podignut u dvorednim pantljikama na crnoj foliji sa sistemom za navodnjavanje kap po kap. Ispitivanja su izvedena tokom 2010 i 2011. godine u zasadu jagode koji se nalazi na proizvodno-oglednom imanju firme "Ekoplant". Cilj istraživanja je utvrditi kako se pojedine sorte ponašaju u agroekološkim uslovima Sjevernog dijela Crne Gore kao i preporuka za njihovo dalje širenje. Najraniji početak fenofaze zrenja registrovan je kod sorte Favette (27.05), a najkasniji kod sorte Record (22.06). Sorta Record je imala najbolju masu ploda (31 g), a najveći sadržaj rastvorljivih suvih materija imala je sorta Roxana (10,1%). Najveće prinose imale su sorte Antea (1.23 kg/bokoru) i Queen elisa (1.12 kg/bokoru). Na osnovu dobijenih rezultata većine ispitivanih parametara, za komercijalno gajenje jagode mogu se preporučiti sledeće sorte: Record, Queen elisa, Asia, Antea i Arosa.

Ključne riječi: jagoda; sorta; vrijeme zrenja; kvalitet ploda; prinos

**POTENTIAL CULTIVATION OF ACTINIDIA UNDER THE
AGROENVIRONMENTAL CONDITIONS IN ČAČAK**

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Actinidia (Actinidia sp.) is increasingly grown due to its good biological and productive traits, including very early fruit bearing, regular abundant yields and an extremely high accumulation potential. Its fruit has exceptional nutritional and dietary values, and it is known as “health fruit“ due to its much higher amounts of vitamin C as compared to other fruits. The objective of this study was to evaluate the potential cultivation of actinidia under the agroenvironmental conditions in Čačak, as outside the optimal production area. An actinidia orchard was established in the vicinity of Čačak in 2006, including 32 cv. Hayward plants characterised by large high quality fruit. The planting ratio of male to female plants was 1:5. The orchard was trained to a support trellis system. Common care and management practices were used, including irrigation as a vital cultural operation. The orchard came into bearing in the fourth year after planting i.e. in 2010. The total yield in the first year was about 250 kg (9 kg per tree on average). During the 2011 growing season, the orchard was hit by stormy weather bringing hail, which led to a significant reduction in both fruit yield and fruit size in this year. During the 2011/2012 dormancy season, extremely low temperatures (as low as -20°C) were recorded, due to which the aboveground system in a number of plants suffered winter killing. However, winter-killed plants regenerated from the root system. Obtain results showed that actinidia can be grown under the agroenvironmental conditions in Čačak.

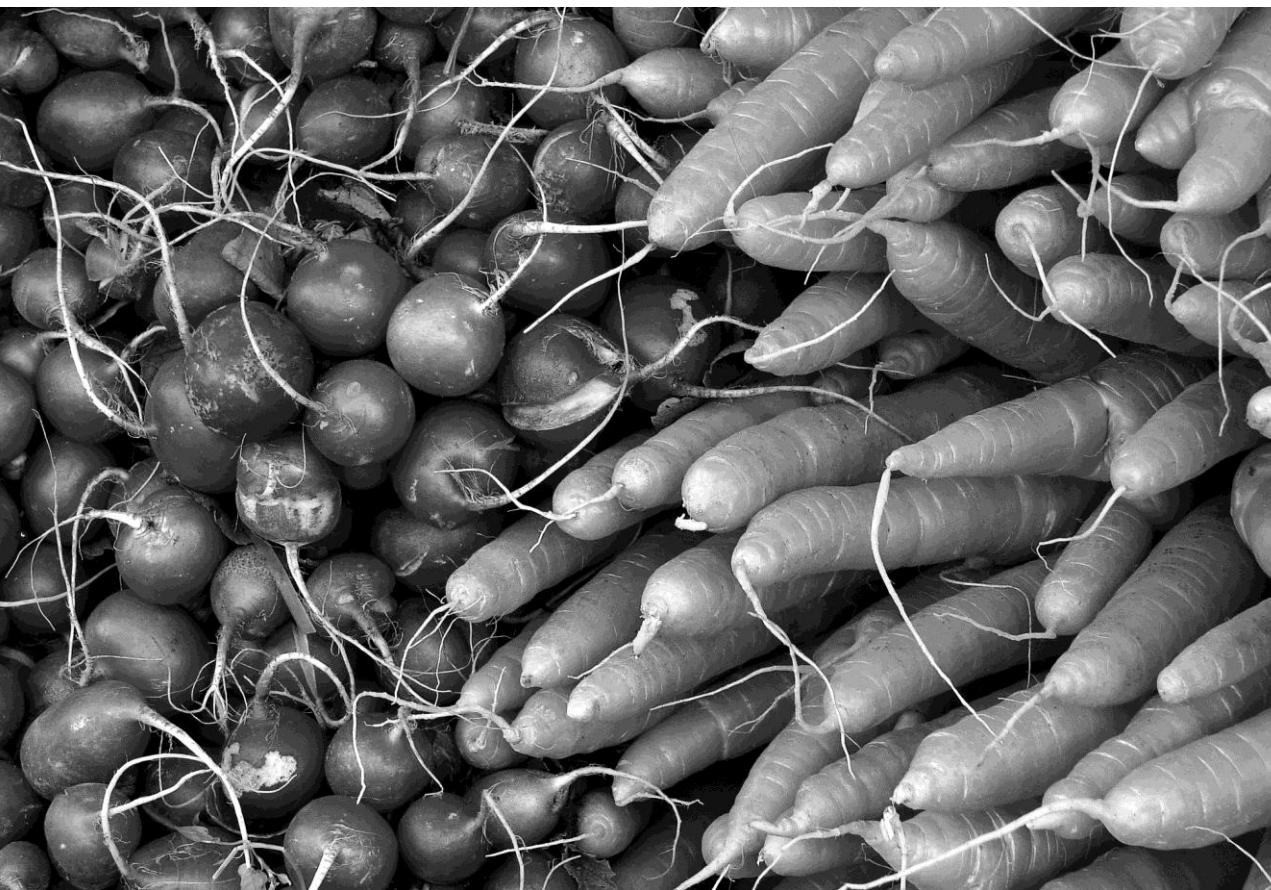
MOGUĆNOST GAJENJA AKTINIDIJE U AGROEKOLOŠKIM USLOVIMA ČAČKA

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Aktinidija (*Actinidia* sp.) je vrsta voćaka koja se sve više gaji zbog svojih dobrih bioloških i proizvodnih osobina. Veoma brzo stupa u rod, rađa redovno i obilno i izuzetno je akumulativna vrsta voćaka. Plodovi su od izuzetne hranljive i dijetetske vrednosti i zbog činjenice da sadrže znatno više vitamina C u odnosu na druge vrste voćaka dobili su naziv "plodovi zdravlja". Cilj rada je prikazati da li se aktinidija može uspešno gajiti u agroekološkim uslovima Čačka, kao izvanoptimalnom proizvodnom području. U okolini Čačka je 2006.godine podignut zasad aktinidije. Posadene su 32 sadnice sorte Hejvord, koja se odlikuje krupnim plodovima odličnog kvaliteta. Odnos muških i ženskih biljaka u sadnji iznosio je 1:5. Sadnja je obavljena u špaliru sa naslonom. Primjenjena je uobičajena nega zasada uz navodnjavanje, koje je neohodna agrotehnička mera. Zasad je stupio u rod u četvrtoj godini po sadnji tj. 2010.godine. Ukupan rod prve godine iznosio je oko 250 kg (prosečno 9 kg po stablu). Tokom vegetacije 2011. godine u području podignutog zasada bilo je olujno nevreme praćeno gradom, tako da je to značajno uticalo na smanjenje roda u ovoj godini. Rod je bio i lošijeg kvaliteta (sitni plodovi). U periodu mirovanja, u zimu 2011/2012.godine, zabeležene su izuzetno niske temperature (i do -20°C) što je uslovilo izmrzavanje nadzemnog sistema kod jednog broja biljaka. Međutim, izmrzle biljke su se obnovile iz korenovog sistema. Dobijeni rezultati ukazuju da se aktinidija može gajiti u agroekološkim uslovima Čačka.

Section 5. Vegetable Production



EFFECT OF FERTILIZATION ON CUCUMBER NURSERY PLANT QUALITY

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The experiments were carried out under controlled conditions (phyto chambers) at the Faculty of Agriculture of the University of Belgrade. Light, temperature and humidity were controlled. Nursery period (research period) lasted for 35 days. Research was conducted on the cucumber hybrid Caman RZ whose seeds were sown in the 10.5cm diameter pots filled with the substrate Organica TC2. The experiment consisted of three variants. The first, control variant, comprised plants grown without fertilization. The plants belonging to the second variant were fertilized (watering) only once using the fertilizer Fitofert crystal (10:40:10) during the first true leaf stage. The third group of plants, in the same vegetative stage, was fertilized with the fertilizer Fitofert humistar. Unlike the second variant, top dressing with this fertilizer was performed weekly (total of 4 times). The following parameters were determined: plant height (cm), number of leaves per plant and leaf area per plant (cm^2) will be shown. Significantly higher plants were obtained in the variants with fertilization compared with the control. Only at the last measurement were statistically significant differences recorded within all examined variants of this parameter. Control plants had an average height of 29.9cm, while the plants in the second variant were averagely 2.5cm higher, and in the third variant plants were 14.4 cm higher than the control plants. Number of leaves per plant was significantly different among all variants even during the third measurement. At the end of the experiment, in the third variant, plants had an average of 8 leaves per plant (the highest value). Leaf area per plant recorded in the control variant during the second measurement (131cm^2) was significantly lower than the values achieved in the variants with fertilization. Starting from the third measurement, differences among all variants were significant. The highest value in the last measurement, for the leaf area per plant (874cm^2) was found in the variant where Fitofert humistar was used as fertilizer. There has been a significant influence of fertilization on the development of cucumber nursery plants. Similarly, there is a positive impact of a continuous fertilization on the reduction of nursery period (economy).

Keywords: cucumber; fertilization; nursery plants; plant height; leaf number; leaf area

UTICAJ PRIHRANJIVANJA NA KVALITET RASADA KRASTAVCA

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Ogledi su izvedeni u kontrolisanim uslovima (fito komore) na Poljoprivrednom fakultetu Univerziteta u Beogradu. Kontrolisana je svetlost, temperatura i vlažnost. Rasadni period (period istraživanja) je trajao 35 dana. Ispitivanja su obavljenia na hibridnom krastavcu Caman RZ čije je seme posejano u supstrat Organica TC 2 kojim su bile napunjene saksije prečnika 10,5 cm. Ogled se sastojao iz tri varijante. Prvu, kontrolnu varijantu, činile su biljke koje su rasle bez prihranjivanja. Biljke iz druge varijante prihranjene su (zalivanjem) samo jednom i to dubrivotom Fitofert kristal (10:40:10) u fazi prvog pravog lista. Treća grupa biljaka, u istoj vegetativnoj fazi, prihranjena je dubrivotom Fitofert humistar. Za razliku od druge varijate, prihrana ovim dubrivotom obavljana je nedeljno (ukupno 4 puta). U radu su prikazani visina biljke (cm), broj listova po biljci i površina lista po biljci (cm^2). Značajno više biljke dobijene su u varijantama sa prihranjivanjem, u odnosu na kontrolu. Tek u poslednjem merenju zabeležene su statistički značajne razlike u okviru svih ispitivanih varijanti kod ovog parametra. Biljke u kontroli su imale visinu u proseku 29,9 cm, dok su biljke u drugoj varijati od njih bile više u proseku za 2,5 cm, a u trećoj za 14,4 cm. Broj listova po biljci se značajno razlikovao kod svih varijati već tokom trećeg merenja. Na kraju ogleda biljke u trećoj varijati imale su u proseku 8 listova po biljci (najviša vrednost). Površina lista po biljci registrovana u kontrolnoj varijanti tokom drugog merenja (131 cm^2) značajno je bila manja od vrednosti ostvarenih u varijantama sa prihranjivanjem. Od trećeg merenja razlike između svih varijanti su bile značajne. Najveća vrednost u poslednjem merenju, za površinu lista po biljci (874 cm^2), ostvarena je u varijanti gde je za prihranu korišćeno dubrivo Fitofert humistar. Ostvaren je značajan uticaj prihranjivanja na razvijenost rasada krastavca. Takođe je dokazan pozitivan uticaj kontinuirane prihrane na skraćenje rasadnog perioda (ekonomičnost).

Ključne riječi: krastavac; prihranjivanje; rasad; visina biljke; broj listova; lisna površina

GENOTYPIC SPECIFICITY OF YIELD OF CONSUMPTION POTATO TUBERS

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About the importance of cultivated potato crops is written a lot. Potato represents the basis of nutrition for population in many countries of the World. According to the researches of International Potato Center (CIP), this species is considered to be world's fourth most important cultivated crop. Regardless of the length of the period when it became cultivated crop, method of production, tradition and habits in consumption and consumption "per capita", today potato represents very significant cultivated plant. In BiH planted areas under potato varies and are in range from 41000-50000 ha of which in Republic of Srpska is 18500-20500 ha and in Federation BiH around 22500-26000 ha. From total arable area of Republic of Srpska to potato belong 7,6%, and to other vegetable 7,8% (Report Ministry of Foreign Trade and Economic Relations BiH 2007). According to the scope of average annual production of 480000 t and variable yield of 9-12 t/ha potato is by importance second grown crop in Republic of Srpska, after maize and in front of wheat. (Dardić, 2008). Variable and different environmental conditions, poor technical equipment and technological (professional) qualifications of producers presented on average, for European scale, with low yield, require constant search for new production solutions. Simple, but good attempt is new variety or genotype, but this will not certainly solve manufacturing success. However, the long term production testing of new varieties with high genetic fruitfulness potential in different ecological (climate and soil) conditions throughout achieved yield is basis for selection of new genotype and its introduction into production, its adaptability to changing environmental conditions and is the most common way for producers to achieve production success. This paper presents a four year study of yield of consumable tuber in three genotypes with high fruitfulness potential in different ecological conditions, Sarajevo field and Glamoč. The research results showed that yield as complex characteristic most significantly varies per years and then less per locality and the least per genotype.

Keywords: potato; yield; locality; ecological conditions

GENOTIPSKE SPECIFIČNOSTI PRINOSA KONZUMNIH KRTOLA KROMPIRA

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O značaju krompira kao gajenog usjeva pisano je mnogo. Krompir predstavlja osnovu ishrane stanovništva u mnogim zemljama svijeta. Po istraživanjima Međunarodnog centra za krompir (CIP), ova vrsta se smatra četvrtim najvažnijim svjetskim gajenim usjevom. Bez obzira na dužinu perioda od kada je postao gajeni usjev, način proizvodnje, tradiciju i naviku u potrošnji i potrošnju "per capita", on danas predstavlja izuzetno značajnu gajenu biljku. U BiH sadne površine pod krompirom variraju i kreću se od 41000-50000 ha od čega u Republici Srpskoj oko 18500-20500 ha i Federaciji BiH oko 22500-26000 ha. Od ukupnih obradivih površina Republike krompiru pripada 7,6%, a ostalom povrću 7,8% (Izv. MSTEo BiH 2007). Prema obimu godišnje proizvodnje od prosječno 480000 t. i verjabilnom prinosu od 9-12 t/ha. po značaju je drugi gajeni usjev u Republici, poslije kukuruza, a ispred pšenice. (Dardić, 2008). Promjenljivi i različiti ekološki uslovi, slaba tehnička opremljenost i tehnološka (stručna) sposobljenost proizvođača predstavljena prosječno, za Evropske razmjere, niskim prinosom, nameću potrebu stalnog traganja za novim proizvodnim rješenjima. Jednostavan, a dobar pokušaj jeste nova sorta, odnosno genotip, ali ni ona sa sigurnošću ne rješava proizvodni uspjeh. Ipak je višegodišnje proizvodno testiranje novih sorti visokog genetičkog potencijala rodnosti u različitim ekološkim (klimatskim i zemljишnim) uslovima preko ostvarenog prinosa polazna osnova izbora novog genotipa i njegovog uvođenja u proizvodnju, njegove adaptabilnosti na promjenljive uslove sredine i najčešći način ka ostvarenju proizvodnog uspjeha uzajimača. U radu su predstavljena četvorogodišnja istraživanja prinosa konzumne frakcije krtole krompira kod tri genotipa visokog potencijala rodnosti u ekološki različitim uslovima, Sarajevsko polje i Glamoč. Rezultati istraživanja su pokazali da prinos kao složeno svojsvo najznačajnije varira po godinama, zatim, manje po lokalitetu, a najmanje po genotipu.

Ključne riječi: krompir; prinos; lokalitet; ekološki uslovi

**INFLUENCE OF TYPE OF SUBSTRATE ON NPK NUTRIENTS EFFICIENCY IN
CAULIFLOWER (BRASSICA OLERACEA VAR. BOTRYTIS L.) HYDROPONIC
PRODUCTION**

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The efficiency of NPK nutrients application in the production of cauliflower (*Brassica oleracea* var. *Botrytis* L.) grown in three different substrates (perlite, gravel and pozolana) has been analyzed in the experiment conducted in the greenhouse of Mediterranean Agronomic Institute of Bari. The highest nitrogen consumption was observed 10 weeks after transplantation, while the highest consumption of P and K was recorded 12 and eight weeks after transplantation, respectively. Among the nutrients the highest loss was recorded in potassium (11.6%). Since the cauliflower is grown in hydroponic system, it has been enable precise control and manipulation of nutrients giving minimal nutrients losses. The highest NPK nutrients application efficiency is obtained in phosphorus (97.2%). Taking into account that the losses of nutrients were very low and that it was used an open hydroponic system, drained nutrients did not cause high pollution of the soil.

Keywords: nutrients; cauliflower; potassium; substrate

**UTICAJ VRSTE SUPSTRATA NA EFIKASNOST PRIMJENE NPK HRANIVA U
PROIZVODNJI KARFIOLA (BRASSICA OLERACEA VAR. BOTRYTIS L.) NA
HIDROPONSKI NAČIN**

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Efikasnost primjene NPK hraniva u proizvodnji karfiola (*Brassica oleracea var. Botrytis L.*) gajenog u tri različita supstrata (perlit, gravel i pozolana) analizirana je eksperimentom sprovedenim u stakleniku Mediteranskog Agronomskog Instituta u Bariju. Najveća potrošnja azota je zabilježena 10 sedmica nakon presadivanja, dok je najveća potrošnja P i K zabilježena 12 i osam sedmica nakon presadivanja, respektivno. Od korišćenih makrohraniva najveći gubitak je zabilježen u kalijumu (11,6%). S obzirom da je karfiol gajen na hidroponski način, preciznom kontrolom i manipulacijom hraniva gubici su svedeni na minimum. Najveća efikasnost u primjeni NPK hraniva postignuta je primjenom fosfora (97,2%). Uzimajući u obzir da su gubici hraniva bili jako niski i da je bio korišćen otvoreni hidroponski sistem, isprana hraniva nisu mogla da izazovu jako zagađenje okolnog zemljišta.

Ključne riječi: hraniva; karfiol; kalijum; supstrat

RESULTS OF POTATO QUARANTINE DISEASES SURVEYS IN REPUBLIC OF SRPSKA IN 2011 AND 2012

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During the Survey of potato quarantine diseases in Bosnia and Herzegovina in 2011 and 2012 in Plant Protection Laboratory analysis of 132 samples of seed and ware potato (*Solanum tuberosum L.*) produced in the Republic of Srpska, as well as analysis of 55 samples delivered by phytosanitary inspection from border crossings were performed. Potato samples were analyzed in accordance with EU Directives (98/57/EC, 2006/56/EC and 69/464/EEC) and the Regulations (Official Gazette 78/09 and 90/09). First screening test for detection of quarantine bacteria was immunofluorescence test (IF test) that was performed using Adgen Phytodiagnostics antibodies specific for these pathogens, while the second screening test was PCR test by Pastrik et al. (2000) for detection of *Clavibacter michiganensis* ssp. *sepedonicus* and Pastrik et al. (2002) for detection of *Ralstonia solanacearum*. To identify the presence of phytopathogenic fungus *Synchytrium endobioticum* visual and microscopic diagnostics was used. During the Survey in 2011 and 2012 *C. m.* (Smith) Davis et al. *sepedonicus* (Spieckermann et Kotthoff) Davis et al. the causal agent of potato ring rot and *Synchytrium endobioticum* (Schilb.) Perc. the causal agent of potato wart disease were not detected. However, in 2011 the presence of *R. solanacearum* was identified in three samples of early potato from Egypt, as well as in two samples of ware potato from Serbia in 2012. The confirmation of obtained results was made by using detection tests (IF test, PCR and RFLP), pathogenicity tests on tomato plants and identification tests (reisolation, identification on the basis of colony morphology on different media – SMSA, TSBA, SPA, as well as IF and PCR test). Since the quarantine phytopathogenic bacteria *Ralstonia solanacearum*, syn. *Pseudomonas solanacearum* (Smith) Smith, is in BiH listed in IA list, Section I, phytosanitary inspection has destroyed the shipments of potato in a safe way (78.186 kg in 2011) and returned shipments to country of origin in 2012 (43.445 kg). In that way spreading of quarantine phytopathogenic bacteria *Ralstonia solanacearum* to Bosnia and Herzegovina was prevented.

Keywords: survey, quarantine diseases, potato, Republic of Srpska

REZULTATI MONITORINGA NA PRISUSTVO KARANTINSKIH PATOGENA KROMPIRA U REPUBLICI SRPSKOJ U 2011. i 2012. GODINI

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U okviru realizacije „Programa posebnog nadzora karantinskih štetnih organizama na krompiru u Bosni i Hercegovini“ tokom 2011. i 2012. godine u Laboratoriji za zaštitu bilja Poljoprivrednog instituta Republike Srpske, Banja Luka analizirano je ukupno 132 uzorka sjemenskog i merkantilnog krompira proizvedenog na području Republike Srpske, kao i 55 uzoraka krompira dostavljenih od strane fitosanitarnih inspektora sa graničnih prelaza. Uzorci krompira analizirani su prema EU direktivima (98/57/EC, 2006/56/EC i 69/464/EEC) i važećim Pravilnicima (Službeni glasnik BiH 78/09 i 90/09). Tako je kao prvi test korišćen test imunofluorescencije sa antitijelima za detekciju karantinskih bakterija proizvođača Adgen Phytodiagnostics, dok je kao drugi test korišćen PCR test prema metodama Pastrick et al. (2000) za analizu uzorka na prisustvo C. m. ssp. sepedonicus i Pastrick et al. (2002) za analizu uzorka na prisustvo R. solanacearum. Za utvrđivanje prisustva fitopatogene gljive *Synchytrium endobioticum* korišćena je vizuelna i mikroskoposka dijagnostika. Među analiziranim uzorcima tokom obe godine sprovedenog monitoringa ni kod jednog uzorka nije utvrđeno prisustvo C. m. ssp. sepedonicus, prouzrokovачa prstenaste truleži krtola krompira i *S. endobioticum*, prouzrokovaca bolesti raka. Međutim, tokom 2011. godine na tri uzorka krtola mladog merkantilnog krompira porijeklom iz Egipta, kao i na dva uzorka merkantilnog krompira porijeklom iz Srbije, tokom 2012. godine utvrđeno je prisustvo fitopatogene bakterije *Ralstonia solanacearum*, prouzrokovaca smeđe truleži i bakterioznog uvenuća krompira. Potvrda dobijenih rezultata izvedena je u skladu sa navedenim Pravilnikom korišćenjem testova detekcije (IF test, PCR i RFLP), testova potvrde patogenosti izolovane bakterije na biljkama paradajza, kao i korišćenjem testova identifikacije (reisolacija i identifikacija na osnovu morfologije kolonija bakterije na različitim podlogama – SMSA, TSBA, SPA, zatim IF test i PCR). S obzirom da se karantinska fitopatogena bakterija *Ralstonia solanacearum*; syn. *Pseudomonas solanacearum* (Smith) Smith, u BiH nalazi na listi IA odjeljak I, fitosanitarni inspektor su na propisan način izvršili bezbjedno uništavanje zaraženih pošiljki iz kojih su uzeti uzorci, u ukupnoj količini od 78.186 kg krompira tokom 2011. godine, odnosno vraćanje pošiljki iz kojih su uzeti uzorci krompira, u ukupnoj količini od 43.445 kg u zemlju porijekla tokom 2012. godine. Na ovaj način spriječen je unos karantinske fitopatogene bakterije *Ralstonia solanacearum* na područje Bosne i Hercegovine.

Ključne riječi: Monitoring, karantinski patogeni, krompir, Republika Srpska

**TETRANYCHID MITES ON VEGETABLE CROPS IN GREENHOUSES IN
SOUTHERN PART OF MONTENEGRO**

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Spider mites from the family Tetranychidae are one of the most important polyphagous pests on vegetable crops in greenhouses. The main vegetable production areas in Montenegro are zetsko-bjelopavlička valley and the seacoast, where this production is placed in the open field and greenhouses. The predominantly grown greenhouse vegetables are tomato, pepper and cucumber, as well aubergine on the seacoast. The aim of this survey was to identify the presence and distribution of spider mites of the family Tetranychidae on vegetable crops in greenhouses and damages they cause. Vegetable crops were inspected in the period 2009 to 2012. In region of zetsko-bjelopavlička valley, greenhouses were checked on eight localities (four in Zeta and four in Bjelopavlići), as well on four along the seacoast. Vegetables were visually inspected in 15-20 days intervals for the presence of spider mites, starting from the end of May until October. During period of this survey two tetranychid species were found: *Tetranychus urticae* Koch. - the two spotted spider mite and *Tetranychus cinnabarinus* Boisd. – the carmine spider mite. The earliest symptoms of presence these two species were recorded in all localities in June, while in July and August very high population growth. During monitoring period *T. urticae* was detected as the most abundant on cucumber in all localities while, according abundance and damages which caused, *T. cinnabarinus* was the most important for tomato and aubergine.

Keywords: *Tetranychus urticae*, *Tetranychus cinnabarinus*, greenhouses, vegetable crops.

**TETRANIHIDNE GRINJE NA POVRTARSKIM KULTURAMA U
PLASTENICIMA U JUŽNOM DIJELU CRNE GORE**

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Grinje iz familije Tetranychidae su veoma značajne polifagne štetočine povrtarskih kultura u zaštićenom prostoru. Najznačajnije proizvodno područje gdje se u Crnoj Gori uzgaja povrće je zetsko-bjelopavlička ravnica i primorje. Proizvodnja se odvija na otvorenom i u zaštićenom prostoru (plastenici). Najviše se gaje paradajz, paprika i krastavac, a na primorju i plavi patlidžan. Cilj rada je da se utvrdi prisustvo i rasprostranjenost grinja iz familije Tetranychidae po kulturama i štete koje pričinjavaju. U periodu od 2009 do 2012. godine vršeni su vizuelni pregledi povrtarskih kultura u plastenicima. Na području zetsko-bjelopavličke ravnice obilascima terena je obuhvaćeno osam lokaliteta (četiri u Zeti i četiri u Bjelopavlićima), a na primorju četiri. Pregledi biljaka na prisustvo tetranihidnih grinja vršeni su od kraja maja do oktobra u intervalima od 15- 20 dana. Tokom istraživanja utvrđeno je prisustvo dvije tetranihidne grinje: *Tetranychus urticae* Koch. -obični paučinar i *Tetranychus cinnabarinus* Boisd. - karminasti paučinar. Početak pojave obje vrste zabilježen je tokom juna na svim lokalitetima, dok je u julu i avgustu utvrđeno značajnije povećanje njihove brojnosti. U svim lokalitetima *T. urticae* je bila najbrojnija tokom cijelog perioda praćenja na krastavcu, dok je *T. cinnabarinus* brojnošću i pričinjenim štetama bio najznačajniji za paradajz i plavi patlidžan.

Ključne riječi: *Tetranychus urticae*, *Tetranychus cinnabarinus*, plastenici, povrtarske kulture.

Section 6. Animal Husbandry



**PRODUCTION PARAMETERS OF CHICKENS REARED EXTENSIVELY IN THE
POULTRY HOUSE AND IN TRADITIONAL FREE RANGE**

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The aim of this study was to examine production parameters of two groups of chickens reared in two different production systems: extensively in the poultry house and traditional free range system. The experiment was carried out on 200 Red Bro chickens divided into two groups. Both groups were divided into four subgroups with 25 chickens each. During the experiment the following traits were examined: body weight, feed conversion ratio and mortality. All data were analyzed by ANOVA and significant differences among treatments were determined using the Duncan Multiple Range Test. During fattening there were no significant differences between the two groups in terms of body weight. Just in the 8th week the chickens reared on free range had higher body weight compared to the chickens in the poultry house. Feed conversion ratio was slightly higher in chickens reared on a free range, but the difference was not statistically significant. Mortality was within the technological standards in both investigated groups.

Ključne riječi: Chickens; production parameters; poultry house; free range

**PROIZVODNI REZULTATI PILIĆA GAJENIH U SISTEMIMA SLOBODNOG
ISPUSTA I EKSTENZIVNO U ŽIVINARNIKU**

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Cilj rada je bio da se ispitaju proizvodni rezultati dve grupe pilića gajenih u dva različita sistema: ekstenzivno u žvinarniku i sistemu slobodnog ispusta. Ekperiment je izveden na 200 pilića hibrida Red Bro koji su podeljeni u dve grupe. Od obe grupe formirane su 4 podgrupe sa po 25 pilića. Ispitivani proizvodni parametri su telesna masa, konverzija hrane i mortalitet. Na osnovu dobijenih podataka urađena je statistička obrada metodom analize varijanse i Dankanovog testa. Tokom ogleda nisu utvrđene značajne razlike između grupa u pogledu telesnih masa. Izuzev u osmoj nedelji u kojoj su pilići sa ispusta imali veću telesnu masu u odnosu na piliće iz objekta. Konverzija hrane je bila nešto veća kod pilića na ispustu ali nije bilo statistički značajne razlike između posmatranih grupa. Mortalitet se nalazio u okviru tehnoloških normativa u obe ispitivane grupe.

Ključne riječi: Pilići; proizvodni parametri; objekat; objekat sa ispustom

CARCASS CHARACTERISTICS OF CHICKEN REARED IN ALTERNATIVE HOUSING SYSTEMS

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The aim of the investigation was to show the carcass characteristics of Red Bro chicken reared in two alternative housing systems, extensively in the poultry house and traditional free range system. At the end of the fattening period at the 9 th week of age, 6 males and 6 females were randomly selected from each group and slaughtered. The following masses were determined: "classic cut carcass", "ready to roast", "ready to grill" and the mass of the certain yield parts. There were some differences in dressing percentage between the two systems of rearing on behalf of chickens reared on a free range. Chickens from free range had a higher "classic cut carcass" then the chickens from the object. The dressing percentage of "ready to roast" and "ready to grill" didn't show a statistically significant difference between the groups. Observing the percentage share of certain yield parts it was observed that higher values append in terms of share of the head, breast and giblets in chickens reared on free range.

Keywords: Chicken; alternative housing systems; carcass characteristics

**KLANIČNE KARAKTERISTIKE PILIĆA IZ ALTERNATIVNIH SISTEMA
GAJENJA**

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Cilj ispitivanja je bio da se prikažu klanične karakteristike pilića Red Bro gajenih u sistemu ekstenzivno u živinarniku i sistemu slobodnog ispusta. Na kraju perioda tova, koji je trajao devet nedelja, žrtvovano je 6 kokica i 6 petlića iz oba sistema gajenja. Određene su mase trupa i radmani po sistemu „klasična obrada“, „spremno za pečenje“ i „spremno za roštilj“, kao i mase i ideo pojedinih delova trupa. Posmatrenjem klanične mase može se zaključiti da postoje značajne razlike između posmatranih sistema gajenja i to u korist pilića gajenih na ispustu. Pilići sa ispustu imali su i veći radman „klasična obrada“ u odnosu na piliće iz objekta, dok kod radmana „trupa spremnog za pečenje“ i „trupa spremnog za roštilj“ nije bilo statistički značajne razlike između posmatrane dve grupe. Posmatranjem procentualnog udela pojedinih delova trupa uočeno je da su veće vrednosti u pogledu udela glave, grudi i jestivih iznutrica ostvarene kod pilića gajenih na ispustu.

Ključne riječi: Pilići; alternativni sistemi gajenja; klanične karakteristike

**INFLUENCE OF COCCIDIAN MEDICINES ON HEALTH AND PRODUCTION
RESULTS IN BROILER FATTENING PRODUCTION**

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In this paper effects of different coccidian medicines in prevention of coccidiosis appearance in broiler fattening industry are shown. Effects of two medicines, Coccisan120G and Diklakoks, that are commonly used are presented in this paper. Three groups of broilers, 100 units each, were formed. First group was control group and was given feed mixture without coccidian medicine. Second group received Coccisan120G and third group received Diklakos in their feed. Results of the research have shown that control group has developed sub clinical coccidiosis with lethality rate of 15%. Second and third group of broilers have not developed coccidiosis and mortality rate for second group was 5% while for the third group was 7%. In terms of growth rate of broilers and their finishing body weight, it has been determined that body weight for the first group of chicks was lowest (2110gr). Second and third group that received coccidian medicine through food have achieved higher body weights compared to the control group. Difference between body weight of the first and second group was 70grams in favor of second group, and between first and third group 80grams in favor of third group. Research has clearly shown that it is necessary to use different coccidian medicines in broiler production as prevention of coccidiosis which can lead to great losses in broiler production.

Keywords: broilers, body weight, coccidiosis, Coccisan120G, Diklakoks, mortality

**LITTER INFLUENCE ON OCCURRENCE OF FOOTPAD DERMATITIS OF
BROILER CHICKENS**

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Law on Animal Welfare goatherd more attention to the health and welfare of farm animals in Serbia. Having in mind the conditions of intensive poultry production it is necessary to find an optimal solution for the environment condition improvements, which will not significantly increase the price of production. During the winter season, biggest problem in poultry breeding facilities is relative humidity which results in wet and litter of poor quality. Straw usage is a relatively poor litter source on farms for fattening broiler chickens and requires some alternative solutions. By changing the litter shape, a significant increase in moisture absorption can be noticed. One possible solution to this problem is the use of chopped straw as litter and addition of certain microbial products. Use of chopped straw as litter in fattening facilities decreased intensity lesions for 22.54% compared to the control group, and the usage of microbial products with chopped straw decreased amount to 34.52%. Using different forms of litter increased final body weight of broiler chickens in the experimental groups, compared to the control group. Average body weight of the control group at 42 days of age was 2358 g, group with chopped straw achieved body weight of 2382 g, and the group with chopped straw and microbiological products 2456 g, respectively. These results indicate that animals with less intensity lesions are easier to move and they are more willingly to go to the feeders and drinkers, resulting in higher final body mass. Certain application procedures can have a significant impact for increased welfare and health of fattening animals.

Keywords: Broiler chickens; footpad dermatitis; microbial compounds; litter

UTICAJ PROSTIRKE NA POJAVU PODODERMATISA BROJLERSKIH PILIĆA

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Stupanjem na snagu zakona o dobrobiti životinja u Republici Srbiji sve veća pažnja se poklanja zdravlju i dobrobiti domaćih životinja. Imajući u vidu uslove intenzivne živinarske proizvodnje potrebno je pronaći optimalno rešenje koje će poboljšati uslove ambijenta, a koje proizvođačima neće u znatnoj meri poskupiti proizvodnju. Najveći problem u objektima za tov živine predstavlja relativna vlažnost vazduha koja u hladnom periodu godine ima za posledicu prostirku lošeg kvaliteta i velike vlažnosti. Upotreba slame koja predstavlja relativno loš izvor prostirke na farmama za tov brojlerskih pilića zahteva pronalaženje alternativnog rešenja. Promenom oblika prostirke dolazi do značajnog povećanja absorbcije vlage. Jedno od mogućih načina rešenja ovog problema jeste primena seckane slame kao prostirke i dodavanja u istu određenih mikrobioloških preparata. Upotrebom seckane slame kao prostirke u objektima tova došlo je do smanjenja intenziteta lezija za 22,54% u odnosu na kontrolnu grupu, a upotrebom mikrobiološkog preparata i seckane slame to smanjenje iznosilo 34,52%. Upotrebom različitih oblika prostirke došlo je do povećanja završnih telesnih masa brojlerskih pilića eksperimentalnih grupa u odnosu na kontrolnu grupu. Presečna telesna masa kontrolne grupe 42 dana tova iznosila je 2.358 g, grupe sa sekanom slamom 2.382 g, a grupe sa seckanom slamom i mikrobiološkim preparatom 2.456g. Ovi podaci ukazaju na činjenicu da se životinje sa manjim intenzitetom lezija lakše kreću i radije odlaze do hranilica i pojilica, što za posledicu ima veće završne mase. Primenom određenih postupaka moguće je značajno uticati na povećanje dobrobiti i zdravstvenog stanja životinja u tovu.

Ključne riječi: Brojlerski pilići; pododermatitis; mikrobiološki preparat; prostirka

**PREDICTION OF ENERGY BALANCE OF EARLY LACTATING DAIRY COWS
FROM MILK COMPOSITION MEASURES AT INDIVIDUAL COW LEVEL**

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In this study, the energy status of the Holstein-Friesian dairy cows was estimated using urea, protein and fat concentrations in individual milk samples. Investigation included milk samples from 211 cows from the commercial dairy herd. All cows were in the first stage of lactation and fed rations recommended for that category of animal. The average milk fat concentration (MF) was 39.01 ± 15.04 g/L, the average milk protein concentration (MP) was 31.11 ± 2.89 g/L, while the average milk urea concentration (MUN) was 5.02 ± 1.77 mmol/L. In addition, relations between MUN and MP, as well as MP and MF in the individual milk samples were investigated. Such an analysis provided a more detailed picture of the energy status of the examined cows. Analyses of MP to MUN relations in individual milk samples showed that 14.22 % of cows had MUN lower than 4 mmol/L and MP lower than 32 g/L, meaning that those cows were probably insufficiently supplied with both dietary energy and protein. 46.92 % of the cows had MP lower than 32 g/L and MUN higher than 4 mmol/L indicating on relative excess in dietary protein supply which means that supply with proteins was probably in accordance with cows' needs but there was no enough dietary energy to maintain ruminal bacterial activity for converting ammonia to microbial proteins. 30.33 % of cows had MP higher than 32 g/L and MUN over 4 mmol/L which indicated on overfeeding of dietary protein. Rest of the individual milk samples had MUN lower than 4 mmol/L and MP higher than 32 g/L, meaning that those cows were adequately supplied with both dietary crude protein and energy. Analyses of MP to MF relations in individual milk samples showed that 17.06 % of cows had MF higher than 45 g/L, but MP lower than 32 g/L, which means that those cow suffered from severe negative energy balance. It conclusion, the determination of relations between urea, fat and protein concentrations in individual milk samples is a reliable indicator of the energy status of cows and may be very useful tool for making corrections of the feed rations.

Keywords: High-yield dairy cows; energy status; milk components

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**THE PERFORMANCE OF SLOVENE RABBIT LINE SIKA FOR MEAT
PRODUCTION**

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In Slovenia, a selection line SIKA for meat production was formed to meet Slovenian needs for breeding rabbits. In conditions of insufficiently developed rabbit market the two-way crossing was established. In Rabbit centre of Biotechnical Faculty, the selection of maternal SIKA line A started in 1988 and the sire (terminal) SIKA line C in 1995. The performance of pure SIKA lines are continually recorded from the beginning and the production and slaughter traits of hybrid SIKA rabbits (two-way cross between maternal A and sire C line) were tested as well. In the article the performance of both pure Slovene SIKA lines (maternal A and terminal C) and of hybrid SIKA rabbits were described.

THE QUALITY OF CORN SILAGE ON FAMILY FARMS IN THE DOBOJ REGION

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The study was conducted in the applied research project: "Improving the nutrition on dairy farms in the Republic of Srpska", and it's aim was to monitor the grass, alfalfa and corn silage and hay quality on the family farms in the Republic of Srpska for six months of feeding (from May until December 2012.). In this study, the nutritive value of corn silage on 12 farms in production that have from 10 to 54 dairy cows, from 8 municipalities of Doboј region. Analysis of samples was performed using Weende method. The average results of the analysis of the samples showed an average content of silage's dry matter (30.50%), crude protein (2.34%), crude fiber (7.17%) and NEL (5.69 MJ / kg DM). Silage, on average remained stable (pH 4.13) as it is the upper limit of good quality silage.

Keywords: corn silage; family farms;

**KVALITET KUKURUZNE SILAŽE NA PORODIČNIM GAZDINSTVIMA NA
PODRUĆJU REGIJE DOBOJ**

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Istraživanje je provedeno u okviru primijenjeno-istraživačkog projekta: «Poboljšanje ishrane na farmama muznih krava u Republici Srpskoj» kojim je praćen kvalitet travne, lucerkine i kukuruzne silaže i sijena na porodičnim poljoprivrednim gazdinstvima u RS tokom šest mjeseci ishrane (od maja do decembra 2012.godine). U ovom istraživanju je praćena hranidbena vrijednost kukuruzne silaže na 12 poljoprivrednih gazdinstava koji u proizvodnji posjeduju od 10 do 54 muznih grla iz 8 opština Dobojske regije. Analiziranje uzorka je vršeno Weende metodom. Prosječni rezultati analiza ispitivanih uzorka silaže pokazuju prosječan sadržaj SM (30,50%), sirovih proteina(2,34%), sirove celuloze (7,17 %) i NEL(5,69 MJ/kg SM). Silaža je u prosjeku bila stabilna (pH 4,13) što je na gornjoj granici kvaliteta dobrih silaža.

Ključne riječi: kukuruzna silaža; porodično gazdinstvo;

FERTILITY AND MILKING TRAITS OF SANSKA GOAT IN FIRST THREE LACTATIONS

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Research has been conducted on Sanska goat breed in first, second and third lactation. Milk yield control was conducted after weaning period in the intervals of 30days. Fertility of Sanska breed in three consequential lambing was approximately 161,61%. If we look at the lactations (age of goats) highest fertility was achieved for third lambing and it was 166,09%. Average lactation length was 241 day for first, 243 days for second and 249 days for third lactation. Higher milk production was achieved in second lactation compared to first by 98,65 kg. Compared to first lactation goats in third lactation have produced 214,40 kg of milk more and compared to second lactation 115, 75kg more. Determined differences were statistically very significant ($P<0,01$). Average content of milk fat in the milk was 3,21%. Using the statistical analysis of obtained results, very significant result has been determined regarding the influence of lactation order on total amount of collected milk. Total milk yield and daily milk production was constantly increased from first to third lactation. Lowest average milk fat content was determined at the middle of lactation while its highest percent was determined in the last stage of lactation. Research results show that lactation order has very significant ($P<0,01$) influence at the amount of produced milk. Therefore, after the first lambing, goats produce least amount of milk, however amount of milk increases from lactation to lactation to reach its maximum between third and fourth lactation. The amount of milk is highly connected with body development of the goats, especially with the growth of mammary gland. Goat fertility was also higher by 4,14% in third lambing compared to first lambing. The influence of goat age is very obvious for this trait too.

Keywords: goats, sanska breed, fertility, milk amount, milk fat, lactation order.

**THE GROWTH CHARACTERISTICS OF RAINBOW TROUT FRY
(ONCORHYNCHUS MYKISS WAL.) FROM DIFFERENT LOCALITIES**

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Experiment analysis of growth characteristics of rainbow trout fry (*Oncorhynchus mykiss* Wal.) for 90 days was carried out in salmonid spawning Klasnik - Banja Luka from 06.4.2012. to 05.7.2012. In the experiment it was used fry originating from five localities (fishponds) from different parent flocks. The water temperature during the experiment in average was 11,0°C (10,9 to 11,2°C), dissolved oxygen in water 10,09 mg / l (8,68 to 10,65), oxygen saturation of water 93,45% (80,90-98,70%) and pH value 7,63 (7,38-7,79). The coefficient of condition (K) indicate on steady increase in weight and body length in all treatments, and no significant variation within groups and between groups. A significant decline in the growth rate (SGR)was determined in the first control after three months of age. The termal growth coefficient (TGC)also show a significant decrease in most of the studied groups at the first control after tree months of age. The analysis of variance and t test showed statistically significant differences mean weight and body length.

Keywords: rainbow trout fry; growth characteristics; different locations.

**KARAKTERISTIKE RASTA MLAĐI DUŽIČASTE PASTRMKE
(ONCORHYNCHUS MYKISS WAL.) SA RAZLIČITIH LOKALITETA**

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Eksperiment analize karakteristika rasta mlađi dužičaste pastrmke (*Oncorhynchus mykiss* Wal.) u trajanju od 90 dana realizovan je u salmonidnom mrestilište Klašnik - Banja Luka od 06.4.2012. do 05.7.2012. U eksperimentu je korišćena mlađ porijeklom sa 5 lokaliteta (ribogojilišta) od različitih matičnih jata. Temperatura vode tokom realizacije eksperimenta prosječno je iznosila 11,0oC (10,9- 11,2oC), rastvoreni kiseonik u vodi 10,09 mg/l (8,68-10,65), zasićenje vode kiseonikom 93,45% (80,90-98,70%) i pH vrijednost 7,63 (7,38-7,79). Koeficijent kondicije (K) ukazuje na ravnomjeran rast mase i dužine tijela u svim tretmanima i nije bilo značajnijih variranja unutar grupa i između grupa. Značajan pad stope rasta (SGR) utvrđen je na prvoj kontroli, nakon tri mjeseca starosti jedinki. Koeficijent rasta za termičku jedinicu (TGC) takođe ukazuju na značajan pad u većini ispitivanih grupa na prvoj kontroli pri starosti jedinki od tri mjeseca. Analizom varijanse i t –testom konstatovane su statistički visoko značajne razlike sredina mase i dužine tijela.

Ključne riječi: mlađ dužičaste pastrmke; karakteristike rasta; različiti lokaliteti.

**MONITOR THE PRESENCE OF NOSEMA SPP. AND THE PROBLEM OF
DISAPPEARING BEE COLONIES**

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The problem of the disappearing bee that was observed in 1972 in the United States. Over the next three decades, populations of wild bees disappeared completely, while in the meantime, similar to the phenomenon observed in honey bee colonies grown bees. The disappearance of bee colonies was recorded in the European Union and the United States, and there was with us. This phenomenon has been observed in Vojvodina in the last few years, in 2009. was based on the application of beekeepers' associations in their winter losses in 44 municipalities ranged from 10 - 70%, and the average loss in the majority of bees between 35 and 40%. In 2012. according to the data obtained from bee associations, winter losses amounted to about 15% of bee colonies. Despite the fact that the decrease in percentage of affected companies, in certain vanishing bee apiaries in Vojvodina and amounted to 80% of the companies. Cause that leads to the disappearance of bee colonies is complex. Factors contributing to the disappearance of bees could be biological, chemical, climatic, physiological or environmental. Among the most important biological factors is the presence of the parasite Nosema apis / ceranae. The presence of agents as a method used is microscopy. The tests are not included differential diagnosis to ascertain whether it is on Nosema apis and Nosema ceranae. The object of our work is laboratory monitoring of bee samples received from the field and notice of the spread of bee disappearance syndrome. Our goal is to try to determine whether the qualitative and quantitative presence of Nosema spp. in bees in relation to the clinical findings in bee communities where there has been a disappearance of bees. Laboratory tests confirmed the presence of Nosema species in the issued sample, but the finding did not indicate the presence of severe infection of the parasitic bees. Since studies have shown that poor infection with Nosema species, can not be safely set the causal relationship between the findings and the occurrence of disappearing bee syndrome, but it certainly should not rule out possible synergistic effect of Nosema and other agents, primarily viruses.

Keywords: Nosema; disappearing bee colonies; the correlation

PRAĆENJE PRISUSTVA NOSEMA SPP. I PROBLEM NESTAJANJA PČELINJIH DRUŠTAVA

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Pojava nestajanja pčelinjih društava je problem koji je primećen još 1972 godine u SAD. Tada je uočen poremećaj kod zajednica divljih pčelinjih društava koji se manifestovao nestajanjem, odnosno potpunim propadanjem ovih zajednica. U naredne tri decenije populacija divljih pčela u potpunosti je nestala, dok je u međuvremenu primećena slična pojava u pčelinjim zajednicama gajenih pčela. Nestajanje pčelinjih društava zabeleženo je u zemljama Evropske Unije i SAD-u, a uočena je i kod nas. Ovaj fenomen je primećen i u Vojvodini u zadnjih nekoliko godina, a 2009. godine na osnovu prijave pčelara u svojim udruženjima zimski gubici u 44 opštine su se kretali od 10 – 70%, a prosečni gubici su u većini pčelinjaka između 35 i 40%. U Republici Srbiji zimski gubici tokom 2007/2008. iznosili su 28,7%, 2008/2009. 21,3%, a 2009/2010. 12,8%. Tokom 2012. godine prema podacima dobijenim od pčelarskih udruženja, zimski gubici su iznosili oko 15% pčelinjih društava. I pored činjenice da se u procentima smanjio broj zahvaćenih društava, nestajanje pčela u pojednim pčelinjacima u Vojvodini iznosilo je i do 80% društava. Uzrok koji dovodi do pojave nestajanja pčelinjih društava je kompleksan. Faktore koji doprinose nestajanju pčela mogu biti biološki, hemijski, klimatski, fiziološki ili ambijentalni. Među biološkim faktorima najznačajnije je prisustvo parazita Nosema apis/ceranae. Za dokazivanje prisustva uzročnika kao metod korištena je mikroskopija. Ispitivanja nisu obuhvatila diferencijalnu dijagnostiku kojom bi se utvrdilo da li je reč o Nosema apis ili Nosema ceranae. Predmet našeg je laboratorijski monitoring uzorka pčela pristiglih sa terena i praćenje pojave širenja sindroma nestajanja pčelinjih društava. Cilj nam je da pokušamo da utvrdimo da li je kvalitativno i kvantitativno prisustvo Nosema spp. kod pčela u vezi sa kliničkim nalazom u pčelinjim zajednicama u kojima je došlo do nestajanja pčela. Laboratorijska ispitivanja su potvrđila prisustvo Nosema vrsta u donešenim uzorcima, ali nalaz nije ukazivao na prisustvo jake infekcije pčela ovim parazitima. Pošto su ispitivanja pokazala da je slaba infekcija sa Nosema vrstama, ne može se sa sigurnošću postaviti uzročno posledična veza između nalaza i pojave sindroma nestajanja pčelinjih društava, ali svakako ne treba isključiti moguće sinergično dejstvo nozema i drugih agenasa, prvenstveno virusa.

Ključne riječi: Ključne reči: nozemoza; nestajanje pčelinjih društava; korelacija

**PROTECTION AND ANIMAL WELFARE IN FARMING PRACTICES FOR MILK
PRODUCTION IN REGION NORTHEASTERN BIH**

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The goal of the research is to determine the conditions of welfare and housing of farm animals to produce milk. Milk producers in the region, northeastern Bosnia are not familiar enough on the protection and welfare of animals. The study was conducted in May 2012. The results were obtained based on the methodology of surveys five freedoms in the welfare and accommodation of animals (according to Webster, 1987). Farms were divided into three groups, farms with up to 5 dairy cows (which is also the highest in the region), farms with up to 20 dairy cows and farms with more than 20 dairy cows. On farms up to 5 dairy cows all farms have tied system for dairy cows and cows are kept in closed conditions. Farms with up to 20 dairy cows are also in a great percentage of 67% related to the system of keeping cows in confined conditions. A smaller part of the farm has a free system for dairy cows and barns open with good light and ventilation. Only 16% of farms with more than 20 dairy cows are tied housing system and the rest is free system for dairy cows. All farms meet freedom from hunger and thirst, but the big problem is freedom from discomfort, freedom from stress and fear, free of injury and disease and the freedom to manifest natural behavior. The research was realized in part of the project "Improvement of milk production in northeastern Bosnia and Herzegovina" funded by the Czech Development Agency (CzDA).

Keywords: welfare; housing; freedom

**ZAŠTITA I DOBROBIT ŽIVOTINJA U PRAKSI NA FARMAMA ZA
PROIZVODNJU MLJEKA U REGIONU SJEVEROISTIČNA BIH**

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Cilj istraživanja je utvrditi uslove dobrobiti i smještaja životinja na farmama za proizvodnju mlijeka. Proizvođači mlijeka u regionu sjeveroistočne BiH nisu dovoljno upoznati o zaštiti i dobrobiti životinja. Istraživanje je sprovedeno u maju 2012. godine. Rezultati su dobiveni na osnovu metodologije uptočnika za pet sloboda u dobrobiti i smještaju životinja (prema Websteru 1987.). Farme su podijeljene u tri grupe, farme koje imaju do 5 muznih grla (kojih je i najviše u ovom regionu), farme koje imaju do 20 muznih grla i farme sa više od 20 muznih grla. Na farmama do 5 muznih grla sve farme imaju vezani sistem držanja krava i krave se drže u zatvorenim uslovima. Farme koje imaju do 20 muznih krava takođe se u velikom procentu 67% vezani sistem držanja krava i u zatvorenim uslovima. Manji dio farmi ima slobodan sistem držanja krava i štale otvorenog tipa sa dobrom svjetlošću i ventilacijom. Samo 16% farmi koje imaju više od 20 muznih grla imaju vezani sistem držanja a ostalo je slobodan sistem držanja krava. Sve farme zadovoljavaju slobodu od gladi i žedi, ali je veliki problem sloboda od neudobnosti, sloboda od stresa i straha, sloboda od povrijeđivanja i bolesti i sloboda ispoljavanja prirodnog ponašanja. Istraživanje je realizovano u sklopu projekta "Unaprijeđenje proizvodnje mlijeka na području sjeveroistočne BiH" finansiran od strane Razvojne Agencije Češke Republike.

Ključne riječi: dobrobit; smještaj; sloboda

**THE DYNAMICS OF ACTIVE AND TITRATABLE ACIDITY (PH) DURING
STORAGE AND RIPENING CHEESE PRODUCED IN SJENICKO INDUSTRY
CONDITIONS**

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Sjenički cheese is one of our best cheeses from the group of white cheese in brine. The main feature of this group is keeping the cheese ripening, which is used as a preservative, gives specifičan smell, sour-salty taste and contribute to brittle structure of these cheeses. Is produced predominantly indigenous technology in the territory Sjenicko-Pester plateau, although in recent years more and more in industrial conditions in the dairy industry. The experiment was conducted in a dairy booths. Cheeses were made from fresh skimmed cow's, sheep's and mixed sheep and cow milk for 5 reps. Analyzes were carried out in the chemical laboratory of Veterinary Specialist Institute Kraljevo standard methods and statistical analysis of the results. Given the importance of these parameters for the flow and quality of cheese ripening, we followed their dynamics and after production, and then pose for 15, 30 and 45 days, which was the period specified maturity. The results showed that the most significant changes in titratable acidity occurred in the first 30 days of ripening, when it recorded the largest increase in titratable acidity values for all three kinds of cheese. After 30 days of ripening, the average value of titratable acidity amounted to 167.51 T cow, sheep T 169.21, 178.34 cheese mixed T. pH decreased most rapidly in the period 1-15 days of ripening, because then inoculated with most of the lactose. After this period, the average maturity of cow pH was 5.03, 5.18, and mixed sheep cheese 5, 16 In the last period of ripening 30/45 days, titratable acidity, pH values did not change significantly, while the pH remained at the same level compared to 30 days of ripening. This proves that for the period of ripening cheese reached full commercial maturity. At the end of the set period of ripening prosoće titratable acidity value amounted to 189.20 T cow, sheep and mixed T 173.09 180.27 T cheese. Statistical treatment of these differences were not significant. Average pH values were 4.04 for the cow, sheep and mixed cheese 4.81 4.39. Data processing difference between cow and sheep cheese were statistically significant.

Keywords: Sjenički cheese, titratable acidity, active acidity

DINAMIKA TITRACIONE I AKTIVNE KISELOSTI (PH) TOKOM ČUVANJA I ZRENJA SJENIČKOG SIRA PROIZVEDENOG U INDUSTRISKIM USLOVIMA

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Sjenički sir je jedan od naših najboljih sireva iz grupe belih sireva u salamuri. Osnovna odlika ove grupe sireva je čuvanje i zrenje u salamuri, koja služi kao konzervans, daje specifičan miris, kiselo-slani i ukus i doprinosi krtoj strukturi ovih sireva. Dominantno se proizvodi autohtonom tehnologijom na području Sjeničko-pešterske visoravni, mada u novije vreme sve više i u industrijskim uslovima u mlekarama. Ogled je izведен u mlekari Sjenica. Sirevi su proizvedeni od svežeg punomasnog kravljeg, ovčjeg i mešanog ovčjeg i kravljeg mleka u po 5 ponavljanja. Analize su radjene u hemijskoj laboratoriji Veterinarsko – specijalističkog instituta u Kraljevu standardnim metodama kao i statistička obrada dobijenih rezultata. Imajući u vidu značaj ovih parametara za tok zrenja i kvalitet sireva, pratili smo njihovu dinamiku i to nakon proizvodnje, a zatim pose 15, 30 i 45 dana, što je bio i utvrđeni period zrenja. Rezultati istraživanja su pokazali da su se najveće promene kod titracione kiselosti desile u prvih 30 dana zrenja kada je zabeleženo i najveće povećanje vrednosti titracione kiselosti kod sve tri vrste sira. Nakon 30 dana zrenja prosečne vrednosti titracione kiselosti su iznosile za kravljí 167,51 T, ovčji 169,21 T, mešani sir 178,34 T. pH vrednost se najbrže smanjila u periodu 1-15 dan zrenja jer je tada fermentisao najveći deo laktoze. Posle ovog perioda zrenja prosečna pH vrednost kravljeg bila je 5,03, ovčjeg 5,18 i mešanog sira 5,16. U poslednjem periodu zrenja 30/45 dana, vrednosti titracione kiselosti nisu se bitnije menjale, dok je pH vrednost ostala na praktično istom nivou u odnosu na 30 dana zrenja. Ovo je dokaz da je za taj period zrenja sir dostigao punu komercijalnu zrelost. Na kraju utvrđenog perioda zrenja prosečne vrednosti titracione kiselosti iznosile su za kravljí 189,20T, ovčji 173,09 T i mešani sir 180,27 T. Statističkom obradom ove razlike nijesu bile značajne. Prosečne vrednosti pH bile su za kravljí 4,04; ovčji 4,81 i mešani sir 4,39. Obradom podataka razlika izmedju kravljeg i ovčjeg sira bile su statistički vrlo značajne.

Ključne reči: Sjenički sir, titraciona kiselost, aktivna kiselost.

Section 7. Crop Production



**PRESENTATION OF A NOVEL SOIL CONSERVATION TILLAGE SYSTEM –
THE COMPOSTING TILLAGE**

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The principle is that the soil is tilled minimally in order to preserve natural structure. The goal of the Composting tillage is to cut the crop residues into small pieces, and homogeneously mix them with top 10 cm of soil while leaving soil surface partly covered by plant residue to prevent erosion. For the Composting tillage a special 4-row disc harrow is used. The disc specific attachment mechanism is the most important figure: the extension of the disc axis is like a handle of a hoe. Each disc is individually suspended and the angle of the discs is each row stageless adjustable for maximum tillage. The disc works gently by cutting and lifting the soil like a traditional hoeing in a garden and is thus not compacting the soil beneath the disc. Tasks to achieve with the Composting tillage: prepare the soil for planting in one operation; chopped residue homogeneously mixed with soil should enable good conditions for proliferation of soil organisms; enhanced soil life improve other physical and chemical soil properties, which leads to lower energy and time consumption for tillage operations, and to lower consumption of nutrients and pesticide; the yields should be as high as with modern intensive agriculture; the economics of the system should be improved; the sustainability of agriculture should be significantly improved (e.g. lower footprint, lower GHG emissions, less nutrient leaching, less pesticide residue). Two of long – term field trials we established in the autumn 2011, one in a heavy soil, and the other in a light textured sandy-loam soil, both in the same area (NE Slovenia near Ptuj), to test the performance of the Composting tillage (CT) in comparison to traditional mouldboard ploughing and seedbed prep (P). First results are encouraging: the yields of maize with CT were not significantly different than the system with P. The CT consumed 2 to 2.5-times less fossil energy and much less time than P. We conclude that the Composting tillage can be successfully used in various soil conditions, and is especially beneficial in more heavy soils in terms of lower energy and work consumption.

WHEAT BREEDING FOR QUALITY IMPROVEMENT

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The wheat breeders have main task to create new selection with increase yield potential, resistance to abiotic and biotic stress condition and with improved quality. The breeders are looking for way to make progress in creating new genotypes. Accumulated knowledge in science have enabled the development of new methods and techniques for efficient achievement of objectives in the breeding. The realization of genetic potential of yield and quality in wheat grown in different environment is very difficult for breeders, producers as well for researcher. In cereals these two complex trait, yield and quality are in negative correlation, which have been improved in past through selection of spontaneous mutation, hybridization, genetic transformation. The breeders need realize combination of many genes with positive effect on yield and quality and eliminate genes that cause negative effect to these traits. The main aim of wheat breeding programs is to create new cultivars that represent accumulation of favorable genes and their recombination in a genotype that can express maximal potential of yield and quality in certain environmental conditions. New cultivars were created with high quality for different purposes and requirements in human and animal's nutrition. The main task in breeding programs is creating improved quality cultivars. Genetics investigations of grain quality were focused on protein sedimentation volume and on the protein and gluten contents, grain hardness and farinograph characteristics in the early generations of breeding. A combination of these parameters and the flour protein content can be used as a base for estimation of the technological quality of selection materials. Gliadins and glutenins are the predominant proteins deposited in the endosperm. Glutenins are playing an important role in the bread making process. Within the group of glutenin proteins are different high molecular weight (HMW) glutenin subunits and low molecular weight (LMW) glutenin subunits. Genes coding for gliadins have been assigned to Gli-1 or Gli-2 loci on short arm of 1A, 1B, 1D, 6A, 6B, 6D chromosome, whereas low-molecular-weight glutenin subunits have been assigned to Glu-3 loci on group 1 chromosome. The HMW glutenin subunits are encoded by the complex Glu-1 loci located at the long arm of the homologous chromosomes 1A, 1B and 1D. By selecting and crossing with superior materials it is possible to eliminate or fix those genes, which are responsible for a given character.

Keywords: breeding, quality, wheat, genes, proteins

OPLEMENJIVANJE PŠENICE NA POBOLJŠANJE KVALITETA

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Oplemenjivači pšenice imaju glavni zadatak da stvore novu selekciju sa povećanjem prinosa, otpornosti prema abiotičkim i biotičkim stresnim uslovima i sa poboljšanim kvalitetom. Oplemenjivači traže način da ostvare napredak u stvaranju novih genotipova. Akumulirano znanje u nauci je omogućilo razvoj novih metoda i tehnika za efikasno postizanje ciljeva u oplemenjivanju. Ostvarivanje genetičkog potencijala sa prinosa i kvalitet kod pšenice koja se gaji u različitim uslovima sredine je vrlo teško za oplemenjivače, proizvođače, kao i za istraživača. Kod žitarica ove dve složene osobine, prinos i kvalitet su u negativnoj korelaciji, koje su poboljšane u prošlosti kroz izbor spontanih mutacija, hibridizaciju, genetske transformacije. Oplemenjivači treba da ostvare kombinaciju mnogih gena sa pozitivnim efektom na prinos i kvalitet i eliminišu gene koji izazivaju negativan efekat na ove osobina. Glavni cilj programa oplemenjivanja pšenice je stvaranje novih sorti koje predstavljaju akumulaciju poželjnih gena i njihove rekombinacije u genotipu, koje mogu da ispolje maksimalni potencijal za prinos i kvalitet u određenim uslovima sredine. Novo sorte su visokokvalitetne i stvorene su za različite namene i zahteve za ljudsku i animalnu ishranu. Glavni zadatak u oplemenjivanju je stvaranje sorti boljeg kvaliteta. Genetička istraživanja kvaliteta zrna bili su fokusirana na volumen sedimentacije proteina, sadržaj protein i sadržaj glutena, tvrdoću zrna i farinološke karakteristike u ranim generacijama oplemenjivanja. Kombinacija ovih parametara i sadržaja proteina brašna može da se koristi kao osnova za procenu tehnološkog kvaliteta selekcionog materijala. Gliadini i glutenini su glavni蛋白 deponovani u endospermu. Glutenini imaju važnu ulogu u procesu spravljanja hleba. U grupi glutenina razlikuju podjedinice glutenina visoke molekularne mase (HMW) i podjedinice niske molekularne mase (LMW). Geni koji kodiraju gliadine su predstavljeni sa oznakama Gli-1 ili Gli-2 lokusa na kratkom kraku 1A, 1B, 1D, 6A, 6B, 6D hromozoma, dok nisko-molekularne mase podjedinice glutenina su označeni Glu-3 lokus na 1. grupa hromozoma. Visokomolekularne podjedinice (HMW) glutenina su kodirane sa složenim Glu-1 lokusima koji se nalaze na dugom kraku hromozoma homologne 1A, 1B i 1D.. Izborom i ukrštanjem najboljeg materijala, moguće je eliminisati ili uneti one gene koji su odgovorni za datu karakteru.

Ključne riječi: oplemenjivanje, kvalitet, pšenica, geni, proteini

**VARIATION OF YIELD AND QUALITY COMPONENTS OF WHEAT
GENOTYPES**

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Variability of yield and quality parameters was studied in 11 genetically divergent wheat genotypes (G-3130, G-35183, G-3501, G-3512, G-3674, G-3027, G-3075, G-3097, G-3643, G-3646, and Pobeda). The experiment was performed in randomized block design in five replication on basic plot 5 m². The technological quality of 11 winter wheat cultivars was estimated by standardized laboratory methods. Standard milling was performed with a Büller type MLU-202 experimental mill (Büller, Uzwil, Switzerland). Sedimentation value was analyzed by Zeleny modified method in which 2 or 5 g of wheat could be evaluated satisfactorily. Rheological quality was analyzed with micro-Brabender farinograph using 10g flour sample. Yield and quality traits of 11 wheat genotypes grown in three year with different conditions were studied. The differences in average values for all the studied parameters among investigated selection were determined. The high variability for analyzed yield and quality components were established, too. Based on the average value of the investigated seed traits, significant differences between the genotypes of wheat were found. In average, genotype G-3130 had the highest average yield (5558 kg ha⁻¹), hectoliter mass of seed G-3130 (84.31 kg hl⁻¹) and 1000-seed mass G-3512 (44.56g). The G-3027 had the highest average volume of sedimentation (50.0ml) dry gluten (16.45%) and protein content (15.24%), whereas the least volume of sedimentation had G-3075 (34.0ml), dry gluten in G-3501 (11.61%) and protein content had G-3130 (11.82%). Differences between investigated genotypes, years and interactions genotype/year were high significant for all analyzed traits.

Keywords: wheat, yield, quality, protein sedimentation, genotype

VARIRANJE KOMPONENTI PRINOSA I KVALITETA KOD GENOTIPOVA PŠENICE

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Varijabilnost parametara prinosa i kvaliteta je proučavana kod 11 genetički divergentnih genotipova pšenice (G-3130, G-35183, G-3501, G-3512, G-3674, G-3027, G-3075, G-3097, G-3643 G-3646, Pobeda). Eksperiment je izveden u slučajnom blok sistemu u pet ponavljanja na osnovnoj parcelli 5m². Tehnološki kvalitet 11 sorti pšenice je utvrđen korišćenjem standardizovanih laboratorijskih metoda. Standardno mlevenje brašna je izvršeno na mlinu Büller tipa MLU-202 eksperimentalni mlin (Büller, Uzwil, Švajcarska). Sedimentaciona vrednost je analizirana korišćenjem modifikovane Zeleni metode pri čemu je dovoljno 2g ili 5g pšenice da bi se pouzdano vršila ocena. Reološki kvalitet je analiziran na farinografu Brabender za koji se koristi 10g brašna za uzorak ispitivanja. Prinos i kvalitet je proučavan kod 11 genotipova pšenice gajenih u tri godine sa različitim klimatskim uslovima. Ustanovljene su razlike u prosečnim vrednostima za sve ispitivane parametre između ispitivanih genotipova. Takođe je ustanovljena visoka varijabilnost za analizirane komponente prinosa i kvaliteta. Na osnovu prosečnih vrednosti ispitivanih osobina semena, nadene su značajne razlike između genotipova pšenice. U proseku, genotip G-3130 je imao najveći prosečan prinos (5558 kg ha⁻¹), hektolitarsku masu semena G-3130 (84,31 kg hl⁻¹) i 1000-semena mase G-3512 (44,56g). Genotip G-3027 je imao najveću prosečnu zapreminu sedimentacije proteina (50,0ml) suvog glutena (16,45%) i sadržaja proteina (15,24%), dok je najmanju vrednost sedimentacije proteina imao genotip G-3075 (34,0ml), suvog glutena G- 3501 (11,61%) i sadržaja proteina G-3130 (11,82%). Razlike između ispitivanih genotipova, godina i interakcije genotip/godina, bile su visoke značajne za sve ispitivane osobine.

Ključne riječi: pšenica, prinos, kvalitet, protein, sedimentacija, genotip

**MULTIANNUAL DROUGHT OCCURRENCE AND ITS IMPACT ON MAIZE
PRODUCTION IN REPUBLIC OF SRPSKA**

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In the period from 2003 to 2012, with small variations maize was grown in the area of 141.568 hectares in Republic of Srpska. With large differences over the years the average yield was 4,28 t/ha. Highest grain yield of 5,4 t/ha was achieved in 2004, and the lowest yield in 2012, which was lower to more than 50 %, compared to 2004, and with sum of 2,6 t/ha. Lower yields, compared to the studied ten-year average and 2012 were made in 2003, 2007 and 2011. In the mentioned years, drought had the greatest impact on low yields and total production of maize in Republic of Srpska, which was manifested in almost 2/3 years of the past decade, in 2003, 2007, 2008, 2009, 2011 and 2012. Greatest impact on the total production of maize in RS drought had in 2003, 2007, 2011 and 2012. These data were confirmed by the decade and monthly indicators of the mean monthly air temperature and the amount and distribution of rainfall during the production season and the growing period. The average rainfall for the six municipal meteorological stations, in whose territory is the largest maize production in RS, was 470,8 mm from 2003 to 2012 during the growing season. The mean monthly air temperature was 18,8 °C. The lowest rainfall in Republic of Srpska (290,2 mm) during vegetation period was recorded in 2011, which was also the lowest rainfall since these climatological measurements exist. Nevertheless, the strongest effect of drought on maize production in RS was in 2012. During the growing season, total rainfall of 410,7 mm was registered, and the largest average mean monthly air temperature (19,9°C) since meteorological observations perform. In 2012, the drought caused a large drop of yield, which was lower for 1,68 t/ha or 41% compared to the multiannual average in Republic of Srpska.

Keywords: period; maize; yield; drought; temperature; rainfall.

VIŠEGODIŠNJA POJAVA SUŠE I NJEN UTICAJ NA PROIZVODNU KUKURUZA U REPUBLICI SRPSKOJ

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U periodu od 2003. do 2012. godine u Republici Srpskoj kukuruz se, uz manja variranja sjetvenih površina, u prosjeku uzgajao na površini od 141.568 hektara. Uz velike razlike po godinama ostvaren je prosječan prinos zrna kukuruza od 4,28 tha-1. Najveći prinos zrna kukuruza od 5,4 tha-1 ostvaren je u 2004. godini, a najmanji u 2012. godini koji je u odnosu na 2004. godinu bio niži za više od 50% i iznosio je 2,6 tha-1. Manji prinosi, u odnosu na proučavani desetogodišnji prosjek i 2012. godinu, ostvareni su u 2003., 2007. i 2011. godini. Najveći uticaj na niske prinose i ukupnu proizvodnju zrna kukuruza u Republici Srpskoj, u navedenim godinama, imala je suša, koja se ispoljila u gotovo dvije trećine godina protekle decenije, odnosno u 2003., 2007., 2008., 2009., 2011. i 2012. godini. Najveće posljedice na ukupnu proizvodnju kukuruza u RS suša je pričinila 2003., 2007., 2011. i 2012. godine. Navedene podatke potvrđuju dekadni i mjesecni pokazatelji o srednjoj mjesecnoj temperaturi vazduha i količini i rasporedu padavina u toku proizvodne godine i vegetacionog perioda kukuruza. Prosječna količina padavina za šest opštinskih meteoroloških stanica, na čijoj teritoriji se odvija najveća proizvodnja kukuruza u RS, za vegetacioni period kukuruza od 2003. do 2012. godine, iznosila je 470,8 mm, a prosječna srednja mjesecna temperatura vazduha 18,8 °C. Najmanja količina padavina u Republici Srpskoj (290,2 mm), u vegetacionom periodu kukuruza, evidentirana je 2011. godine, što je ujedno i najmanja količina padavina od kako postoje ova klimatološka mjerena. I pored toga, najizraženiji uticaj suše na proizvodnju kukuruza u RS bio je u 2012. godini, kada je tokom vegetacionog perioda registrovana ukupna količina padavina od 410,7 mm, ali i najveća prosječna srednja mjesecna temperatura vazduha (19,9°C), od kako se vrše meteorološka mjerena. Tako je suša u 2012. godini uzrokovala veliki pad prinosa zrna kukuruza, koji je manji za 1,68 tha-1, odnosno za 41%, u odnosu na višegodišnji prosjek u Republici Srpskoj.

Ključne riječi: period; kukuruz; prinos; suša; temperatura; padavine.

**GRAIN YIELD AND YIELD STABILITY OF COMMERCIAL MAIZE HYBRIDS IN
BOSNIA AND HERZEGOVINA**

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Several decades of work on maize breeding, Maize Research Institute "Zemun Polje" created a large number of hybrids with high yield potential, high adaptability and tolerance to major diseases and pests. For commercial hybrid it is essential for high grain yield to be accompanied by yield stability, both in agroecological favorable and in unfavorable conditions of production. The aim of this study was to evaluate the two most important agronomic traits (grain yield and yield stability) in 10 commercial maize hybrids from different maturity groups (FAO 300-700). Tests were carried out in 2011th and 2012th at 11 locations in Bosnia and Herzegovina. The data were analyzed using analysis of variance program MSTAT-C (MSTAT, 1989), and stability parameters were calculated by Eberhart and Russell in (1966). The results showed that the hybrid ZP 505 had the highest yield in both years (9.11 t / ha), while the hybrid ZP 677 with a yield of 7.74 t/ha recorded the lowest yield. As the most stable hybrid ZP 505 points out with the value of the standardized coefficient of linear regression (b_1) of 0.999. Hybrid ZP 606 had shown a high stability (1.010) followed by high yield (8.72 t / ha). ZP 341 and ZP 434, as a group of medium early hybrids (FAO 300-400) showed a lower stability (0.717, 0.866 respectively) indicating their better adaptation to poorer growing conditions. Recommendation for better agro-ecological conditions and intense production are hybrids ZP 505, ZP 600, ZP 606 and ZP 684, while for poorer agro-ecological conditions hybrids ZP 341 and ZP 434 should be preferred.

Keywords: maize, hybrid, stability, regression coefficient, yield

**PRINOS I STABILNOST PRINOSA KOMERCIJALNIH ZP HIBRIDA
KUKURUZA U BOSNI I HERCEGOVINI**

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Višedecenijskim radom na oplemenjivanju kukuruza u Institutu za kukuruz „Zemun Polje“ stvoren je veliki broj hibrida visokog potencijala rodnosti, visoke adaptabilnosti i tolerantnosti na najvažnije biljne bolesti i štetočine. Za komercijalni hibrid je bitno da visok prinos bude praćen maksimalnom stabilnošću prinosa, kako u agroekološki povoljnijim, tako i u nepovoljnim uslovima proizvodnje. Cilj rada je bio da se ocjene dvije najvažnije agronomске osobine (rodnost i stabilnost prinosa) kod 10 komercijalnih ZP hibrida kukuruza različitih grupa zrenja (FAO 300-700). Testiranja su obavljena tokom 2011. i 2012. godine na 11 lokacija u Bosni i Hercegovini. Dobijeni podaci su obrađeni analizom varijanse po MSTAT-C programu (MSTAT, 1989), a parametri stabilnosti su računati po Eberhart i Russell-u (1966). Dobijeni rezultati su pokazali da je hibrid ZP 505 bio najprinosniji u obje godine (9,11 t/ha), dok je hibrid ZP 677 sa prinosom od 7,74 t/ha ostvario najniži prinos. Kao najstabilniji hibrid ističe se ZP 505 sa vrijednosti standardizovanog koeficijenta linearne regresije (bi) od 0,999. I hibrid ZP 606 je ispoljio visoku stabilnost (1,010) praćenu visokim prinosom (8,72 t/ha). Hibridi ZP 341 i ZP 434, kao hibridi srednje ranih grupa (FAO 300-400) su pokazali nižu stabilnost (0,717, odnosno 0,866) što ukazuje na njihovu bolju adaptiranost na lošije uslove gajenja. Preporuka za gajenje u uslovima boljih agroekoloških uslova i intenzivnije proizvodnje je za hibride ZP 505, ZP 600, ZP 606 i ZP 684, dok za lošije agroekološke uslove prednost treba dati hibridima ZP 341 i ZP 434.

Ključne riječi: kukuruz, hibrid, stabilnost, koeficijent regresije, prinos

**THE CONSTITUTION OF THE FEMALE GAMETOPHYTE OF TRITICALE (×
TRITICOSECALE WITTMACK)**

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The limiting factor in the realization of yield can be a number of fertile flowers in spike of triticale. A fertil flower implies a fully constituted and functional male and female gametophytes. Number of grains per spike of triticale is in correlation with the number of fertile flowers with fully constituted and functional of all elements of the female gametophyte. Cyto-histological study of the constitution of the female gametophyte of winter triticale genotypes Trimaran, BLT17, BLT10 and Mah1793 was carried out during 2006 and 2007. year. Cyto-histological analysis of flowers, respectively the ovary in spikelets was done by permanent histological preparations. Using standard histological methods were clearly visible process of embryo sac constitution of the triticale genotypes which consisted of egg cell, two synergides, polar nuclei and a larger number of antipodal cells. Analysis of developing of embryo sac in all observed genotypes were consistent basic dynamics of constitution of the female gametophyte in which are not observed teratogenic changes.

Keywords: triticale; embryo sac; yield

**KONSTITUISANJE ŽENSKOG GAMETOFAITA KOD TRITIKALEA (×
TRITICOSECALE WITTMACK)**

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Ograničavajući faktor prinosa može biti broj plodnih cvjetova u klasu tritikalea. Plodan cvijet podrazumjeva potpuno konstituisan i funkcionalan ženski i muški gametofit. Broj zrna u klasu tritikalea je u korelaciji sa brojem fertilnih cvjetova u kojima su u potpunosti konstituisani i funkcionalni svi elementi ženskog gametofita. Cito-histološka proučavanja konstituisanja ženskog gametofita ispitivanih genotipova ozimog tritikalea Trimaran, BLT17, BLT10 i Mah 1793 izvršena su u toku 2006 i 2007. godine. Cito-histološka analiza cvjetova, odnosno ovarijuma u klasičima izvršena je izradom trajnih histoloških preparata. Primjenom standardne histološke metode bilo je jasno uočljivo konstituisanje embrionalne kesice posmatranih genotipova tritikalea koja se sastojala od jajne ćelije, dvije sinergide, dva jedra u centralnom dijelu embrionalne kesice i većeg broja ćelija antipoda. Analize razvoja embrionalnih kesica kod svih ispitivanih genotipova bile su saglasne osnovnoj dinamici konstituisanja ženskog gametofita bez uočenih teratogenih promjena.

Ključne riječi: tritikale; embrionalna kesica; prinos

**FRUIT YIELD AND QUALITY OF IRRIGATED FORAGE WATERMELON
(CITRULLUS LANATUS VAR. CITROIDES) GROWN IN SERBIA**

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Forage watermelon (*Citrullus lanatus* var. *citroides*) is a new species for agriculture system in Serbia. It is possibly interesting for growing in Serbia and surrounding countries because of: 1) a good keeping quality of the fruit; its fruit can be kept for one year, due to a high content of pectin; 2) large fruit and high yields; 3) immunity to a number of diseases and lesser demands on cultivation conditions. The experiment was carried out during 2011 and 2012 growing season in the vicinity of city Šabac, Serbia. The experiment was established by seeds originated from Central Asia, sowed indoors in small pots. Afterwards, 40 plants transplanted in the field and grown as a main crop. Crop was irrigated by drip irrigation method in the field. Fruits were collected and stored at the dry place to follow keeping quality and yield characteristics. Yield characteristics were measured for average fruit length, number of fruits per plant, average fruit weight, dry matter and sugar content of fruit, seed number and weight per fruit and 1000-seed weight. Average results for two years indicated that forage watermelon reached 152 t ha⁻¹ of fresh fruit yield, 5.7 fruits per plant, 214 g seed yield per fruit and 192 g 1000-seed-weight. The forage watermelon fruits can be conserved for more than 210 days without losing its nutritional qualities. There are good conditions for growing forage watermelons in Serbia and their conservation is viable without sophisticated storage practices. The forage watermelon could be an essential food resource for animal husbandry in the region.

Keywords: forage watermelon; fruit yield; fruit quality; keeping quality

**PRINOS PLODA I KVALITET NAVODNJAVANE KRMNE LUBENICE
(CITRULLUS LANATUS VAR. CITROIDES) GAJENE U SRBIJI**

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Krmna lubenica (*Citrullus lanatus* var. *citroides*) je nova vrsta za poljoprivrednu proizvodnju Srbije. Ona je od mogućeg značaja za gajenje u Srbiji i okolnim zemljama zbog: 1) dobrih mogućnosti čuvanja ploda, jer njen plod može biti očuvan do godinu dana, zbog visokog sadržaja pektina; 2) krupnih plodova i visokog prinosa; 3) imuniteta na brojne bolesti i manjih zahteva za gajenje. Ogled je izведен tokom 2011 i 2012 vegetacione sezone u okolini grada Šapca, Srbija. Eksperiment je zasnovan sa semenom poreklom iz Centralne Azije, sejanim u saksije u zaštićenom prostoru. Potom je 40 biljaka rasađeno u polje i gajeno kao glavni usev. Usev je navodnjavan sa sistemom kap-po-kap u polju. Plodovi su ubirani i skladišteni na suvo i zaštićeno mesto radi praćenja mogućnosti čuvanja i osobina prinosa. Merene su sledeće osobine prinosa: dužina ploda, broj plodova po biljci, prosečna težina ploda, sadržaj suve materije i šećera u plodu, broj semena i težina po plodu, kao i masa 1000 semena. Prosečni dvogodišnji rezultati ukazuju da krmna lubenica dostiže prinos svežeg ploda od 152 t ha⁻¹, 5,7 plodova po biljci, prinos semena po biljci 214 g i 192 g masu 1000 semena. Plodovi krmne lubenice se mogu čuvati duže od 210 dana bez gubitaka kvaliteta, sa malim smanjenjem početne težine. U uslovima Srbije postoje dobri uslovi za gajenje krmne lubenice i njeno čuvanje je moguće bez specijalnih uslova skladištenja. Krmna lubenica može predstavljati značajan izvor hrane za stočarstvo u regionu.

Ključne riječi: krmna lubenica; kvalitet ploda; mogućnost čuvanja; prinos ploda

**RESEARCH OF DIVERSE GRASS MIXTURES AND METHODS OF
ESTABLISHING OF GRASSLANDS IN INTERLINEAR AREA OF ORCHARDS**

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Research of methods of soil maintenance in interlinear area of orchards had been performed during 2011 and 2012 on two locations: experimental field of Agricultural Institute of RS in Delibasino Selo and Stranjani, places near Banja Luka. In this research four dedicated grass mixtures and ryegrass for havy trample and utilization had been used in two locations in a pure sowing system. Experiments had been set in four repetitions on a brown valley soil (in Delibasino Selo) and vertisol (in Stranjani). In Delibasino Selo location we had applied a classic soil processing and in Stranjani location reduced soil processing. Also, before sowing on both locations hydrogel had been introduced. During biennial research we determined: floristic content of weed community in orchards, green and dry mass yield from surfaces on which hydrogel had been used and surfaces without usage of hydrogel, number of mulchig during vegetation period, botanical content of green mass of first swath, and covering - density of crops at the end of vegetation period. From the surfaces where hydrogel had been used and those without hydrogel usage, soil samples had been taken for determination of differences in moisture content between them in soil laboratory. Green biomass and dry mater yield in a first swath of 2011 in Delibasino Selo location had been higher in all researched variants on surfaces where hydrogel had been used. On a location where reduced soil processing had been applied in green biomass of first swath a part of other plant species (weed) had been higher during biennial period of research. Content of moisture in plant roots area on both locations had been higher on variants where hydrogel had been applied before lawn establishment. The highest covering – density of crops on Delibasino Selo location had a mixture *Lolium perenne*, *Phleum pratense*, *Festuca rubra* (81,42%), and on Stranjani location smješa *Lolium perenne*, *Phleum pratense* (91,21%).

Keywords: grass mixtures; reduced processing; hydrogel; botanical content; covering

**ISPITIVANJE RAZLIČITIH TRAVNIH SMJEŠA I NAČINA ZASNIVANJA
TRAVNJAKA U MEĐUREDNUM PROSTORU VOĆNJAKA**

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Istraživanja o načinima održavanja zemljišta u međurednom prostoru voćnjaka obavljena su tokom 2011. i 2012. godine na dvije lokacije, i to: na oglednom polju Poljoprivrednog instituta RS u Delibašinom selu i mjestu Stranjani kod Banjaluke. U ovim istraživanja korišćene su 4 namjenski kreirane travne smješe za jače gaženje i teško korišćenje i engleski ljulj u čistoj sjetvi. Ogledi su postavljeni u četiri ponavljanja, i to na smeđe-dolinskom zemljištu (Delibašino selo) i smonici (Stranjani). Na lokaciji Delibašino selo primjenjen je klasičan način obrade zemljišta, a na lokaciji Stranjani redukovana obrada zemljišta. Takođe, prije sjetve na obje lokacije u zemljište je unijet hydrogel. Tokom dvogodišnjih istraživanja utvrđen je: floristički sastav korovske zajednice u voćnjacima, prinos zelene i suve mase sa površina na kojima je korišćen hidrogel i onih bez njega, broj mulčiranja u toku vegetacije, botanički sastav zelene mase prvog otkosa i pokrovnost-gustina usjeva na kraju vegetacije. Sa površina na kojima je unijet hydrogel i onih na kojima on nije upotrebljen, uzeti su uzorci zemljišta kako bi se u laboratoriji za zemljište utvrdilo da li među njima postoji razlika u sadržaju vlage. Prinos zelene biomase i suve materije u prvom otkosu 2011. godine, na lokaciji Delibašino selo, bio je kod svih ispitivanih varijanti veći na površinama gdje je primjenjen hydrogel. Na lokaciji gdje je primjenjena redukovana obrada zemljišta, u zelenoj biomasi prvog otkosa udio drugih biljnih vrste (korova) bio je veći tokom obje godine ispitvanja. Sadržaj vlage u zoni korjena biljaka, na obje lokacije, bio je veći na varijantama gdje je prije zasnivanja travnjaka primjenjen hydrogel. Najveću prosječnu pokrovnost-gustinu usjeva na lokaciji Delibašino selo imala je smješa *Lolium perenne*, *Phleum pratense*, *Festuca rubra* (81,42%), a na lokaciji Stranjani smješa *Lolium perenne*, *Phleum pratense* (91,21%).

Ključne riječi: travne smješe; redukovana obrada; hydrogel; botanički sastav; pokrovnost

POSTER PRESENTATION

Section 1. Agroecology and Organic Agriculture



COMPARATIVE EXPLOITATION CHARACTERISTICS OF SOME TYPES OF MACHINES IN MAKING HAYLAGE

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In this paper were given the results of two different types of machines in preparing haylage: line of making haylage with self-loaded trailer with knives SIP Pionir 17 in a trench silo and round bale press for large round bales Deutz - Fahr GP 2.50 and wrapping bales in stretch plastic foil. Tests were performed in production conditions on the family farm in Mokro (Republic of Srpska). The aim of this study is the comparative exploiting characteristics of both types of machines. Following parameters are considered: speed, efficiency and the share of each operation. For assessing the effectiveness of individual way of performing work, we performed timing analysis (time-motion study) and examination of individual working operations from collecting aerated mass and transport, unloading and storage of the same. Self-loading trailer Pionir 17 in the aggregate with a tractor IMT 540 Deluxe, in production terms achieved a speed of 1.73 km/h. Surface-based field capacity of machine in time-motion study was 0.30 ha/h. Time-motion has found that the largest part of time spent on the filling trailers 46.67%, as well as in downtime 25.05%. Round bale press Deutz-Fahr GP 2.50 in the aggregate with a tractor IMT 577 DV achieved a speed of 1.62 km/h with the surface field capacity of machine 0.45 ha/h. Based on time-motion study most of the time was spent on the process of pressing and the chamber filling with plant mass 77.23% and the minimum of time was spent on the process of bonding same bale, 5.31% of the total time.

Keywords: haylage; self-loading trailers; round bale press; work speed; efficiency

UPOREDNE EKSPLOATACIONE KARAKTERISTIKE NEKIH TIPOVA MAŠINA U SPREMANJU SJENAŽE

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U radu su dati rezultati ispitivanja dvije različite linije mašina u spremanju travne sjenaže i to: linija spremanja sjenaže samoutovarnom prikolicom sa noževima SIP Pionir 17 u silo-rov i rolobaleru za velike okrugle bale Deutz – Fahr GP 2.50, te omotavanjem bala rastegljivom folijom. Ispitivanja su vršena u proizvodnim uslovima, na porodičnom poljoprivrednom gazdinstvu u mjestu Mokro (Republika Srpska), s ciljem istraživanja uporednih eksploatacionih karakteristika obadvije linije mašina. Razmatrani su sljedeći parametri: brzina rada, učinak i udio pojedinih operacija. Za ocjenu efikasnosti pojedinih načina obavljanja radova, vršena je vremenska analiza (hronometrija) i ispitivanje pojedinih radnih zahvata kod sakupljanja provenute mase, te transporta, istovara i skladištenja istog. Samoutovarna prikolica Pionir 17 u agregatu sa traktorom IMT 540 Deluxe, u proizvodnim uslovima rada ostvarila je brzinu od 1,73 km/h. Površinski učinak na bazi hronografije iznosio je 0,30 ha/h. Hronometrijom je utvrđeno da je najveći dio vremena utrošen na punjenje prikolice 46,67%, kao i u zastojima 25,05%. Rolobalerka Deutz-Fahr GP 2.50 u agregatu sa traktorom IMT 577 DV ostvarila je brzinu od 1,62 km/h uz površinski učinak od 0,45 ha/h. Na osnovu hronografije najveći dio vremena utrošen je na sam proces presovanja tj. punjenje komore prese bilnjom masom i formiranje bale 77,23%, a najmanje vremena je utrošeno na proces vezivanja bale tj. 5,31% od ukupnog radnog vremena.

Ključne riječi: sjenaža; samoutovarna prikolica; rolobaler; brzina rada; učinak

**EFFECT OF HEAVY METALS ON CHEMICAL COMPOSITION AND GROWTH
OF CAMELINA SATIVA L.**

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Marjanovic-Jeromela²***

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Camelina (*Camelina sativa* L.) is studied mostly as oil plant that can replace oilseed rape in the extensive agriculture. It is a good source of oil (40% oil in seeds) similar to sunflower, soybeans, canola, castor bean and other oil crops. Oil of camelina is rich in essential omega 3 fatty acids. In addition, seed protein content is relatively high. Camelina has modest requirements for agro-ecological conditions and it is highly resistant to pathogens. Those features make camelina suitable for human nutrition and animal feed. Its use is related to sustainable agriculture, bio-diesel industry, cold-pressed oils and the use of so-called marginal land. Examination of its ability to uptake and accumulate heavy metals (HM) is interesting from the standpoint of 1) food safety and 2) potential for phytoremediation. Hence, the aim of this study was to investigate the effect of HM on growth, physiological processes and uptake and accumulation of some essential macro- and micronutrients and unwanted HM. Experiments were done with *Camelina sativa* L., cultivar Stepski 1. The seeds were exposed to 1 µM Cd or Cu and 10 µM Ni or Zn since the beginning of germination. Plants were grown in water cultures, in semi-controlled conditions of a greenhouse, on ½ strength Hoagland solution to which were added HM in the same concentrations as during germination. In the presence of Cu and Ni, and especially Cd and Zn, fresh and dry weight decreased, while the water content, transpiration intensity and concentration of photosynthetic pigments were not significantly changed. The activity of nitrate reductase and concentration of free proline in the presence of Cu declined, which might indicate disturbances in nitrogen metabolism. Concentrations and distribution of Ca, Mg, P, K, Fe and Mn in roots and shoots were also altered in the presence of increased concentration of Cd, Cu, Ni and Zn.

Ključne riječi: camelina; Cd; Ni; Cu; Zn; photosynthesis; water regime

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**UTICAJ TEŠKIH METALA NA HEMIJSKI SASTAV I RAST CAMELINA SATIVA
L.**

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Lanik (*Camelina sativa L.*) je vrsta koja je interesantna prvenstveno kao uljana kultura, koja može da zameni uljanu repicu u ekstenzivnoj poljoprivrednoj proizvodnji. Seme lanika sadrži 40% ulja i po tome je lanik sličan suncokretu, soji, uljanoj repici, ricinusu i drugim uljanim kulturama. Ulje lanika je bogato esencijalnim omega 3 masnim kiselinama. Osim uljem, seme je bogato i proteinima. Lanik ima umerene zahteve za agroekološkim uslovima i veoma je otporan na bolesti. Ove osobine ga čine pogodnim za ishranu ljudi i životinja. Upotreba lanika je uglavnom vezana za održivu poljoprivrodu, industriju biodizela, hladno ceđenih ulja i korišćenje tzv. marginalnih zemljišta. Ispitivanje svojstava lanika vezanih za intenzitet usvajanja i nakupljanja teških metala (TM) je interesantan sa dva stanovišta: 1) zdravstvene bezbednosti hrane i 2) mogućnosti za korišćenje lanika u fitoremedijaciji. Zbog toga je cilj ovog rada bio da se ispita uticaj TM na rast, fiziološke procese i usvajanje i akumulaciju nekih neophodnih makro- i mikroelemenata, kao i nepoželjnih teških metala. Ogledi su izvedeni na *Camelina sativa L.*, sorta Stepski 1. Seme je naklijavano u prisustvu 1 µM Cd ili Cu i 10 µM Ni ili Zn. Biljke su gajene metodom vodenih kultura, u polukontrolisanim uslovima staklenika, na ½ koncentrovanom hranljivom rastvoru po Hoagland-u, kome su dodavani TM u istim koncentracijama kao i tokom naklijavanja semena. U prisustvu Cu i Ni, a posebno Cd i Zn, smanjila se sveža i suva masa biljaka, dok sadržaj vode, intenzitet transpiracije i koncentracija pigmenata hloroplasta nisu značajno promenjeni. Aktivnost nitrat reduktaze i koncentracija slobodnog prolina su smanjene u prisustvu Cu, što ukazuje na poremećaj u metabolizmu azota. Koncentracija i distribucija Ca, Mg, P, K, Fe i Mn u nadzemnom delu i korenju je takođe promenjena pod uticajem primenjenih koncentracija Cd, Cu, Ni i Zn.

Ključne riječi: lanik; Cd; Ni; Cu; Zn; fotosinteza; vodni rezim

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**EVALUATION OF THE VEGETABLE WATER PRODUCED FROM OLIVE OIL
TECHNOLOGY**

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The aim of this study was to evaluate the characteristics of the vegetable water (olive mill waste water), produced during elaboration of the olive oil from three-phase system. Study was realized during October 2012- February 2013. Water samples were taken in the exit of decanter and are analyzed the following indicators: pH, temperature, COD, DBO₅, CE, turbidity, density, NO₃, oil and grease, total dissolved solids, salinity. These analyses were conducted at the laboratory at the Department of Environmental and Ecology, Agricultural University of Tirana. The results demonstrated a very high value of COD, BOD, density, oil and grease, total dissolved solids. Based on these results, we conclude that vegetable water (olive mill waste water) have different characteristics, depending on the technology and cultivars used for the oil elaboration.

Keywords: Olive oil; vegetable water; three-phase system; cultivars

**CHEMICAL PROPERTIES OF THE SOIL AT THE REKAVICE LOCALITY AND
THE AMELIORATION MEASURES PROPOSAL FOR THEIR IMPROVEMENT**

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The chemical properties of dominant soils in the Rekavice donje locality near Banja Luka are presented in this paper. Chemical composition and chemical properties of the soils are among the most important factors that determine quantity and quality of the yield of crops. The Rekavice donje locality is a suburb of the Banja Luka municipality, located on Manjaca mountain, at the distance of about 13 km southwest of the urban center of Banja Luka town. The altitude is about 500 m, but because of the undulated terrain, the relief vary a lot in a small space. The relief of Rekavice donje is predominantly represented by hilly slopes and steep, rugged coves. Dominant soils in the Rekavice donje are calcic cambisols on flysch, on limestone and on marl, with A-B-C soil profile. Several soil profiles were analyzed at this site during the field visit in the year 2011. The chemical properties of the soil were analyzed as follows: pH in H₂O and KCl, humus content, total nitrogen content and the content of plant available phosphorus and potassium. The results showed that calcic cambisols on flysch are characterized by a rather unfavorable chemical properties. The pH ranges from slightly acid, acid to very acid. The humus content is low to very low. Total nitrogen content is medium to low. Content of plant available phosphorus is extremely low in all horizons, while the content of plant available potassium is medium. In order to successfully organize and intensify crop production, especially the dominant fruit production, it is necessary to ameliorate the unfavorable chemical properties of the studied calcic cambisol, using appropriate ameliorative measures. We recommend the following ameliorative measures: liming, manuring, intensive fertilization by phosphorus and moderate fertilization by potassium, with the soil deepening where applicable.

Keywords: Keywords: soil; soil chemical properties; ameliorative measures.

HEMIJSKE OSOBINE ZEMLJIŠTA NA LOKALITETU REKAVICE I PRIJEDLOG MELIORATIVNIH MJERA ZA NJIHOVO POBOLJŠANJE

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U radu su prezentovane hemijske osobine dominantnih zemljišta na lokalitetu Rekavice donje kod Banja Luke. Hemijski sastav i hemijske osobine zemljišta se ubrajaju u najvažnije faktore od kojih zavise kako visina tako i kvalitet prinosa gajenih biljaka. Lokalitet Rekavice donje je prigradsko naselje koje pripada gradu Banja Luka, nalazi se na planini Manjači, na udaljenosti od oko 13 km jugozapadno od urbanog centra Banja Luke. Nadmorska visina je oko 500 m, ali zbog izlomljenoosti terena reljef dosta varira na malom prostoru. Reljef lokaliteta Rekavice je pretežno predstavljen blago zatalasanim padinama i mjestimično ispresjecan strmim uvalama. Dominirajuće zemljište na lokalitetu Rekavice donje je smeđe zemljište na flišu, na krečnjacima i laporima i laporcima, sa A-(B)-C građom profila. Nekoliko pedoloških profila je otvoreno i analizirano pri terenskim istraživanjima tokom 2011. godine na ovom lokalitetu. Od hemijskih osobina zemljišta analizirane su sledeće: aktivna i potencijalna reakcija zemljišta, sadržaj humusa u zemljištu, sadržaj ukupnog azota, sadržaj lakopristupačnog fosfora i sadržaj lakopristupačnog kalijuma. Rezultati istraživanja su pokazali da smeđe zemljište na flišu, ovog lokaliteta se odlikuje prilično nepovoljnim hemijskim osobinama. Reakcija je od slabo kisele, kisele do jako kisele. Sadržaj humusa je nizak do vrlo nizak. Sadržaj ukupnog azota je osrednji do nizak. Sadržaj lakopristupačnog fosfora je ekstremno nizak u svim horizontima, dok je sadržaj lakopristupačnog kalijuma osrednji. U cilju uspješnijeg organizovanja i intenziviranja biljne, prije svega voćarske proizvodnje, koja dominira, neophodno je otkloniti nepovoljne hemijske osobine proučavanog smeđeg zemljišta primjenom odgovarajućih meliorativnih mera. Preporučuju se sledeće agromeliorativne mjeru: kalcifikacija, humizacija, fosfatizacija i u manjem obimu kalizacija, uz produbljivanje oraničnog sloja, gdje god je to moguće.

Ključne riječi: Ključne riječi: zemljište; hemijske osobine zemljišta; meliorativne mjeru.

**WATER POLLUTION OF TIRANA AND LANA RIVERS IN TERMS OF
SUSTAINABILITY OF ECOLOGICAL BALANCE**

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In the scope of this study a research was conducted over the water pollution in Tirana and Lana Rivers. The samples were obtained from a total of 10 stations between 2010-2012 (June, July, August and September). These samples were analyzed in terms of 5 parameters; its water quality was determined by evaluation methods according to "Standard States Catalogue" (Republic of Albania, Ministry of Environment, Water and Forest). Regulation for Water pollution Control and thus the factors that cause pollutions in Tirana zone were also determined. Moreover, the monthly variations recorded on the quality criteria of Tirana zone were determined and the necessary measures towards minimizing the pollution were discussed. In view of the research, the effects of domestic wastewater, industrial wastewater and the overall effects of wastes as a common source were established accordingly. According to the Albanian Catalogue Standards, Water Quality Classifications Criteria the surface water fell under IIIrd and IVth class in terms of nitrate and nitrite presence and under IV th class water property in terms other parameters. When the findings of samples obtained in the period 2010-2012 were compared, it was determined that the amount of pollution increased over time. It was also observed that the surface water of Tirana and Lana rivers was exposed to pollution by common sources and the quality of water decreased significantly.

Keywords: Tirana and Lana rivers, water quality, seasonal variations, environmental pollution

**THE IMPORTANCE OF DETERMINATION MINIMUM LETHAL DOSES OF
HERBICIDES (MLHD) AS THE BASIS FOR THE RATIONAL APPLICATION OF
HERBICIDES**

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The concept of integrated weed management (IWMS-Integrated Weed Management System) provides that herbicides are used only when it is economically justified, in the smallest doses, ie. minimum dosage that will suppress weeds present. Lowest dose that achieves satisfactory efficiency is defined as the minimum lethal dose of herbicides (MLHD = Minimum Lethal Herbicide Dose, The Hague, 2002). Above MLHD's, and some other indexes can be used for the rational application of herbicides, such as the NOEL (NOEL = No Observed Effect Level), and it is the biggest concentration or amount of a substance, determined in experiment or observation, which did not affect on the morphology, functional capacity, growth, development and longevity treated and control organisms. Determination MLHD, the NOEL and other quantitative values phytotoxicity of herbicides relieve the construction of device for pesticide application in laboratory conditions. Device for pesticides application is an innovation in the approach for pesticides use in our area and provide to create models of dose/herbicide/weed/ecologically-viable factors. This device allows easier, faster and more efficient research which is carried out to determine: minimum lethal dose of herbicide, pesticide phytotoxicity on plants, efficacy of pesticides, effective dose and ecotoxicological importance of herbicide doses. The paper will present detailed description and construction device for pesticide application, which is a simulator of tractor sprayers. The biometric measures used for the determination minimum lethal dose of herbicide need to be adapted to the mechanism action of herbicides. For herbicides that affect on protein synthesis, usually it is measured quantitative indicators of growth (fresh and dry weight of plants, plant height, leaf area index), while for herbicides that affect on photosynthesis, we measured intensity of photosynthesis and determinate of chlorophyllous pigments.

Keywords: minimum lethal dose of herbicide (MLHD), herbicides

**ZNAČAJ ODREĐIVANJA MINIMALNE LETALNE DOZE HERBICIDA (MLHD)
KAO OSNOVE ZA RACIONALNU PRIMJENU HERBICIDA**

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Koncept integralnog sistema kontrole korova (IWMS-Integrated Weed Management System) predviđa da se herbicidi upotrebljavaju samo kada je to ekonomski isplativo u što je moguće manjoj dozi, tj. minimalnoj dozi koja će suzbiti prisutne korove. Najniža doza kojom se postiže zadovoljavajuća efikasnost definisana je kao minimalna letalna doza herbicida (MLHD=Minimum Lethal Herbicide Dose). Osim MLHD-a, i neki drugi indeksi mogu biti jako važni za racionalnu upotrebu herbicida, kao što je NOEL (NOEL= No Observed Effect Level), a to je najveća koncentracija ili količina supstance, utvrđena u eksperimentu ili posmatranju, koja ne uzrokuje promjenu morfologije, funkcionalne sposobnosti, rasta, razvoja i dužine života ciljnih organizama u odnosu na kontrolne organizame iste vrste. Određivanje MLHD-a, NOEL-a i drugih kvantitativnih indeksa fitotoksičnosti herbicida znatno olakšava konstrukciju uređaja za aplikaciju pesticida u laboratorijskim uslovima. Uređaj za aplikaciju pesticida predstavlja inovaciju u pristupu upotrebe pesticida na našem prostoru i omogućava izradu modela doza/herbicid/korovska vrsta/ekoliški faktori. Pomenuti uređaj omogućava mnogo lakša, brža i efikasnija istraživanja koja se provode u svrhu određivanja: minimalne letalne doze herbicida, fitotoksičnosti pesticida na gajenim biljkama, efikasnosti pesticida, efektivne doze kao i ekotoksikološkog značaja doze herbicida. U radu će biti predstavljen detaljan opis i konstrukcija uređaja za aplikaciju pesticida, koji u suštini predstavlja simulator traktorske prskalice. Biometrički pokazatelji koji se koriste za određivanje minimalne letalne doze herbicida prilagođavaju se mehanizmu djelovanja herbicida. Tako se za herbicide koje djeluju na biosentezu proteina, obično mjere kvantitativni pokazatelji rastenja (svježa i suva masa biljaka, visina biljaka, indeks lisne površine), dok se za herbicide koji djeluju na proces fotosinteze, a takvih je najviše, vrši mjerjenje intenziteta fotosinteze i određivanje sadržaja hlorofila.

Ključne riječi: minimalna letalna doza herbicida (MLHD), herbicidi

ECONOMICAL AND ENVIRONMENTAL BENEFITS OF APPLICATION OF PESTICIDES WITH CALIBRATED SPRAYER

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The paper shows effectiveness of the chemical protection in apple orchards using traditional sprayer with routers. The research aimed to determine the benefits of application with calibrated, controlled and precise sprayer compared to traditional one. The expression "traditional one" refers to the protection and uses of sprayer without correctness monitoring and adjustment of basic parameters (flow pump, pressure gauge accuracy, correctness sprinklers, proper amount of air flow fans, mixers etc.). Benefits of application with calibrated sprayer are multiple, and are reflected primarily in smaller application quantities, reduced labor and machine work, and fostered environmental aspects. Environmental aspects are monitored as a loss in the form of liquid pesticide drift on the soil surface. Using water sensitive strips losses of working liquid on the ground were measured, comparing calibrated and not calibrated sprayer. The recommended standard norm for testing was 500 l/ha, however, when measuring the norm of 754 l/ha were recorded, which is increased for 50,80 %. The reason of increase is faulty gauge and poor distribution of nozzles. After calibration and tuning the norm of 422 l/ha were achieved, or 55,96 % reduction compared to the old setting. Uses of calibrated and precisely tuned sprayer ensure the reduction of treatment norm of 15,60 % smaller than recommended, with good coverage of the crown. The advantage of application with calibrated and precisely tuned sprayer is reducing drift and improvement of ecological effect. The research results show that with correct calibration the soil drift can be reduced to a minimum quantity. If tacked into account that the average cost of plant protection is 350 KM/ha, including the cost of pesticides, labor and machine work, we have the case that the economic analysis shows that treatments with controlled sprayer reduces cost of protection per treatment on average about 55 KM/ha. Projected for the entire season, the savings are amounted to total of 1100 KM/ha, if we take into account that the average number of treatment is about 20 times, depending of the season.

Keywords: apple protection; economic analysis; soil drift; traditional and controlled application

**EKONOMSKO-EKOLOŠKA ANALIZA PREDNOSTI APLIKACIJE PESTICIDA
KALIBRISANIM I PRECIZNO PODEŠENIM ATOMIZEROM**

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U radu je analizirana efikasnost hemijske zaštite zasada jabuke primjenom klasičnog atomizra sa usmjerivačima. Analiza je imala za cilj da utvrdi prednosti aplikacije baždarenim, kontrolisanim i precizno podešenim atomizerom u odnosu na klasičnu zaštitu. Pod pojmom klasične zaštite podrazumijeva se eksploracija atomizera bez praćenja ispravnosti i podešenosti osnovnih parametara (protok pumpe, ispravnost manometra, ispravnost rasprskivača, podešenost količine vazdušne struje ventilatora, ispravnost mješača itd.). Prednosti aplikacije baždarenim atomizerom su višestruke, a ogledaju se prije svega u uštetu preparata, smanjenju utroška ljudskog i mašinskog rada, a bitan je i ekološki aspekt. Ekološki aspekt se prati u vidu gubitaka pesticidne tečnosti u obliku zemljишnog drifta. Pomoću vodosenzitivnih pločica mjereni su gubici radne tečnosti na zemljiju, upoređujući baždareni i nebaždareni atomizer. Preporučena norma pri ispitivanju iznosila je 500 l/ha, međutim prilikom mjerena evidentirana je norma od 754 l/ha, tj. uvećana za 50,80 %. Razlog uvećanja je neispravan manometar i loša distribucija rasprskivača. Nakon kalibracije i podešavanja postignuta je norma od 422 l/ha, odnosno umanjena za 55,96 % u odnosu na zatečenu. Primjena baždarenog i precizno podešenog atomizera obezbijedila je smanjenje norme tretiranja za 15,60 % od preporučene, uz dobru pokrivenost krune. Prednost primjene kalibrisanog i precizno podešenog atmizera ogleda se u smanjenju drifta, a kroz umanjenje drifta i poboljšanje ekološkog efakta. Rezultati istraživanja pokazuju da se pravilnom kalibracijom zemljinski drift može smanjiti na minimalne količine. Ako se uzme u obzir prosječna cijena zaštite od 350 KM/ha uključujući cijenu pesticida, ljudski i mašinski rad, imamo slučaj da ekonomska analiza tretiranja jabuke pokazuje da kontrolisana aplikacija umanjuje cijenu zaštite po jednom tretiranju u prosjeku oko 55 KM/ha. Projektovano na cijelu sezonu, uštete pri zaštiti iznose oko 1100 KM/ha, ako uzmemu u obzir da je prosječan broj tretiranja oko 20 puta, u zavisnosti od sezone do sezone.

Ključne riječi: zaštita jabuke; ekonomska analiza; zemljinski drift; klasična i kontrolisana aplikacija

**INFLUENCE OF GREEN ALGAE CHLORELLA VULGARIS ON INFESTED WITH
XIPHINEMA INDEX GRAPE SEEDLINGS**

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Plant-parasitic nematodes are considered a major pest in grape growing countries. The dagger nematode Xiphinema index is especially important because of its ability to transmit Grapevine fanleaf virus when feeding on grapevine roots. The present study was conducted during June-November 2007. The aim of the pot experiments was to establish the impact of dry extract of Chlorella vulgaris on the ungrafted grapevine seedlings cv. "Palieri" infested with root ectoparasite Xiphinema index. Different dosages of Chlorella (0.5, 1.0, 2.0 g per plant/pot) were investigated. The results show a decrease in the number of X. index in the variants treated with 1 g Chlorella. There has been a positive effect on the growth characteristics of the test plants at the same concentrations. The green algae Chlorella vulgaris as a powerful phytoprotector have strong stimulating effect on the plant growth. Implementation and expansion of the spectrum of environmentally friendly means for pest control is an important step to avoid agrochemicals and promote sustainable agriculture.

Keywords: plant-parasitic nematodes, Xiphinema index, Chlorella vulgaris, phytoprotector.

CHANGES IN THE CHEMICAL PROPERTIES OF THE DEPOSOL IN THE RECLAMATION PROCESS ESTABLISHING OF THE GRASSLAND

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The research were conducted in deposols and on the reclaimed land in lignite mine Stanari. Grassland seeding is the important part of the biological reclamation phase. The main task of the formed grasslands is to improve the mechanical, chemical and biological properties of the deposol in the reclamation process. The fertility of Stanari deposol is extremely low in comparison to the natural soil. Grassland seeding through direct type of reclamation was conducted in 2008, 2011 i 2012. Agromeliorative measures were used in grassland seeding and grassland care process. The conducted researches include the changes in the chemical properties in the surface layer of the treated deposol in the reclamation process. Laboratory analysis of this technogenic soil were carried out before the reclamation and sowing started, and then in the process of reclamation at the end of 2012. A total of eleven average soil samples were analysed. The following properties were analysed: rN, organic matter content, humous, nitrogen, plant available P₂O₅, K₂O and soil adsorption complex. Significant improvement in soil reaction has not been identified. Positive changes in the content of organic matter (average increase of 100%) have been identified, which is a positive characteristic in reclamation of the deposols. Slight increase in the concentration of physiologically active P₂O₅ and K₂O is the result of the application of mineral fertilizers. In the reclamation process adsorption capacity and degree of saturation of alkali cations in the deposols were increased. On the experimental plots where reclamation measures were implemented, there is a slight improvement in most of the chemical characteristics of the meliorated deposol. Proper selection of the agromeliorative and other measures is required in the reclamation process. Well based artificial grasslands contribute to the creation of quality recultisol. Further increase of the recultisol fertility is directly related to the applicable measures of timely grassland care.

Keywords: deposol; reclamation; soil; chemical properties; Stanari

Poster presentation

Section 1. Agroecology and Organic Agriculture

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PROMJENE HEMIJSKIH SVOJSTAVA U DEPOSOLIMA U POSTUPKU REKULTIVACIJE ZASNIVANJEM TRAVNJAKA

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Istraživanja su obavljena u deposolima i na rekultivisanim površinama u rudniku lignita Stanari. U okviru biološke faze rekultivacije važan pravac zauzima zasnivanje travnjaka. Zadatak formiranih travnjaka je poboljšanje mehaničkih, hemijskih i bioloških osobina deposola u postupku rekultivacije. Plodnost stanarskih deposola je izuzetno niska u odnosu na prirodna zemljišta. Zasnivanje travnjaka direktnim tipom rekultivacije je vršeno tokom 2008., 2011. i 2012. godine. Pri zasnivanju i njezi travnjaka korišćene su potrebne agromeliorativne mјere. Provedena istraživanja obuhvataju nastale promjene osnovnih hemijskih osobina u površinskom sloju deposola u postupku rekultivacije. Laboratorijske analize ovih tehnogenih zemljišta su vršene prije početka rekultivacije i sjetve, a potom u procesu rekultivacije, na kraju 2012. godine. Ukupno je analizirano 11 prosječnih zemljišnih uzoraka. Analizirane su sledeće osobine: rN, sadržaj organske materije, humusa, azota, lakopristupačnog R2O5, K2O i adsorptivn kompleks zemljišta. Značajnije poboljšanje reakcije zemljišta nije utvrđeno. Utvrđene su pozitivne promjene u sadržaju organske materije (prosječno povećanje za 100%), što je pozitivna karakteristika u rekultivaciji deposola. Blago povećanje koncentracija fiziološki aktivnog R2O5 i K2O je rezultat primjene mineralnih đubriva. Povećana je sposobnost adsorpcije i stepen zasićenosti baznim katjonima u deposolima u postupku rekultivacije. Na parcelama koje su bile obuhvaćene analizom nakon rekultivacije može se zaključiti blago poboljšanje većine hemijskih osobina. U procesu rekultivacije je potreban pravilan izbor agromeliorativnih i drugih mјera. Dobro zasnovani vještački travnjaci doprinose stvaranju kvalitetnog rekultisola. Dalje povećanje plodnosti rekultisola je u direktnoj vezi sa primjenjenim mjerama njege travnjaka u funkciji vremena.

Ključne riječi: deposol; rekultivacija; zemljište; hemijske osobine; Stanari

**TRAINING OF INTERESTED CARRIERS OF ORGANIC PRODUCTION IN THE
DANUBE REGION OF REPUBLIC OF SERBIA**

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Since 1990, the activities of the Terra's Association from Subotica greatly contributed to the promotion and development of organic farming in Serbia. Apart from it, a number of other organizations and institutions joined the popularization of this specific type of production. A few years ago, several active national, regional and local associations started conducting theoretical and practical education; National association for development of organic farming "Serbia Organica", "Green Network of Vojvodina", and lately "Vojvodina's Society for organic production", were among the most active ones. They represented a great support to all those already involved in organic production as well as to all those who were just planning to develop their business in accordance to the organic principles. Support to individuals and legal entities proved to be best provided through education and networking with all participants involved in the process "from farm to fork". The main activities of the Integrated and Interdisciplinary Scientific Research Project funded by the Ministry of Education, Science and Technological Development of Republic of Serbia (Grant III46006), entitled "Sustainable agriculture and rural development performed in order to realize the strategic goals of the Danube region in Serbia" were implementation and realization of the theoretical and practical education of the local carriers of organic production. Consequently, in 2011. and 2012, during autumn-winter and spring-summer periods, a number of lectures on methods, control and certification of organic production of selected cereals, industrial and spice plants, has been realized. In a practical way, through various workshops organized at several locations of the metropolitan area of Belgrade-Novи Sad, the importance of continuous education in organic production was presented to the manufacturers and other interested parties. Through a number of thematic trainings, certain organic methods were presented to the farmers in order to make them practice primary organic production of specific cereal, industrial and spice plant species that ensure sustainable development, especially in rural areas of the Danube region in Serbia.

Keywords: organic production, Danube region, producers, education, Serbia.

OBUKA ZAINTERESOVANIH I NOSILACA ORGANSKE PROIZVODNJE U OKVIRU DUNAVSKOG REGIONA NA TERITORIJI REPUBLIKE SRBIJE

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Počev od 1990. godine, pa do danas Udruženje Terra's iz Subotice je svojim aktivnostima u velikoj meri doprinelo unapređenju i razvoju organske proizvodnje u našoj zemlji. Pored navedenog veliki broj ostalih udruženja i institucija je pristupio popularizaciji ove vrste proizvodnje. Nekoliko godina unazad edukaciju kroz teorijski i praktični rad sprovode nekoliko aktivnih udruženja nacionalnog, regionalnog i lokalnog karaktera. Među najaktivnijim u ovoj oblasti ističu se Nacionalno udruženje za razvoj organske proizvodnje "Serbia Organica" i Zelena mreža Vojvodine, a u poslednje vreme i Vojvođansko društvo za organsku proizvodnju. Navedena udruženja predstavljaju veliku podršku svima onima koji su u oblasti organske proizvodnje već započeli određene aktivnosti, kao i onima koji tek planiraju da razvijaju svoje poslovanje u skladu s organskim principima. Podrška fizičkim i pravnim licima se pruža putem edukacija, povezivanja i kontakata sa svim učesnicima u procesu od njive do trpeze. Jedna od aktivnosti Projekta Integralnih i interdisciplinarnih istraživanja br. 46006 "*Održiva poljoprivreda i ruralni razvoj u funkciji ostvarivanja strateških ciljeva Republike Srbije u okviru Dunavskog regiona*", finansiranog od strane Ministarstva prosvete, nauke i tehnološkog razvoja Republike Srbije, jeste sprovođenje i realizacija teorijske i praktične obuke nosilaca organske proizvodnje. Tokom 2011. i 2012. godine, u jesenjo-zimskom u većoj i prolećno-letnjem periodu u manjoj meri realizovano je više predavanja o metodama, kontroli i sertifikaciji organske proizvodnje izabranih vrsta žita, industrijskog i začinskog bilja. Na praktičan način putem otvorenih radionica, na više lokacija metropolitenskog područja Beograd-Novi Sad, proizvođačima i ostalim zainteresovanim prikazan je značaj kontinuiranog obrazovanja u organskoj proizvodnji. Kroz veći broj tematskih edukacija, prikazane su pojedine od organskih metoda koje su imale za cilj osposobljavanje poljoprivrednika za bavljenje primarnom organskom proizvodnjom pojedinih vrsta žita, industrijskog i začinskog bilja koje obezbeđuju održiv razvoj, posebno u ruralnim sredinama koje pripadaju oblasti Dunavskog regiona.

Ključne reči: organska proizvodnja, Dunavski region, proizvođači, obuke, Srbija.

**UTILISATION OF NATURAL RESOURCES FOR IRRIGATION IN VOJVODINA
(SERBIA)**

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Significant part of fertile arable land areas with good soil properties and available amounts of water, as the most important natural resources, enable Vojvodina to have favourable conditions for more intensive irrigated crop production. Also, there are existing real requirements for irrigation given on relatively high crop water deficit (100-300 mm), as well as more frequent water shortage (droughts) and unevenly precipitation distribution during the vegetation period recently. The majority of water resources represent a hidrographic network of Danube, Tisa and Sava Rivers, smaller natural streams, then the basic (in total length of 930 km) and detail (in total length of 20,000 km) channel network, which ensure possibility for water extraction and using for irrigation. Although in the most important documents for planning and strategic development in agriculture, irrigation has the crucial role and priority, situation in practice (on the field) is markedly different. Planned areas under irrigation have never realised in fully, and over the recent period, there are no significant changes in irrigated areas and/or water consumption in agriculture. In Vojvodina area irrigation systems have been constructed on around 100,000 ha. However, it is estimated that the irrigation practice is maximally conducted on around 30,000 ha per year, which is only 1/3 of constructed capacities or 1-2% of the total arable lands, mostly because of relatively old irrigation systems. New and modern irrigation systems are implemented on relatively small portion of irrigated lands, what is not in accordance with current needs and availability of water/land potentials in Vojvodina. The greatest portion of irrigated land areas (crop and gardens cca 95% and the rest cca 5% are orchards) use sprinkler systems (80-90%) and water from the natural riverflows and channel network (>90%). Based on analyses of natural resources and already constructed certain capital hydrosystems (e.g. Danube-Tisa-Danube; DTD) it was documented there is almost 1 million ha with a very high potential for irrigation in Vojvodina, out of that around 500,000 ha in surrounding of DTD system and the rest from regional hydrosystems; 130,000 ha in North Backa, 100,000 ha in Banat and 200,000 in Srem.

Keywords: Water resources; irrigation systems; irrigation areas; Vojvodina

ISKORIŠĆENOST PRIRODNIH RESURSA VOJVODINE ZA NAVODNJAVANJE

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Značajne površine plodnog obradivog zemljišta dobrih proizvodnih svojstava i raspoložive količine vode, kao najznačajniji prirodni resursi i potencijali, čine da Vojvodina ima povoljne uslove za intenzivniji razvoj i primenu navodnjavanja. Takođe, postoje realne potrebe za navodnjavanjem jer zemljištu i gajenim biljkama tokom vegetacionog perioda nedostaje oko 100 do 300 mm vode. Sve češće se ispoljava manjak i neodgovarajuća unutarnjopravna raspodela atmosferskih padavina. Osnovu vodnih resursa predstavlja hidrografska mreža koju čine reke Dunav, Tisa i Sava, niz manjih prirodnih vodotoka, osnovna (ukupne dužine 930 km) i detaljna (20.000 km) kanalska mreža koji pružaju mogućnost zahvatanja dovoljnih količina vode za potrebe navodnjavanja. Navodnjavanju se u najznačajnijim planskim i strateškim dokumentima daje prioritet i važna uloga u viziji daljeg razvoja poljoprivrede. Međutim, realnost je sasvim drugačija. Površine pod sistemima za navodnjavanje nikada ni približno nisu dostigle planirane. Već duži niz godina nema bitnijeg pomaka ni u povećanju površina, ni u potrošnji vode. Na području Vojvodine sistemi za navodnjavanje su izgrađeni na oko 100 hiljada ha ali navodnjavane površine tek u pojedinim godinama dostižu 30 hiljada ha što čini tek 1/3 izgrađenih kapaciteta i manje od 1-2% ukupnih obradivih površina. Neki od sistema su zastareli, zapušteni, u lošem stanju, delimično ili uopšte nisu u funkciji. Retki su i sporadični slučajevi izgradnje novih sistema i to na relativno malim površinama. Opšta ocena je da navodnjavanje nije na zadovoljavajućem nivou, niti je u skladu sa potrebama i mogućnostima poljoprivrede i vodoprivrede Vojvodine. Najveći deo površina navodnjava se vodom iz prirodnih vodotoka i kanala (preko 90%) i to najčešće veštačkom kišom (80-90%). Među navodnjavanim površinama dominiraju oranice i bašte (oko 95%) dok su ostale pretežno pod voćnjacima (5%). Mogućnosti su daleko veće. Postoje potencijalni preuslovi za navodnjavanje skoro milion ha. Zahvatanjem vode iz Hidrosistem DTD može se obezbediti navodnjavanje na oko 500.000 ha, Regionalnim hidrosistemima na još oko 400.000 ha (Severna Bačka – 130.000 ha, Banat – 100.000 ha i Srem – 200.000), značajne mogućnosti pruža i dvonamensko korišćenje postojećih kanala detaljne kanalske mreže (za odvodnjavanje i navodnjavanje – 90.000 ha).

Ključne riječi: Vodni resursi; sistemi za navodnjavanje; navodnjavane površine; Vojvodina

INFLUENCE OF MULCHING ON CANOPY TEMPERATURE OF PEPPERS AND TOMATO IN TERMS OF SEVERAL VARIANTS OF IRRIGATION

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This paper presents the measurement results of temperature of the above-ground parts of pepper and tomato plants using a thermal imager in order to determine the influence of mulching on canopy temperature during the vegetation seasons between May and September 2012. The experiment was set in the open field on carbonate chernozem soil in Stara Pazova (40 km North of Belgrade, Serbia). Three treatments of irrigation regimes were used for peppers, with and without the application of mulch. The first form of irrigation was with full irrigation (F) when 100% was covered by ETc (evapotranspiration), a treatment with deficit irrigation (R) with 80% of the ETc and a treatment with deficit irrigation (S) with 70% of ETc. Two treatments of irrigation regimes were monitored for tomatoes. The first variant was with full irrigation (F) when 100% was covered by ETc and a treatment with deficit irrigation (S) with 50% of ETc, with and without the application mulch. The measurements of the plant temperature were carried out with infrared cameras (FLIR, T335) four times during the vegetation season for pepper and six times during the vegetation season for tomato. From each treatment a sample of 15 temperatures was taken and the samples were used for determining the average temperature of the plants for every variety of irrigation. Temperature measurement data for the above-ground parts of the peppers show, that the temperature canopy cover was lower in all treatments where mulch was used. Pepper plants in F, R, and S treatments with mulch were colder than the same varieties of plants without mulch for an average of 1.45°C, 1.52°C, and 1.38°C, respectively. Measured differences are less at tomatoes than at peppers. On the F variant with mulch plants were on average by 0.3°C cooler than the F variant plants without mulch. In the treatment with deficit irrigation(S), temperature tomato plants with mulch an average of 1°C lower than the temperature of plants without mulch. Based on these results it can be conclude that there is a significant effect of mulching on the temperature canopy of peppers, and to a lesser extent in tomato fruits. Mulch foil prevents evaporation, thus plants have more water, which transpiration and thus are cooled. *There is less of a difference with tomatoes because the tomato plants dense canopy and the biomass prevents evaporation.*

Keywords: mulch foil, irrigation regime, pepper, tomato

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UTICAJ MULČIRANJA NA TEMPERATURU BILJNOG POKRIVAČA PAPRIKE I PARADAJZA U USLOVIMA VIŠE VARIJANTI NAVODNJAVA

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U ovom radu prikazani su rezultati merenja temperaturu nadzemnog dela biljaka paprike i paradajza primenom termovizijske kamere sa ciljem određivanja uticaja mulč folije na temperaturu biljnog pokrivača u periodu maj-septembar 2012. Ogled je postavljen na otvorenom polju na zemljištu tipa karbonatni černozem u Staroj Pazovi (40 km severno od Beograda, Srbija). Kod paprike su praćene tri varijante režima navodnjavanja sa i bez mulč folije. Varijanta sa punim navodnjavanjem (F) kada je pokriveno 100 % ETc (evapotranspiracije kulture), varijanta sa redukovanim navodnjavanjem (R) kada je pokriveno 80% ETc i varijanta sa redukovanim navodnjavanjem (S) kada je pokriveno 70% ETc. Kod paradajza su praćene dve varijante režima zalivanja, varijanta sa punim navodnjavanjem, (F) kada je pokriveno 100 % ETc i varijanta sa redukovanim navodnjavanjem (S) kada je pokriveno 50% ETc sa i bez primene mulč folije. Merenja temperature biljaka izvedena su termovizijskom kamerom (FLIR, T335) četiri puta u toku vegetacije paprike i šest puta u toku vegetacije paradajza. Sa svake varijante je uzet uzorak od 15 temperatura na osnovu kojih je merena prosečna temperatura biljaka na svakoj varijanti navodnjavanja. Podaci merenja temperatura nadzemnog dela paprike pokazuju, da je temperatura biljnog pokrivača bila niža na svim varijantama gde je postavljena malč folija. Biljke paprike na F, R, S varijantama sa mulč folijom bile su hladnije od biljaka na istim varijantama zalivanja bez mulč folije prosečno za 1.45°C, 1.52°C, 1.38°C, respektivno. Kod paradajza razlike su manje u odnosu na papriku. Na F varijanti sa mulč folijom biljke su bile prosečno za 0.3 °C hladnije od biljaka na F varijanti bez folije. Na varijanti redukovanih zalivanja (S), temperatura biljaka paradajza sa mulč folijom je prosečno za 1°C niža od temperature biljaka bez folije. Iz navedenih rezultata može se zaključiti da postoji značajan uticaj mulč folije na temperaturu biljnog pokrivača paprike, a u manjoj meri kod paradajza. Mulč folija sprečava evaporaciju, samim tim biljke imaju na raspolaganju više vode, koju transpirišu i na taj način se hlađe. Kod paradajza su te razlike manje, jer je paradajz biljka gušćeg sklopa i svojom biomasom sprečava evaporaciju.

Ključne reči: mulč folija, režim zalivanja, paprika, paradajz

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**RESEARCH ON THE USE OF BIO-INDICATORS TO ASSESS THE
ENVIRONMENTAL QUALITIES OF AGRO-ECOSYSTEMS**

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Biodiversity which we possess today, is the result of the process of evolution of life on earth on which operates extinction process and the creation of new species, but progressive growth of its disappearance, influenced by human activities, is obviously verified in the agro-ecosystems. Major changes brought about in the field of agriculture, have broken the balance that existed between agriculture and biodiversity. Many species, assessed as a species of "keys", which perform important functional roles, are directly dependent on agriculture. Ecological function of species may be significant in assessing the biodiversity and their presence is an indication of the specific characteristics of the environment, so they are also called biological indicators. They provide data on the level of biodiversity in agro-ecosystems. In particular in the last 10 years have been introduced bio-indicators, which are a species or a set of species with special requirements, i.e. a set of physical and chemical variables. This study examines a system of bio-indicators, with more levels to evaluate the reduction of biological complexity and its impact on two types of agro-ecosystems (traditional and conventional) and consequences for environmental qualities of their sustainability.

Keywords: agro-ecosystem, bio-indicator, species, complexity.

**WEED FLORA AND VEGETATION IN THE MAIZE IN THE AREA OF
POSAVOTAMNAVA**

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Irregular and irrational use of herbicides has contributed significantly alter the quantitative and qualitative composition weed communities in maize in the study area. Weed vegetation in maize Posavotamnava investigated during 2012. Phytocoenological were performed using a combined method of the Swiss-French school (Braun-Blanquet, 1951). Phytocoenological study was carried out at 13 locations on the soil pseudogley. Taxonomic analysis Posavotamnava maize plants showed the presence of 40 species of vascular macrophytes, covered with 14 families. 10 species of that number belongs to family Asteraceae, 6 species belongs to family Poaceae , 4 species belonging to family Polygonaceae, and 3 species belongs to families Lamiaceae and Chenopodiaceae , while other families are represented by two and one taxon. Based on research conducted in 2012 in the territory of maize Posavotamnava the following conclusions: weed vegetation corn Posavotamnava an association Panico-Ambrosietum artemisifoliae, the biological spectrum weed associations are represented terofit 60% with a significant share of geophytes 27.50%. At least represented hemicryptophytes with 12.50%; floral elements are present wide distribution of 80%. Agro-ecological indicator value index shows: moderately aerated soil (D), medium illuminated (L) and favorable thermal regime (T), high incidence of plant wide distribution (K), high soil moisture (F), high soil acidity (R); medium coverage with organic matter (N) and nezaslanjenost soil (S). The aim of the study was to learn about weed vegetation corn to weed control access seriously, thoroughly and complex.

Keywords: maize, Posavotamnava, weed flora, weed vegetation

**KOROVSKA FLORA I VEGETACIJA KUKURUZA NA PODRUČJU
POSAVOTAMNAVE**

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Nepravilna i neracionalna upotreba herbicida je znatno doprinela izmeni kvantitativnog i kvalitativnog sastava korovskih zajednica kukuruza na istraživanom području. Korovska vegetacija kukuruza Posavotamnave istraživana je tokom 2012 godine. Fitocenološka ispitivanja su vršena kombinovanom metodom Švajcarsko-Francuske škole (Braun-Blanquet, 1951). Fitocenološka snimanja su obavljena na 13 lokaliteta na tipu zemljišta pseudoglej. Taksonomskom analizom flore kukuruza Posavotamnave utvrđeno je prisustvo 40 vrsta vaskularnih makrofita, obuhvaćenih sa 14 familija. Od tog broja familiji Asteraceae pripada 10 vrsta, familiji Poaceae pripada 6 vrsta, familiji Polygonaceae pripada 4 vrste, familijama Chenopodiaceae i Lamiaceae po 3 vrste, dok su ostale familije zastupljene sa po dva i jedan takson. Na osnovu obavljenih istraživanja 2012 godine u usevima kukuruza na teritoriji Posavotamnave može se konstatovati sledeće: Korovsku vegetaciju kukuruza Posavotamnave predstavlja asocijacija Panico-Ambrosietum artemisifoliae; U biološkom spektru korovske asocijacije zastupljene su terofite 60% sa značajnim učešćem geofita 27.50%. Najmanje su zastupljene hemikriptofite sa 12.50%; Prisutni su florni elementi širokog rasprostranjenja sa 80%. Indikatorske vrednosti agroekoloških indeksa pokazuju: zemljišta su umereno aerisana (D); srednje osvetljena (L); povoljnog termičkog režima (T); visoka zastupljenost biljaka širokog rasprostranjenja (K); srednje vlažnosti zemljišta (F); srednje kiselosti zemljišta (R); osrednja obezbeđenost organskim materijama (N) i nezaslanjenost zemljišta (S). Cilj rada je bio da se upozna korovska vegetacija kukuruza kako bi se suzbijanju korova pristupilo ozbiljno, studiozno i kompleksno.

Ključne riječi: kukuruz, Posavotamnava, korovska flora, korovska vegetacija

LIFE FORMS OF WEED PLANTS IN WHEAT CROP IN THE DONJI SREM AND THE KOLUBARA RIVER BASIN

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The presence of certain life forms is one of the most important indicators of living conditions in the weed community. Determining which life forms are dominant in a phytocenosis is of vital importance because this determines the choice of herbicide, method and time of application. Participation of certain forms of life, certainly depends on various factors: the climatic conditions, soil type, crop type, cropping practices. Phytocoenological tests were conducted in Donji Srem at 12 sites in the Kolubara basin and 11 sites in 2012. Life forms are determined according to Raunkier who modified Ujvaros in 1957. The results showed that the most common terofit the wheat crop in Donji Srem presence with 63.64%, while the presence in the Kolubara region with 56.72%. Among the most common are terophita T4 (species that germinate in the spring, and ripen in late summer), and T2 (species that germinate in the fall and early spring, early summer fruiting). As for the bulbs in the Kolubara basin, they are present in a greater percentage of 28.36% in comparison with the area of Donji Srem where they are present with 25.45%. In the Kolubara region the most common types are G1 types with underground shoots - rice, while in the lower Srem the most common G3 types are those with root offshoots. Hemicryptophytes are present in the Kolubara region in a greater proportion of 14.92%, while the area of Donji Srem presence in a much smaller percentage of 10.91%. These differences in the presence of life forms in the investigated area are definitely the result of intensive agricultural practices, regular application of herbicides, soil types that are used in Donji Srem. These results can help us in carrying out the necessary cultural practices and the choice of quality herbicide, time and method of application.

Keywords: terofits, geofits, wheat, Donji Srem, Kolubara basin

**ŽIVOTNI OBLICI KOROVSKIH BILJAKA U USEVU PŠENICE NA PODRUČJU
DONJEG SREMA I SLIVA KOLUBARE**

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Prisustvo određenih životnih oblika je jedan od veoma značajnih pokazatelja životnih prilika u korovskoj zajednici. Od veoma velikog značaja je utvrditi koji životni oblici dominiraju u nekoj fitocenozi jer od toga zavisi izbor herbicida, način i vreme njegove primene. Učešće pojedinih životnih oblika, svakako zavisi od raznih faktora: klimatskih uslova, tipa zemljišta, vrste useva, agrotehničkih mera. Fitocenološka ispitivanja vršena su u Donjem Sremu na 12 lokaliteta i slivu Kolubare na 11 lokaliteta tokom 2012. godine. Životne forme su određene prema Raunkier-u koji je modifikovao Ujvaros-i 1957. godine. Rezultati ispitivanja su pokazali da su terofite najzastupljenije u usevu pšenice na području Donjeg Srema, prisutne su sa 63,64%, dok su na području Kolubare prisutne sa 56,72%. Među terofitama najzastupljenije su T4 (vrste koje klijaju u proleće, a sazrevaju krajem leta), zatim T2 (vrste koje klijaju u jesen i rano proleće, plodonose početkom leta). Kada je reč o geofitama u slivu Kolubare one su zastupljene u nešto većem procentu 28,36%, nego na području Donjeg Srema gde su prisutne sa 25,45%. Na području Kolubare najzastupljenije su G1 vrste sa podzemnim izdancima – rizomom, dok su na području Donjeg Srema najzastupljenije G3 vrste sa korenским izdancima. Hemikriptofite su prisutne u veće procentu na području Kolubare 14,92%, dok su na području Donjeg Srema prisutne u znatno manjem procentu 10,91%. Navedene razlike prisustva životnih oblika na ispitivanom području svakako su rezultat intenzivnih agrotehničkih mera, redovne primene herbicida, tipa zemljišta koje se u Donjem Sremu primenjuje. Ovi rezultati nam mogu pomoći u izvođenju potrebnih agrotehničkih mera i izboru kvalitetnih herbicida, vremenu i načinu primene.

**THE CONTENT OF CADMIUM AND NICKEL IN MEDICINAL PLANTS
POTENTILLA HEPTAPHYLLA L. AND POTENTILLA ERECTA (L.) RAEUSCH.
ON SERPENTINE SOILS IN THE WESTERN PART OF THE REPUBLIC OF
SRPSKA**

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Medicinal plants deserve special attention because they are used in folk and official medicine and have great significance for human health. According to the World Health Organization (WHO), about 80% of the human population uses different medicinal plants. However, due to the increased content of heavy metals in soils, especially in serpentine soils, medicinal plants can accumulate different heavy metals in their tissues and thus cause problems for human health. In this paper the content of cadmium (Cd) and nickel (Ni) in the two medicinal plants, *Potentilla heptaphylla* L. and *Potentilla erecta* (L.) Raeusch. was investigated at five locations with serpentine soils in the western part of the Republic of Srpska. The results indicate significant variation in Cd content in the analyzed plant material. On two of the five sites, the content of Cd in the dry weight of both plant species was below the detection limit, on the other two sites Cd concentration was below the limit recommended by the World Health Organization, while at one site content of Cd concentrations were above the upper limit (0,3 mg/kg of dry weight). Ni content in dry plant weight of both plant species at all investigated sites was far above the level recommended by FAO and WHO (1,63 mg/kg for edible plants) and also moderate to high (15-81 mg/kg dry weight) compared with plants that do not grow on serpentine soils (0.5-1 mg/kg dry weight). The results of this study suggest the need to introduce systematic control of toxic metals content and to determine their maximum concentrations in medicinal plants. This especially applies to soils that are naturally characterized by elevated concentrations of heavy metals, such as serpentine soils.

Keywords: cadmium, nickel, medicinal plants, serpentine soils, Republic of Srpska

SADRŽAJ KADMIJUMA I NIKLA U LJEKOVITIM BILJKAMA *POTENTILLA HEPTAPHYLLA* L. I *POTENTILLA ERECTA* (L.) RAEUSCH. NA SERPENTINSKIM ZEMLJIŠTIMA U ZAPADNOM DIJELU REPUBLIKE SRPSKE

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Ljekovite biljke zaslužuju posebnu pažnju, jer se koriste i u narodnoj i u oficijalnoj medicini i imaju veliki značaj za ljudsko zdravlje. Prema podacima Svjetske zdravstvene organizacije (SZO), oko 80% ljudske populacije koristi različite ljekovite biljke. Međutim, uslijed povećanog sadržaja teških metala u zemljjištima, posebno serpentinskim, ljekovite biljke mogu da akumulišu u svojim tkivima različite teške metale i da na taj način uzrokuju probleme po ljudsko zdravlje. U ovom radu ispitivan je sadržaj kadmijuma (Cd) i nikla (Ni) u herbi dvije ljekovite biljne vrste, *Potentilla heptaphylla* L. i *Potentilla erecta* (L.) Raeusch. na pet lokaliteta serpentinskih zemljija zapadnog dijela Republike Srpske. Rezultati ukazuju na značajne varijacije u sadržaju Cd u analiziranom bilnjom materijalu. Na dva od pet istraženih lokaliteta, sadržaj Cd u suvoj herbi obe biljne vrste bio je ispod granice detekcije; na druga dva lokaliteta koncentracija Cd bila je ispod granice koju preporučuje Svjetska zdravstvena organizacija, dok je na jednom lokalitetu bila iznad gornje granice (0,3 mg/kg suve biljne mase). Sadržaj Ni u suvoj biljnoj masi obe biljne vrste na svim istraženim lokalitetima bio je daleko iznad nivoa koji preporučuju FAO i SZO (1,63 mg/kg za jestive biljke) i takođe umjerenog do veoma visok (15-81 mg/kg suve mase) u poređenju sa biljkama koje ne rastu na serpentinskim zemljjištima (0,5-1 mg/kg suve mase). Rezultati ovog rada ukazuju na potrebu uvođenja sistematske kontrole sadržaja toksičnih metala i određivanja njihovih maksimalno dozvoljenih koncentracija u ljekovitim biljnim vrstama. To se posebno odnosi na zemljija koja se prirodno karakterišu povećanim koncentracijama teških metala, kao što su serpentinska zemljija.

Ključne riječi: kadmijum, nikl, ljekovite biljke, serpentinska zemljija, Republika Srpska

MELLIFEROUS PLANTS OF DUGO POLJE (MODRIČA, REPUBLIC OF SRPSKA)

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This study was conducted to identify melliferous higher plants of Dugo Polje (Modriča, Republic of Srpska). The total number of melliferous plants collected during the vegetation season 2012 was 137 taxa on species and subspecies level included in 111 genera and 49 families. The most numerous in melliferous plant species were families Fabaceae (16), Asteraceae (14), Lamiaceae (13) and Rosaceae (12). The hemicryptophytes and geophytes dominated in life form spectrum. The phytogeographical analysis showed that the Sub-Central European and Eurasian floral element were represented with the greatest number of taxa.

Key words: melliferous plants, Dugo Polje, flora

MEDONOSNA FLORA DUGOG POLJA (MODRIČA, REPUBLIKA SRPSKA)

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Rad predstavlja doprinos poznavanju medonosnih biljaka Dugog Polja (Modriča, Republika Srpska). Floristička istraživanja su sprovedena u vegetacijskoj sezoni 2012. godine. Ukupno je sakupljeno 137 biljnih taksona na nivou vrste i podvrste, sistematizovanih u 111 rodova i 49 porodica. Vrstama i podvrstama najbogatije porodice medonosnih biljaka su Fabaceae (16), Asteraceae (14), Lamiaceae (13) i Rosaceae (12). Hemikriptofite i geofite dominiraju u ekološkom spektru flore. Fitogeografska analiza pokazuje da najveći broj taksona pripada subsrednjeevropskom i evroazijskom flornom elementu.

Ključne riječi: medonosne biljke, Dugo Polje, flora

**ASSOCIATION DIPLITAXIETUM MURALIS (ASS. NEW) IN WEED
VEGETATION OF VINEYARD IN THE REGION OF HERZEGOVINA**

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Association with the species *Diplotaxis muralis* (L.) DC. is not reported until now in Bosnia and Herzegovina. In the syntaxonomic review of vegetation in Serbia (Kojic et al., 1998) it was noted the association of *Amarantho* (*blitoides*)-*Diplotaxietum muralis* Mijatovic 1971 classified as bond *Eragrostion* Tüxen 1950th. Association *Diplotaxietum muralis* (ass. new) in the vineyards of Bosnia and Herzegovina shows regional specificity dictated by the climate conditions, and is optimal developed in a winegrowing region of Herzegovina. The association is classified as Mediterranean syntaxonomic unit (*Diplotaxion* Br.-Bl. 1931 em 1936 *ordo Chenopodietalia mediterranea* Br.-Bl. 1931 em 1936), which significantly differs from the Eurosiberian region (*Polygono-Chenopodium* Koch 1926 em Sissing. 1946 i *Eragrostion* Tüxen 1950) primarily by the participation of thermophilic species. Stands of association *Diplotaxietum muralis* (ass. new) builds 38 species. In total floristic composition of the association 68.42% of the species are characteristic for the association and more syntaxonomical units, which is suggest that the association typically expressed and optimal developed in the vineyards region of Herzegovina. A typical composite of association build four species: *Diplotaxis muralis* (L.) DC., *Convolvulus arvensis* L., *Chenopodium album* L. and *Setaria glauca* (L.) Beauv. Analysis of biological spectrum show terophytic character of association. Stands of association *Diplotaxietum muralis* (ass. new) are fully developed throughout the vineyard area in the summer and autumn terms. Areal spectrum of association *Diplotaxietum muralis* (ass. new), with seven group of floral elements are significantly distinguish from associations of *ordo Chenopodietalia albi* Tüxen, Lohm. et Prsg. 1950. Gradient analysis shows the greatest dependence on floristic composition of the association *Diplotaxietum muralis* (ass. new) compared to the chemical reaction of the substrate, slightly lower than the content of nitrogen in the soil and light, while the lowest dependence on soil moisture and temperature. Numerical classification performed by UPGMA method can distinguish two groups of stands which precisely confirm the results of correspondence analysis.

Keywords: *Diplotaxietum muralis* (ass. new), syntaxonomic position, biological spectrum, floral elements, numerical classification, correspondence analysis.

**ASOCIJACIJA DIPLITAXIETUM MURALIS (ASS. NOVA) U KOROVSKOJ
VEGETACIJI VINOGRADA REJONA HERCEGOVINA**

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Asocijacija sa vrstom *Diplotaxis muralis* (L.) DC. do sada nije opisana u Bosni i Hercegovini. U sintaksonomskom pregledu vegetacije Srbije (Kojić et al., 1998) konstatovana je asocijacija *Amarantho (blitoides)-Diplotaxietum muralis* Mijatović 1971 svrstana u svezu *Eragrostion* Tüxen 1950. Asocijacija *Diplotaxietum muralis* (ass. nova) u vinogradima Bosne i Hercegovine pokazuje regionalnu osobenost uslovljenu klimatskim karakteristikama, te je optimalno razvijena u vinogradarskom rejoni Hercegovina. Asocijacija je svrstana u mediteransku sintaksonomsку jedinicu (*Diplotaxion* Br.-Bl. 1931 em 1936 iz reda *Chenopodietaalia mediterranea* Br.-Bl. 1931 em 1936) koja se značajno razlikuje od sintaksonomskih jedinica eurosibirske regije (*Polygono-Chenopodion* Koch 1926 em Sissing. 1946 i *Eragrostion* Tüxen 1950) prvenstveno po učeštu termofilnih vrsta. Sastojine asocijacije *Diplotaxietum muralis* (ass. nova) izgrađuje 38 vrsta. Od ukupnog florističkog sastava asocijacije 68,42 % vrsta su karakteristične za asocijaciju i više sintaksonomske jedinice, što govori da je asocijacija tipično izražena i optimalno razvijena u vinogradima rejona Hercegovina. Potpuni karakteristični skup asocijacije izgrađuju četiri vrste: *Diplotaxis muralis* (L.) DC., *Convolvulus arvensis* L., *Chenopodium album* L. i *Setaria glauca* (L.) Beauv. Analizom biološkog spektra asocijacije može se konstatovati izrazito terofitski karakter. Sastojine asocijacije *Diplotaxietum muralis* (ass. nova) su potpuno razvijene na cijeloj površini vinograda u ljetnjem i jesenjem aspektu. Areal spektar asocijacije *Diplotaxietum muralis* (ass. nova), u kojem učestvuje sedam grupa flornih elemenata se značajno razlikuje od konstatovanih asocijacija reda *Chenopodietalia albi* Tüxen, Lohm. et Prsg. 1950. Gradjentna analiza pokazuje najveću zavisnost florističkog sastava sastojina asocijacije *Diplotaxietum muralis* (ass. nova) u odnosu na hemijsku reakciju podloge, nešto manju u odnosu na sadržaj azota u zemljištu i svjetlost, dok je najmanja zavisnost u odnosu na vlažnost zemljišta i temperaturu. Numeričkom klasifikacijom vršenom UPGMA metodom mogu se izdvojiti dvije grupe sastojina što preciznije potvrđuju rezultati ordinacije vršene korespondentnom analizom.

Ključne riječi: *Diplotaxietum muralis* (ass. nova), sintaksonomski položaj, biološki spektar, florni elementi, numerička klasifikacija, korespondentna analiza.

pH VALUE OF THE SOIL, YIELD FAKTOR OF SOME MEDICINAL PLANTS

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Cultivated and wild medicinal plants for optimal growth and development require various environmental and edaphic (soil) conditions, from which some of the plant species are adaptable only to certain habitat. One of the indicators of soil quality, which affects the growth and development of plants and the subsequent yield formation is a pH value or soil reaction. Based on the pH value, soil is divided into five groups: I alkaline ($> \text{pH } 7.20 \text{ M KCl}$), II neutral (6.51 to 7.20), moderate acid III (5.51 to 6.50), IV strong acid (4.51 to 5.50) and V are ultra acid (< 4.50). The optimum pH for most cultivated and wild plants belongs to neutral soil. On such soils medicinal herbs are the best in adopting present macro and micronutrients. On the other hand, certain types of cultivated and wild herbs can be better in adopting nutrients and achieving higher yield and quality of drugs. In our research we tested three plant species: Lavender (*Lavandula officinalis* Chaix.), Centaury (*Centaureum umbellatum* Gilib.) and Grecian foxglove (*Digitalis lanata* Ehrh.). Studies were carried out on the soils of different pH values, namely: 1. weak acidic (pH = 5.6), 2. neutral (pH = 6.9) and 3. the alkaline (pH-8, 3). Monitoring was conducted in the second year of cultivation. Reproduction of all three plant species was carried out through the production of seedlings in the spring of 2011. Research was carried out during 2012, in a randomized complete block system in four repetitions with randomized variants schedule. All agro technical operations were carried out by the usual procedure. Harvesting was done at the time of the technological maturity of each species, and the measurement yield of (lavender) flowers, herb (Centaury) and the leaf (Grecian foxglove) was performed after drying the plant material in the thermal dryer at a temperature of 45 ° C. The highest average yield on the low acidity soil of 1211 kg ha⁻¹ was achieved by Centaury, which was also the highest yield of this herb specie taken by all studied pH values. For 44.0% lower yield was recorded in lavender and 50.8% in Grecian foxglove. The biggest influence on the yield of lavender flowers had a neutral pH value of the soil. On the soil with a pH 6.9 Lavender has made 1156 kg ha⁻¹ flower, Grecian foxglove made 898 kg ha⁻¹ of leaf and Centaury made 860 kg ha⁻¹ herb. The highest average yield on the alkaline soil was achieved in the production of Grecian foxglove leaf (1,243 kg ha⁻¹), lower production of the lavender flowers (1,036 kg ha⁻¹) and lowest in the production of herb Centaury (634 kg ha⁻¹). Yield of Centaury herb was decreasing with the increase of pH value, yield of lavender flower was the highest on the soil of neutral reaction, while the yield of Grecian foxglove was increasing with the increase of pH value.

Keywords: soil pH value, cultivation of medicinal plants, yield.

pH VREDNOST ZEMLJIŠTA, FAKTOR PRINOSA NEKIH LEKOVITIH BILJAKA

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Gajeno i samoniklo lekovito bilje, za optimalan rast i razviće zahteva različite ekološke i edafiske (zemljjišne) uslove, od kojih su pojedine biljne vrste prilagodljive samo na određena staništa. Jedan od pokazatelja kvaliteta zemljjišta, koji utiče na rast i razviće biljaka i kasnije formiranje prinosa, predstavlja pH vrednost ili reakcija zemljjišta. Na osnovu pH vrednosti, zemljjišta su podjeljena u pet grupa: I alkalna ($>7,20$ pH u M KCl), II neutralna (6,51-7,20), III slabo kisela (5,51-6,50), IV kisela (4,51-5,50) i V jako kisela ($<4,50$). Optimalna pH vrednost za većinu gajenog i samoniklog bilja pripada grupi neutralnih zemljjišta. Na ovakvim zemljjištima lekovite biljke najbolje usvajaju prisutna makro i mikrohraniva. S druge strane, određene vrste gajenog i samoniklog lekovitog bilja, bolje usvajaju hraniva, te postižu viši prinos i kvalitet droge. U našim istraživanjima testirane su tri biljne vrste: lavanda (*Lavandula officinalis* Chaix.), kičica (*Centaurium umbellatum* Gilib.) i vunasti digitalis (*Digitalis lanata* Ehrh.). Istraživanja su vršena na zemljjištima različitih pH vrednosti i to: 1. na slabo kiselim (pH=5,6), 2. na neutralnom (pH=6,9) i 3. na alkalnom (pH=8,3). Praćenje je provedeno u drugoj godini gajenja. Razmnožavanje sve tri ispitivane biljne vrste obavljeno je preko proizvodnje rasada u proleće 2011 godine. Istraživanja su provedena u toku 2012 godine, po slučajnom kompletном blok sistemu, u četiri ponavljanja, sa randomiziranim rasporedom varijanti. Sve agrotehničke operacije provedene su po uobičajenoj proceduri. Žetva je obavljena u vreme tehnološke zrelosti svake od biljnih vrsta, a merenje prinosa cveta (lavanda), herbe (kičica) i lista (vunasti digitalis) vršeno je nakon sušenja biljnih delova u termičkoj sušari na temperaturi od 45 °C. Najveći prosečan prinos na slabo kiselim zemljjištu, od 1.211 kg ha-1 ostvarila je kičica, što je ujedno bio i najveći prinos ove biljne vrste gledano za sve istraživane pH vrednosti. Za 44,0% manji prinos zabeležen je kod lavande i za 50,8% kod vunastog digitalisa. Najviše uticaja na prinos cveta lavande imala je neutralna pH vrednost zemljjišta. Na zemljjištu sa pH 6,9 lavanda je ostvarila 1.156 kg ha-1 cveta, vunasti digitalis 898 kg ha-1 lista i kičica 860 kg ha-1 herbe. Najveći prosečan prinos na alkalnom zemljjištu ostvaren je pri proizvodnji lista vunastog digitalisa (1.243 kg ha-1), manji pri proizvodnji cveta lavande (1.036 kg ha-1) i najmanji pri proizvodnji herbe kičice (634 kg ha-1). Prinos herbe kičice je porastom pH vrednosti opadao, prinos cveta lavande bio je najveći na zemljjištu neutralne reakcije, dok je prinos lista vunastog digitalisa rastao porastom pH vrednosti.

Ključne reči: pH vrednost zemljjišta, gajeno lekovito bilje, prinos.

Section 2. Genetic Resources



FRUIT QUALITY OF NINE OLD APPLE CULTIVARS ON MM106 ROOTSTOCK

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The quality of the nine local apple cultivars ('Bijeli fler ', ' Carevic', 'Celenka', 'Crvena jesenska rebraca', 'Paradija', 'Paulaner weinapfel', 'Perovnjaca', 'Winter Banana' and 'Zuccalmaggio') was studied. Cultivars 'Bijeli fler', Crvena jesenska rebrača Paulaner weinapfel and Winter banana had significantly highest fruit mass, and Carević, Čelenka, Paradija and Zuccalmaggio the lowest. Cultivar 'Bijeli fler' had significantly the highest fruit height and cultivar 'Čelenka' the smallest. Cultivar 'Perovnjača' had significantly the widest fruits, a cultivar 'Zuccalmaggio' the narrowest. Cultivar 'Paradija' had significantly the highest fruit shape index and cultivar "Perovnjača" the smallest. Among red-colored cultivars, cultivars 'Carević' and 'Crvena jesenska rebrača' had significantly higher L and a values, while cultivar 'Čelenka' had significantly higher Chroma and Hue angle. Hue angle in this cultivar was 72 % higher than in cultivar 'Crvena jesenska rebrača' and 51 % higher than in cultivar 'Carević', showing nice and intensive red coloration of this cultivar. Among yellow-colored cultivars, cultivar 'Winter Banana' had significantly the highest L – value. There were no significant difference in a- value among cultivars 'Bel Fleur', 'Paradija ', and 'Zuccalmagio ' which had the highest values. Cultivar 'Paulaner Weinapfel ' had the highest b- value, and there were no significant differences among cultivars in Hue angle. The highest firmness had cultivar 'Zuccalmaggio ' and 'Paulaner Weinapfel ' the smallest. Cultivars ' Crvena jesenska rebrača ', had significantly highest SSC and cultivar Perovnjača the smallest. Cultivar 'Perovnjača ' had significantly highest TA, and there was significant difference compared cultivar 'Čelenka'. Cultivars 'Crvena jesenska rebrača', 'Paradija', 'Winter Banana', 'Paulaner Weinapfel' and 'Zuccalmaggio' had significantly lowest TA and there was no statistical difference among these cultivars. Cultivar 'Crvena jesenska rebrača' had significantly highest SSC : TA ratio, and cultivar 'Perovnjača' the lowest. The main disadvantage of these cultivars was small fruit size. Before reintroduction of these cultivars into production, it is necessary to evaluate improving their fruit size by pruning, fertilizing and thinning.

Keywords: *Malus x domestica* Borkh.; fruit quality; conservation; pomology; biodiversity

**KARAKTERISTIKE AUTOHTONE KRUŠKE(*PYRUS COMMUNIS*) CV.
KARAMUT**

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Područje Potkozarja ima veoma povoljne prirodne uslove za gajenje voćaka, pored dobrih prirodnih uslova geostrateški položaj regiona uticao je na česte migracije raznih naroda koji su sa sobom donosili pored običaja i neka materijalna dobra, a između ostalog i razne vrste i sorte voćaka. Navedeni razlozi su uticali na gajenje i širenje određenih sorti voćaka. Kako nema dovoljno pisanih tragova o ovim događajima, tko nema zapisa i o nazivima pojedinih sorti koje se često gaje na ovom području, pa se na veoma malim geografskim udaljenostima jedna ista sorta sreće pod različitim nazivima ili se više sorti naziva jednim imenom. S obzirom na potražnju sadnica autohtone sorte krušaka cilj nam je bio da u regionu Gradiške izvršimo inventarizaciju, karakterizaciju i djelomičnu evaluaciju autohtone sorte kruške Karamut. U ekspediciji koja je obavljena 2009. godine na području opštine Gradiška i Prnjavor izdvojena su 4 stabla kruške koje vlasnici stabala i lokalno stanovništvo nazivaju karamut. Detaljnija pomološkim istraživanjima sastojala su se u utvrđivanju osnovnih pomološki karakteristika ploda (nasa ploda, visina ploda, širina ploda, oblik ploda i boja pokožice ploda) i nekih tehnoloških vrijednosti (čvrstoća mesa ploda i sadržaj suve materije ploda). Na osnovu dobijenih rezultata konstatovali smo da se sve četiri odabrane priove morfološki međusobno razlikuju, što ukazuje da među njima postoje i genetičke razlike. Da bismo uradili potpunu evaluaciju i izvršili standardizaciju u proizvodnji sadnica ove sorte neophodna su i dodatna genetička istraživanja.

Ključne riječi: kruška; karamut; genotip; pomološka

**POLLEN GERMINATION OF MYROBALAN, CORNEL AND SWEET CHERRY
GENOTYPES IN NORTH MONTENEGRO AREA**

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The vitality of pollen units their functional ability is of great importance for the success of fruit fertilisation. For the proper selection of good pollinatos sit necessary to do pollen germination of examined units as same as analyses of flowering periods. In three year period the pollen vitality of Myrobalan, Cornel and Sweet Sherry genotypes in North Montenegro area was examined. The examination of pollen germination was done by direct method which based on germination polen units on nutritive medium. The aim of the study is examination of pollen germination in controlled conditions, which is reliable sign of their vitality in natural conditions. Myrobalan genotypes, which average 77,66 %, have vital pollen units. A bit smaller pollen germination is shown at Cornel genotypes (average 51,93 %) and Sweet Sherry (average 48,62 %). Cornel genotype with the best pollen germination is D 4 with average 64,36 %, and Sweet Sherry genotype with 60,77 %.

Keywords: germination; pollen; Myrobalan; Cornel; Sweet Sherry

**KLIJAVOST POLENA GENOTIPOVA DŽANARIKE, DRIJENA I TREŠNJE SA
PODRUČJA SJEVERNE CRNE GORE**

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Vitalnost polenovih zrna ili njihova funkcionalna sposobnost je od velikog značaja za uspjeh oplođenja kod voćaka. Za pravilno određivanje kvalitetnih oprašivača potrebno je, pored analiziranja perioda cvjetanja, utvrditi i kljajost polena ispitivanih jedinki. U toku trogodišnjeg perioda proučavana je vitalnost polena genotipova džanarike, drijena i trešnje sa teritorije sjeverne Crne Gore. Ispitivanje kljajosti polena je vršeno direktnom metodom koja se zasniva na naklijavanju polenovih zrna na hranljivoj podlozi. Cilj rada je ispitivanje kljajosti polena u kontrolisanim uslovima, što je pouzdan pokazatelj njegove vitalnosti u prirodnim uslovima. Genotipovi džanarike, sa prosječnih 77,66 %, se odlikuju vitalnim polenovim zrnima. Znatno manja kljajost polena je utvrđena kod genotipova drijena (prosječno 51,93 %) i trešnje (prosječno 48,62 %). Genotip drijena koji je imao najbolju kljajost polena je D 4 sa prosječnih 64,36 %, a genotip trešnje A 4 sa 60,77 %.

Ključne riječi: kljajost; polen; džanarika; drijen; trešnja

**INVENTORY AND COLLECTION OF LOCAL GENETIC RESOURCES FROM
VEGETABLE CROPS FOR THEIR CONSERVATION AND TARGETED USE**

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By the implementation of bilateral research project between Bulgaria and China inventory and collection of local plant genetic resources from the Bulgarian and Chinese flora is carried on with a view to their preservation and targeted use. During the period 2011-2012 several expeditions in the rural areas of South Bulgaria were conducted. Inventory of the areas was performed using the GPS system. The National collection was enriched with 134 local vegetable accessions and 98 valuable genotypes originated from China. Collected materials are listed in the National Register PHYTO'2000, according to international descriptors of FAO, ECP/GR and Bioversity International. The accessions are included in survey and are stored at the long-term conditions in the National Genebank.

Keywords: local vegetable accessions, collection, documentation, evaluation, conservation

**APPLICATION OF STATISTICAL METHODS FOR EVALUATION OF LOCAL
PHASEOLUS VULGARIS L. EXPERIMENTAL DATA**

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Beans are a traditional crop grown almost anywhere in the country. The local forms are well adapted to specific agro-climatic conditions in the growing areas and are an interesting initial material for selection programs. The aim of the study is the implementation of statistical methods for evaluation and compare the biological and economic properties of Phaseolus vulgaris L. local accessions. The included genotypes were collected from expeditions by bilateral cooperation project with China. The experiment was conducted in the experimental field of IPGR, Sadovo. Plants are characterized by quantitative and qualitative indicators, according to the International descriptor of IBPGRI (1982). The results indicate a high genetic diversity in the studied collection and genetic sources with valuable economical characteristics are identified.

Keywords: Phaseolus vulgaris L., biological and economical indices, statistical evaluation

**CROPS WILD RELATIVES: SURVEYING AND CONSERVING IN ALPS OF
ALBANIA.**

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Albanian Alps with highly contrasts of the relief, valleys and surrounding alpine crests represent a treasury of wild plants diversity. The flora of Alps includes 1450 plant species, e.g. about 40% of the Albanian Flora or about 14 % of the European Flora. There are 11 endemic species; 95 sub-endemic species, and also 80 threatened species. Crop wild relatives (CWR) are taxa related to species of direct socio-economic importance, including food, fodder and forage crops, medicinal plants, condiments, ornamental and forestry species, as well as plants used for industrial purposes, such as oils and fibers. To analyze eco-geographic diversity of CWR collecting missions were realized in Northern part of Albania during 2012. 47 different CWR plants were investigated and collected. Geographic distribution maps of prioritized CWR species in natural areas were prepared.

**EVALUATION OF MORPHOLOGICAL TRAITS OF S. OFFICINALIS L. IN
NORTH OF ALBANIA.**

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The objectives of this study were to evaluate the distribution of diversity in six populations of *Salvia officinalis* in North of Albania by using morphological traits. Evaluation of morphological and biometric showed a pronounced variation among populations of *Salvia officinalis* grown wild from different natural sites in Shkodra region. Significant differences between populations were observed for all morphological traits quantified and two distinct groups of species accessions were observed after the principal components analysis. Principal component analysis (PCA) showed significant variation among populations, where 100 % of the total variation in the morphological data was separated on the first five components, indicating a high degree of correlation among traits studied. Based on the calculated coefficient of variation, PC1 expressed the highest variability (C.V. ~ 52%) and was followed by PC2 (C.V. ~ 33%), PC3 (C.V. ~ 10%), PC4 (C.V. ~ 3%), and PC5 . Furthermore, this study identified 6 highly diverse populations, providing opportunities for optimizing parental sources in future breeding programs to develop new or more productive *Salvia officinalis* varieties.

AEGILOPS SSP. PARTICIPATION IN DEVELOPMENT OF TRITICUM SSP

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Wheat is not only the oldest but also the most common and most important cultivated plant, where the human race is especially grateful for their development and civilization. Grown, more or less, in almost all latitudes, from the North Pole to the southernmost regions of Africa and South America, and to a greater or lesser extent in all soils and positions of the seashore to 4000 mns. Wheat is very suitable for growing: a resilient, adaptable to various climatic and geographical areas, does not require large investments nor time, nor labor, nor the means. As food is a complete food that contains all the essential elements of human life-humans can live only on bread and water. Despite the proportion of good knowledge of this important plant, interest in its origins, the origin, evolution, and properties of continuous improvement and further increases can be explained by, first of all, the needs of its further improvement and increase yield. Breeding of a plant, is based essentially on the introduction of new positive attributes, whether long evolutionary influence of the corresponding genes interact with environmental factors. To create a new variety, often genetic basis for some properties to be sought in ancestors forms and wild relatives of the genus Triticum L. that provide rich resources and considerable opportunities to create new and better varieties. For the origin and evolution of cultivated plants, especially for the creation of their properties and shape, genes and chromosomes mutations play an important role and mutual, spontaneous hybridization in the conditions of common simultaneous growth and development of a variety of related wild or cultivated and wild characteristics, varieties and species. Possibilities of the synthesis and creation of new, better or improved varieties are almost limitless, considering that genetic boundaries of a single plant is not reached. The aim of this paper is to show the evolution of wheat and the proportion of Aegilops L. species in the process.

Keywords: wheat; evolution; Aegilops L.

UDIO RODA AEGILOPS L. U NASTANKU RODA TRITICUM L.

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Pšenica je ne samo najstarija, nego i najrasprostranjenija i najznačajnija gajena biljka, kojoj je ljudski rod posebno zahvalan za svoj razvoj i civilizaciju. Gaji se, manje ili više, na gotovo svim geografskim širinama, od severnog pola do najjužnijih predela Afrike i Južne Amerike, i u većoj ili manjoj meri na svim zemljиштima i položajima od obala mora do 4000 m.n.s. Pšenica je veoma pogodna za gajenje: otporna je, adaptibilna različitim klimatskim i geografskim područjima, ne traži velika ulaganja ni vremena, ni rada, ni sredstava. Kao hrana je kompletna namirnica koja sadrži sve najvažnije elemente za život čoveka - može da se živi samo na hljebu i vodi. I pored srazmerno dobrog poznavanja ove značajne biljke, interesovanje za njeno poreklo, nastanak, evoluciju, osobine i oplemenjivanje i dalje neprekidno raste što se objašnjava, pre svega, potrebama njenog daljeg unapređenja i povećanja rodnosti. Oplemenjivanje jedne biljke, zasniva se u osnovi na unošenju novih pozitivnih svojstava, nastalim dugim evolucionim uticajem odgovarajućih gena u interakciji sa faktorima spoljne sredine. Da bi se nova sorta stvorila, često se genetske osnove za neka svojstva moraju tražiti u oblicima dalekih predaka i divljih srodnika roda Triticum L. koji pružaju bogate izvore i znatne mogućnosti za stvaranje novih i boljih sorti. Za porijeklo i evoluciju kultivisanog bilja, posebno za stvaranje njihovih osobina i oblika, veliki značaj imaju mutacije gena i hromozoma i međusobne, spontane hibridizacije u uslovima zajedničkog istovremenog rasta i razvoja raznih srodnih divljih ili divljih i kultivisanih odlika, varijeteta i vrsta. Mogućnosti sinteze i dobijanja novih, boljih sorti ili poboljšanja postojećih gotovo su neograničene, s obzirim na t što genetska granica ni jedne biljke nije dotignuta. Cilj ovog rada je da ukaže na evoluciju pšenice i ideo roda Aegilops L. u tom procesu.

Ključne riječi: pšenica; evolucija; Aegilops L.

**MORPHOLOGICAL CHARACTERIZATION OF OREGANO POPULATIONS IN
ALBANIA**

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Oregano (*Origanum vulgare L.*) is one of major aromatic plant that belongs to Labiateae family in Albania. Fourteen oregano samples were collected in North Albania and cultivated during 2011-2012. One year after planting, from the observations based on morpho-biometric traits was analyzed in order to determine the valuable morphological characters. A second harvest was carried out fresh weight and dry weight (g/plant) was registered. ANOVA indicated significant differences for majority of variables. Correlation analysis of the genetic distance matrix and the Euclidian distance matrix revealed significant correlation between them. The high level of morphological variability among the studied populations suggests approach attractive for the pharmaceutical industry, to the variability of cultivated material and for breeding programs in the future.

Keywords: *Origanum*; correlation; genetic distance; variability.

BIOMORPHOLOGICAL CHARACTERIZATION OF MAIZE LANDRACES FROM ALBANIA

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Conservation of maize genetic resources is now considered an important component for the Albanian Gene Bank. Supported by SEEDNet Project, during 2008-2010 we collected 13 local maize populations in the different locations. For the base collection, characterization and evaluation is necessary. The evaluation process involved the following elements: to male flowering, female flowering, during of plant period, plant height, ear height, stay green, number of leaves above the uppermost ear including ear leaf, stem color, tassel type. The results showed that the evaluated landraces have difference from our investigation, it emerged that the difference between the male flowering and female flowering was 2-9 days and the plant period was short in most part of the populations. The short vegetative period made possible the increase of their cultivation in the hill and mountain areas and in areas without irrigation. The statistical cluster analyses was accomplished the data collected on morph biological descriptors, processed through by Hierarchical Clustering Method and identified three varietal groups characterized according to metrical parameters and the locations of origin are identified. The populations of this study are an important source for in situ conservation and adapted maize landraces. Interventions may be designed to influence farmers' management of agro-biodiversity. By characterizing the landraces of maize it is be possible to identify the most distinct varieties and use these in breeding programs in a more effective way.

Keywords: Accession; diversity; genetic resources; landraces; variability.

INVENTORY OF WILD FRUIT TREES IN STARCEVICA FOREST PARK

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Wild fruit trees have a special significance in the plant genetic resources. They are a significant genetic potential important for selection and breeding. The subject of this research is inventory, and determination of the presence and spread of wild fruit trees, then the analysis of the site and associated woody species in a community in Starcevica Forest Park . Starcevica Forest Park area is the southern border of Banja Luka area, which separates the flat belt Lijevče field of canyon and mountain region of Krajina, which is formed further on the south. The total area is 1125.62 hectares. Inventory of wild fruit trees (apple, pear, cherry and service tree) was conducted on a sample basis in accordance with the methods used in the work SEEDNet regional working groups Fruit and Vitis and the ECP GR methodology for Wild Fruits and wild relatives of cultivated fruit trees. The size of each selected sampling units is 20x20 meters. On the 37 sampling units is inventoried a total of 1134 trees, of which 43 wild apple trees, 27 wild pear trees, 110 wild cherry trees, and 3 service trees. The rest of the trees represent other forest tree species. All trees are marked with GIS coordinate, for the trees for further study minimum passport descriptors were made. For each sample data on the habitat ecology and composition of associated woody species in the community were taken. The work will form the basis for further exploration of presence, status and distribution of wild fruit trees in areas exposed to anthropogenic impact, or for more detailed analysis of the characteristics of wild fruit trees, a conservation status and need to establish protective measures (conservation), as well as better use of these resources.

Keywords: inventory, wild fruit trees, plant genetic resources

**INVENTARIZACIJA SAMONIKLIH VRSTA VOĆAKA PARK ŠUME
STARČEVICA**

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Samonikle voćke imaju poseban značaj u okviru biljnih genetičkih resursa i predstavljaju značajan genetski potencijal od važnosti za selekciju i oplemenjivanje. Predmet ovog istraživanja je inventarizacija, odnosno utvrđivanje prisustva i zastupljenosti samoniklih vrsta voćaka, zatim analiza lokaliteta i pratećih drvenastih vrsta u zajednici na području park šume Starčevica. Područje Park šume Starčevica predstavlja južnu granicu gradskog područja Banja Luke, koji odvaja ravničarski pojas Lijevče polja od kanjonskog i planinskog dijela Krajine koji se formira dalje na jugu. Ukupna površine iznosi 1125.62 hektara. Inventarizacija samoniklih vrsta voćaka (jabuke, kruške, trešnje i oskoruše) urađena je na bazi uzoraka u skladu sa metodama koje se koriste u radu SEEDNet regionalne radne grupe Fruit and Vitis i prema ECP GR metodologiji za Wild Fruits, odnosno divlje srodnike gajenih voćaka. Veličina površine svakog inventarisanog poligona iznosi 20x20 metara. Na 37 poligona je inventarisano ukupno 1134 stabla od čega 43 stabla divlje jabuke, 27 stabala divlje krušake, 110 stabala divlje trešnje i 3 stabla oskoruše. Ostala stabla predstavljaju ostale šumske vrste. Sva stabla su obilježena sa GIS koordinatama i za stabla za dalje proučavanje su uređeni minimalni pasoški deskriptori. Za svaki uzorak uzeti su i podaci o ekologiji staništa i sastavu pratećih drvenastih vrsta u zajednici. Rad će predstavljati osnov za dalja istraživanja zastupljenosti, stanja i rasprostranjenosti samoniklih vrsta voćaka na područjima izloženim antropogenom uticaju, odnosno za detaljnije sagledavanje karakteristika samoniklih vrsta voćaka, stanje ugroženosti i potreba utvrđivanja mjera zaštite (konzervacije), kao i bolje iskorišćavanje ovih resursa.

Ključne riječi: inventarizacija, samonikle vrste voćaka, biljni genetički resursi,

OLD TOMATO POPULATIONS AS A POTENTIAL IN BREEDING FOR INCREASED LYCOPENE AND B CAROTENE CONTENT

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In order to collect, preserve and choose tomato genotypes (*Lycopersicon esculentum* Mill.) for breeding for increased lycopene and Beta carotene content, 35 genotypes were studied. These genotypes originate from locations in Serbia with tradition of growing old tomato and domestic populations and varieties. These varieties were specific in their colour, shape, size, taste, purpose etc. They are the valuable part of the Institute for Vegetable Crops collection for selection for breeding for increased level of lycopene and Beta carotene content. Correlation of genotypes and traits was derived by applying multivariation technique of principal component analysis (PCA-Principal Component Analysis). PCA analysis has been performed for all characteristics of each group and the ratio of the major components was PC1 - 57.23% and PC2 - 42.77%. The genotype GK20 had the highest content of lycopene that took part in grouping genotypes with 15.536% and 12.643% of Beta carotene for all the studied genotypes. Grouped in this way, the genotypes were the starting material for the program of tomato selection for increased lycopene and Beta carotene content.

Keywords: *Lycopersicon esculentum* Mill; domestic populations; old varieties; gene fond; PCA grouping; breeding

**STARE SORTE I POPULACIJE PARADAJZA KAO POTENCIJAL U
OPLEMENJIVANJU NA POVEĆAN SADRŽAJ LIKOPENA I B KAROTINA**

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U cilju prikupljanja, očuvanja genofonda i izbora genotipova paradajza (*Lycopersicon esculentum* Mill.) za oplemenjivanje na povećan sadržaj likopena i beta karotena, ispitano je 35 genotipova poreklom iz Srbije, domaćih populacija i starih sorti sa lokacije sa tradicijom gajenja starih sorti. Sorte su se isticale specifičnošću po boji, obliku, veličini, aromi, nameni i sl. One će se deo Kolekcije Instituta za povrtarstvo, i predstavljaju dragocen materijal u selekciji i oplemenjivanju paradajza u programu povećan sadržaj likopena i beta karotena. Povezanost genotipova i osobina izvedena je multivarijacionom tehnikom Analizom glavnih komponenti (PCA-Principal Component analysis). PCA analiza prema svakoj grupi osobina a odnos glavnih komponenti je PC1 - 57,23%, a PC2 – 42,77%. Najveći sadržaj likopina bio je kod genotipa GK20, koji je i procentualno uzeo učešća u grupisanju genotipova 15,536% i beta krotina 12,643% u odnosu na sve ispitivane genotipove. Ovako grupisani genotipovi predstavljaju početni material za program selekcije na paradajza sa povećanim sadržajem likopina i beta karotina.

Ključne riječi: *Lycopersicon esculentum* Mill; domaće populacije i stare sorte; genofond; PCA grupisanje; oplemenjivanje

**DEVELOPMENT OF HORTICULTURAL OBJECTS IN THE STRUCTURE OF
URBAN MATRIX OF BANJA LUKA**

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Horticultural objects in the urban development of Banja Luka are the subject and the frame of this study. In the context of urban matrix transformation, and based on the literature and written and graphic archives, as well as facts established in the field, the developmental trends of horticultural objects were analyzed through certain historical periods. The analytical approach of this research supports traditional integration of the functional structures of the city, through the protection of the urban landscape, its morphology and natural environment. Influential factors (natural, created and socio-economic) determine the dynamics of the processes of structural change in the urban matrix. Sustainable development of Banja Luka should be in the focus of planning settings, as well as the preservation of traditional values of the green city attribute. Study results indicate that Banja Luka has created its identity through ages, which is important to keep in any future visions of city development, because memory defines the essence of the spiritual map of the urban environment. The results of the study should be implemented in the planning, design and regeneration of horticultural objects for efficient solving of the current problems, as well as for the continuous monitoring of changes in ways of using green spaces in Banja Luka.

Keywords: horticultural objects; green matrix; sustainable development; urban transformation

**RAZVOJ OBJEKATA HORTIKULTURE U STRUKTURI URBANE MATRICE
BANJALUKE**

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Objekti hortikulture u procesu urbanog razvoja Banjaluke su predmet i tematski okvir ovoga istraživanja. U kontekstu transformacije urbane matrice, a na temelju literature, te pisane i grafičke arhivske građe, kao i na terenu ustanovljenih činjenica, analizirani su razvojni tokovi objekata hortikulture kroz određene istorijske epohe. Analitički pristup ovog istraživanja podržava tradicionalne integracije funkcionalnih struktura grada kroz zaštitu urbanog pejzaža, njegove morfologije i prirodnog okruženja. Uticajni faktori (prirodni, stvoreni i socio-ekonomski) određuju dinamiku procesa svih strukturnih promjena urbane matrice. Održivi razvoj Banjaluke treba da bude u fokusu planerskih postavki, ali i očuvanje ambijentalne vrijednosti obilježja zelenog grada. Rezultati istraživanja ukazuju da je Banjaluka stvarala svoj identitet kroz vijekove, koji je neophodno zadržati u budućim vizijama razvoja grada, jer memorija definiše suštinu duhovne mape urbane sredine. Rezultate istraživanja moguće je implementirati na polju planiranja, uređenja i regeneracije objekata hortikulture kako za efikasnije rješavanje aktuelnih problema, tako i za stalno praćenje promijena u načinima korišćenja zelenih prostora Banjaluke.

Ključne riječi: objekti hortikulture; zelena matrica; održivi razvoj; urbane transformacije

**MORFOMETRIC CHARACTERISTICS OF TELESTES METOHIENSIS FROM
DIFFERENT WATERCOURSES OF DABAR FIELD**

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Endemic species *Telestes metohiensis* (striped pijor) inhabit number of watercourses of Eastern Herzegovina and every watercourse in Dabar field. In the last decades habitat conditions of this species have been changed significantly. Watercourses from Dabar field differ in the quality of the environment, with both physicochemical and microbiological aspect. Some watercourses are active during the entire year, with lower or higher flow, while some has temporary character. In the study are monitored basic morfometric characteristics: total and standard length, and beside them mass and Fulton's coefficient of condition were determined in pijors from three watercourses of Drabar field Vrijek, Opačica, Pribitul). Analysis of collected data and comparation of monitored characteristics in individuals from different watercourses was done using relevant statistical methods. Results of some parameters show significant difference. The highest values were noted in the individuals from the river Opačica, while the lowest except the Fulton's coefficient of condition, were noted in fish from Pribitul watercourse.

Keywords: Keywords: striped pijor; endemic species; Dabar field

MORFOMETRIJSKE KARAKTERISTIKE TELESTES METOHIENSIS IZ RAZLIČITIH VODOTOKA DABARSKOG POLJA

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Endemična vrsta *Telestes metohiensis* (gatačka gaovica) naseljava veći broj vodotoka Istočne Hercegovine i sve tekućice u Dabarskom polju. U poslednjim decenijama u značajnoj mjeri su promjenjeni uslovi u većini staništa ove vrste. Vodotoci Dabarskog polja se međusobno razlikuju po kvalitetu životnih uslova, kako sa fizičko-hemijiskog tako i sa mikrobiolškog aspekta. Neki vodotoci su aktivni čitave godine, sa manjim ili većim proticajima, dok su neki privremenog karaktera. U radu su praćene osnovne morfometrijske karakteristika: totalna i standardna dužina, a pored njih određeni su masa i Fultonov koeficijent uhranjenosti kod gaovica iz tri vodotoka Dabarskog polja (Vrijeka, Opačica, Pribitul). Relevantnim statističkim metodama izvršena je obrada dobijenih podataka i komparacija praćenih karakteristika kod jedinki iz različitih vodotoka. Rezultati pokazuju postojanje značajnih razlika u vrijednostima pojedinih parametra. Najveće vrijednosti su konstatovane kod jedinki iz rijeke Opačice, dok su najmanje izuzev Fultonog koeficijenta uhranjenosti utvrđene kod gaovica iz vodotoka Pribitul.

Ključne riječi: Ključne riječi:gaovica; endemi; Dabarsko polje

*Section 3. Agricultural Economics and Rural
Development*



**EXPLORING THE EFFECTS OF THE GLOBAL ECONOMIC CRISIS ON
AGRICULTURE AND RURAL AREAS IN BOSNIA AND HERZEGOVINA**

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In Bosnia and Herzegovina (BiH), agriculture employs about 20% of the total labour force while around 61% of the population is rural. Living standards in rural Bosnia improved before the global economic and financial crisis (GEFC), which started revealing its impact in the last quarter of 2008; economic activity decelerated and the already high rate of registered unemployment picked up. The work aims at exploring the effects of the GEFC on the Bosnian agriculture and rural areas. The paper is based on secondary data from different sources including the Agency for Statistics of BiH. The review paper monitors the trends of some economic and social indicators: unemployment, inflation, agricultural trade, agricultural prices, farmer indebtedness and access to finance, gender equity, migration, rural poverty and vulnerability, agricultural investment, income, etc. The paper also describes the main measures introduced for relieving the consequences of the GEFC. A special attention was devoted to the evolution of agricultural budget and international aid. Bosnia was poorly prepared to the GEFC that affected more than 60% of households. Along with the recession (GDP fell by 2.9% in 2009) an immediate fall of exports and foreign remittances was experienced. This was followed by the increase of bank interest rates and the decrease of investments in a number of sectors including agriculture. Agricultural lending record, already poor before the GEFC, deteriorated reducing the access to loans and consequently the investments in the sector. This was aggravated by the decrease of agricultural budgets and a sharp decrease of official development aid. Assistance to agriculture sector as well as its share in total assistance also decreased in a dramatic way from 2010. The crisis reversed the hard-won gains in poverty reduction especially in rural areas. The GEFC is underlining the deficiencies in the agricultural sector and rural development policy. Bosnian policy makers should capitalise on the current crisis to make the necessary structural reforms. Relieving the consequences of the GEFC requires concerted efforts of public institutions, civil society organisations, the private sector and donors to foster Bosnian agriculture competitiveness and rural economy diversification.

Keywords: crisis; Bosnia; agriculture; rural economy.

**TRADE IN AGRICULTURAL PRODUCTS ON GREEN AND LIVESTOCK
MARKETS IN REPUBLIC OF SRPSKA**

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A significant part of agricultural products in Republic of Srpska is produced on farms. Features of this production are small amounts of marketable surplus, heterogeneous assortment of uneven quality, seasonal variations in supply and the like. All this makes the sale of these products to industrial processors and trade intermediaries more difficult. Therefore, a portion of agricultural products remain unsold or sold under unfavourable conditions (low cost, delayed payment). In such a situation, green and cattle markets arise as an efficient form of distribution of agricultural and other complementary products through which a successful connection between buyers and sellers can be made. The subject of this research is to analyze the agricultural products trade flows on green and livestock markets in Republic of Srpska. The analysis included the sale of products of plant and animal origin in the period since 2007 to 2011 year. Research in this study is intended to show the importance of sales of agricultural products in green markets. The results of the analysis show that the sales figures for the period 2007-2011 tends to fall at a rate of -4.6%. The largest share in sales of agriculture products is for products of plant origin with 65.5%, which has also decreased at a rate of -5.3%. The research is based on the available data gathered through a desk research method. Basic data are taken from the statistical publications of the Statistical Office of the RS, which are systematized using standard mathematical and statistical methods.

Keywords: sales of agricultural products; local markets; Republic of Srpska

**PROMET POLJOPRIVREDNIH PROIZVODA NA ZELENIM I STOČNIM
PIJACAMA U REPUBLICI SRPSKOJ**

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Značajan dio poljoprivrednih proizvoda u Republici Srpskoj proizvodi se na poljoprivrednim gazdinstvima. Karakteristika ove proizvodnje su male količine tržnih viškova, heterogen asortiman, neujednačen kvalitet, sezonske varijacije u ponudi i sl. Sve ovo otežava ili onemogućava prodaju ovih proizvoda industrijskim preradivačima ili trgovinskim posrednicima. Zbog toga jedan dio poljoprivrednih proizvoda ostaje neprodat ili se proda pod nepovoljnim uslovima (niske cijene, odgođena naplata). U takvoj situaciji zelene i stočne pijace se javljaju kao efikasan vid distribucije poljoprivrednih i drugih komplementarnih proizvoda putem kojih se uspješno mogu spojiti kupci i prodavci. Predmet ovih istraživanja je analiza kretanja prometa poljoprivrednih proizvoda na zelenim i stočnim pijacama u Republici Srpskoj. Analiza je obuhvatila prodaju proizvoda biljnog i animalnog porekla u periodu od 2007. do 2011. godine. Istraživanja u ovom radu imaju za cilj da ukažu na značaj prodaje poljoprivrednih proizvoda na zelenim pijacama. Rezultati analize pokazuju da je prodaja u posmatranom periodu imala tendenciju pada po stopi od -4,6%. Najveći udio u prodaji poljoprivrednih proizvoda ima prodaja proizvoda biljnog porijekla sa 65,5% koja takođe bilježi pad po stopi od -5,3%. Istraživanje je bazirano na raspoloživim podacima, uz primjenjeni metod "istraživanje za stolom" ("desk research"). Osnovni podaci preuzeti su iz statističkih publikacija Republičkog zavoda za statistiku RS, koji su u radu sistematizovani primenom standardnih matematičko-statistički metodama.

Ključne riječi: prodaja poljoprivrednih proizvoda; pijace; Republika Srpska

**THE IMPORTANCE OF MODELS IN AGRO ECONOMICAL RESEARCH OF
CATTLE PRODUCTION**

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In this paper shows the importance of modeling and model in agro economical research of cattle production. The research is based on the assumption that the model is a simplified picture of reality. Use of the model requires the use of analogies and chronology. Logical model farm, which is being investigated is created at the start of research. Logical model contains a description of the main elements of the system and the relationships between them. The mathematical model is a mathematical formulation of the logical model. Techniques of using these two models allow experiments "in vitro" on cattle farms. In this way there is the possibility of monitoring system behavior according to changes in the parameters.

Keywords: farm; system; logical model; mathematical model

**ZNAČAJ MODELA U AGROEKONOMSKIM ISTRAŽIVANJIMA GOVEDARSKE
PROIZVODNJE**

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U radu se navodi značaj modelovanja i modela u agrekonomskim istraživanjima govedarske proizvodnje. Polazi se od pretpostavke da je model pojednostavljena slika stvarnosti. Upotreba modela zahtijeva primjenu analogije i hronologije. Istraživanje počinje izradom logičkog modela gazdinstva koje se istražuje. Logički model obuhvata opis najvažnijih elemenata sistema i relacija između njih. Matematički model predstavlja matematičku formulaciju logičkog modela. Korišćenjem logičkih i matematičkih modela u agroekonomskim istraživanjima govedarske proizvodnje moguće je izvoditi eksperimente "in vitro". To znači da je moguće pomoći modela pratiti ponašanje objekta koji se istražuje na promjenu pojedinih parametara.

Ključne riječi: farma; sistem; logički model; matematički model

THE IMPORTANCE OF CLUSTERING OF ENTERPRISES IN THE FIELD OF AGROINDUSTRY

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The role and importance of the cluster is to enable small and medium of enterprises and individual entrepreneurs and farmers to grow and develop in order to ensure greater competitiveness in the agro-industrial market. Clusters enable its members to easily connect with large manufacturing and business systems in the field of agriculture and trade, and thus to provide a number of competitive advantages over the competition in the field of primary agricultural production, food processing and marketing of products. Clusters are formed independently, but it is common practice to do so by the initiative of the local community or region, and also states may encourage the formation and development of clusters. Agriculture-related industries both have long-term significance and are strategically important. In agricultural production, there are certain rules and standards relating to the quality of agricultural and food products, which makes it difficult for individual producers or SMEs in agribusiness, which can be achieved through their association into clusters. Clusters provide significant advantages in the field of economics of scale, security of supply in the market in sufficient quantity, range and quality of products. This is especially true for export-oriented producers. Agro-industrial clusters allow for greater productivity, innovation of production and use of modern production technologies, the application of modern management methods, as well as greater efficiency and effectiveness. The task of clustering is to connect manufacturers with research institutions to provide education of cluster members in agro-business and its development, and in marketing and sales. This paper analyzes the experience and practice of the existing clusters in the field of agro-industry in Serbia, with all the advantages and disadvantages over the past few years of their existence. The conclusion provides recommendations for improving existing practices of existence, functioning and development of the cluster.

Keywords: cluster, agro-industry, management, competitiveness, growth and development

ZNAČAJ KLASTERIZACIJE PREDUZEĆA U OBLASTI AGROINDUSTRIJE

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Uloga i značaj klastera je da omogući malim i srednjim preduzećima, ali i individualnim preduzetnicima i poljoprivrednim proizvođačima rast i razvoj, kako bi obezbedili veću konkurentnost na zahtevnom agroindustrijskom tržištu. Klasteri omogućuju da se njegove članice lakše povezuju sa velikim proizvodnim i poslovnim sistemima u oblasti agrara i trgovine i da na taj način obezbede brojne komparativne prednosti u odnosu na konkureniju u oblasti primarne poljoprivredne proizvodnje, prehrambene industrije i plasmana proizvoda. Klasteri se formiraju samoinicijativno, ali je češća praksa da se to čini uz inicijativu lokalne zajednice ili regionala, a takođe i država svojim merama može podsticati formiranje i razvoj klastera. Agroindustrija predstavlja jednu od dugoročno perspektivnih industrijskih grana od strateškog značaja. U oblasti poljoprivredne proizvodnje postoje određena pravila i norme vezana za kvalitet poljoprivrednih i prehrambenih proizvoda što predstavlja poteškoću za svakog individualnog proizvođača, odnosno za mala i srednja preduzeća u oblasti agrobiznisa, a što se jednostavnije obezbeđuje putem njihovog udruživanja u klastere. Klasteri omogućuju značajne prednosti i u oblasti ekonomije obima, sigurnosti snabdevanja tržišta u potrebnom obimu, assortimanu i kvalitetu proizvoda. To posebno važi za one proizvođače koji imaju strategiju internacionalizacije agrobiznisa. Agroindustrijski klasteri omogućuju veću produktivnost, inovaciju proizvodnje i primenu savremenih proizvodnih tehnologija, primenu savremenog menadžmenta u upravljanju poslovanjem, kao i veću efikasnost i efektivnost. Zadatak klastera je da povezuje proizvođače sa naučno-istraživačkim institucijama, da obezbedi obrazovanje članica klastera iz različitih oblasti agroindustrije, poslovanja i razvoja, marketinga i prodaje. U radu se analizira iskustvo i praksa postojećih klastera u oblasti agroindustrije Srbije, sa svim prednostima i nedostacima tokom poslednjih nekoliko godina njihovog postojanja. Na kraju se daju preporuke za unapređenje postojeće prakse postojanja, funkcionisanja i razvoja klastera.

Ključne riječi: klaster, agroindustrija, menadžment, konkurentnost, rast i razvoj

COST ANALYSIS, THE HIGHLIGHT OF BUSINESS MANAGEMENT

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Background: Design and analysis of variances calculated between the objectives set out in the company's budget and performance is very important for its effective operation. With this research I am trying to influence and contribute in some way responsible young managements for analysis of their businesses, according to the principles, rules and methods presented. The aims of this study were: 1. calculation and analysis of different types of production costs and deviations 2. analysis of the limits and the conditions of its application. **Methods:** The study was conducted in a factory which produces footwear. For a period of one year are estimated variable costs and fixed costs of the company during the manufacturing process. With the methods we have used, we have noticed how the costs have changed over the period of one year, from 100,000 units to 200,000 units and also analyzed to avoid the quantity, price and common variance. **Results and Conclusions:** After doubling the product it has been observed that large volumes reached according what was programmed allowed the manufacturing management to soften the largest part of fixed costs (51 million more than 90 million euro in costs on the budget). But his service was not exciting for production efficiency, because it was as distinct, especially below the programmed one (deviation of 75 million negative). Therefore, the results remain negative in the production area, but thanks to the positive "false" variance of volumes that change dimension. Costs are a management tool and the company has realized this made them a competitive weapon. In terms of variance it must be said that the division of the total variation in a subset variation is not deprived from some variances, let's think about the variety of mix in the sales level and margin contribution, price-cost variation, usage opportunities and alternative formulas in comparison to those proposed to isolate these variances to the direct cost. Furthermore, it cannot be considered, at least in a first level of analysis, the possible combined effects of measurable factors, or not, to a certain variation.

Keywords: Cost Analysis, Cost Variance, Analysis.

DECISION MAKING IN FRUIT PRODUCTION

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The process of decision making presents the rational choice of one between the available alternatives expected to offer the most favourable solution to issues in the field of fruit production but knowledge in both fruit growing and the economy is required as well. Prior to decision making apart from agronomic knowledge, economic principles need to be taken into account as well, namely analyze carefully where to invest the financial means in order to achieve the highest possible revenue. Today in the process of decision making, models are given major priority. Previously genuine systems were used for a trial in practice. Later on, the method of stimulation has been introduced offering the possibility of experimenting on models used as substitutes for an already existing genuine system. In general, a model can be considered a system offering either quantitative or qualitative description of the problem encountered. The above mentioned models have thus found their application in fruit production as well being known as investment models, primary production models, processing models, models of financial business, etc. Investment stimuli in the production and processing of fruit are based on the data obtained from the analysis of farm or enterprise business activities. Based on these data, problems tend to be easily revealed but also solutions to their overcoming.

Keywords: decision making; production fruit; models; economic

DONOŠENJE POSLOVNIH ODLUKA U PROIZVODNJI VOĆA

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Proces odlučivanja, kao racionalni izbor jedne od skupa raspoloživih alternativa koje će na najbolji način razrešiti neku situaciju ili problem u sferi voćarske proizvodnje zahteva znanje iz oblasti voćarstva, sa jedne i ekonomije, sa druge strane. Pre donošenja konačne poslovne odluke pored agronomskih mora da se rukovodi i ekonomskim principima, tj. da se sagleda gde će uložiti finansijska sredstva da bi se ostvario najveći mogući iznos dobiti. U današnje vreme, u procesu donošenja poslovnih odluka, veliki značaj se pridaje modelima. Nekada se u praksi eksperimentisalo na realnim sistemima, da bi se kasnije uveo metod simulacije koji daje mogućnost da se eksperimentisanje obavlja na modelima, koji predstavljaju zamenu za određeni realni sistem. Model je sistem koji mora da dà kvantitativni ili kvalitativni opis problema. Iz navedenih razloga modeli su našli svoju primenu i u voćarskoj proizvodnji kao modeli investicionog ulaganja, modeli primarne proizvodnje, modeli prerade, modeli finansijskog poslovanja, itd. Podsticaji za investiranje u proizvodnju i preradu voća zasnivaju se na informacijama dobijenim analizom poslovanja gazdinstva ili preduzeća. Na osnovu ovih informacija, dolazi se do saznanja o konkretnim problemima u ovoj proizvodnji i kako treba da se rešavaju.

Ključne riječi: poslovne odluke; voćarstvo; modeli

INTERNAL AND EXTERNAL MIGRATION IN AGRICULTURE

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The globalization of the contemporary economy creates new challenges for modern society. Ecological problems, conflicts, aging populations in some parts of the world as opposed to the high birth rate in other ones, generate the disbalance of labor. Availability and, consequently, increasing the opportunities for labor mobility leads to migration growth. In these conditions occurs the interaction of cultural interests. Consequently such processes generate previously unknown challenges in various aspects of the life. Investigation of this challenges, its structure and origin in the context of international and internal migration will be the basis of the article. Initially it will reviewed a simpler example - aspects of internal migration, leading to differences in the socio-economic development between regions of one country. The article will consider the ways to control its trends and quantity, besides, will classified the possible benefits and risks of this process. Hereafter it will be discussed more complicated example - aspects of international migration, which has contradictory differences and inconsistencies in the cultures, customs, education, and language barriers, as well as tax policies of the different countries. The selected object of the research is the Krasnodar region of the Russian Federation. It is the agricultural sector of Russia and economically developed region. Complex of these factors in the Krasnodar region will make relevant the investigation of international and internal migration flows and the associated problems. This research is conducted with the support of the EU student exchange programme «Erasmus Mundus», on the basis of the University of Rome La Sapienza and the Kuban State Agrarian University.

Keywords: agricultural sustainability; internal migration; external migration; rural development; farm management

MODEL FOR MAXIMIZING THE USE OF AGRICULTURAL LAND FOR CATTLE FARMS

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In this paper, we carried out optimization of cattle breeding farm for milk production. For goal we use maximize the use of arable land. We used linear programming as a method for optimization. Model was created for the dairy farm with a capacity of 60 dairy cows and 45 acres of agricultural land. Maximum use of what has been obtained as a result of solving a linear programming model. Arable land is almost fully utilized (98,4 %). Post optimal analysis showed the quality of the optimal solution, then the competitiveness of certain inputs and outputs and the degree of utilization of individual capacities.

Keywords: cattle farm; optimization; linear programming; agricultural land

MODEL ZA MAKSIMIZACIJU KORIŠĆENJA POLJOPRIVREDNOG ZEMLJIŠTA NA GOVEDARSKOJ FARMI

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U radu je izvršena optimizacija govedarske proizvodnje na farmi za proizvodnju mlijeka uz respektovanje maksimizacije korišćenja oraničnog zemljišta kao kriterijuma optimalnosti. Za ovu svrhu korišćen je model linearнog programiranja sa koeficijentima koji imaju vrijednost jedan za aktivnosti biljne proizvodnje. Model je kreiran za govedarsku farmu usmjerenu na proizvodnju mlijeka, sa kapacitetom od 60 ležišta za muzna grla i sa 45 ha oraničnog zemljišta. Ostali koeficijenti imaju vrijednost nula. Rezultat modela osigurava maksimalno iskorišćavanje kapaciteta za muzna grla. Oranično zemljište je skoro u potpunosti iskorišćeno (98,4 %). Postoptimalna analiza je pokazala kvalitet optimalnog rješenja, zatim konkurentnost pojedinih inputa i autputa i stepen iskorišćavanja pojedinih kapaciteta.

Ključne riječi: govedarska farma; optimizacija; linearno programiranje; poljoprivredno zemljište

**OPPORTUNITIES FOR SUSTAINABLE MANAGEMENT OF LAND
RESOURCES IN THE MUNICIPALITY PRNJAVOR**

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The aim of this work is to present a synthesized view of land resources in the municipality Prnjavor as the basis for sustainable development of rural areas. The theme was selected due to the necessity of seeing the available land capacity of the Municipality, preceneed the access to the rational use of land a non-renewable natural resource, with potentially rapidrate and a really slow process of formation and regeneration. The land that is irreplaceable condition for rural development, should be adequately protected and rationally used and at the sametime explore the possibilities of its use in the development of various activities and purposes that contribute to the rural development. The aim and the expected result of the research conducted is to familiar with the situation and the problems that threaten this resource and define the actions to be taken for the adequate development and protection of agricultural land, in order to preserve the land fund and to increase its production capacity, rational use and organization of economically sustainable agricultural production. Sustainable management of agricultural land contributes to sustainable rural development, and the aim is to achieve a balance between the three main elements of sustainability: economic, social and environmental. As a method of research willre used theoretical methods, definition, classification, induction, deduction, analysis, synthesis, then historical and comparative method of analysis to research more detail the methodology of collecting and processing data on land resources in the municipality Prnjavor.

Keywords: land resources; sustainable management; rural development

**MOGUĆNOSTI ZA ODRŽIVO UPRAVLJANJE ZEMLJIŠNIM RESURSIMA NA
PODRUČJU OPŠTINE PRNJAVOR**

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Cilj ovog rada je da predstavi sintetizovan prikaz zemljišnih resursa na području opštine Prnjavor, kao osnove za održiv razvoj ruralnih područja Opštine. Tema je odabrana zbog nužnosti sagledavanja raspoloživih zemljišnih kapaciteta Opštine koje prethodi pristupanju racionalnog iskorištanja zemljišta kao neobnovljivog prirodnog resursa, sa potencijalno brzom stopom degradacije i sa veoma sporim procesom formiranja i regeneracije. Zemljište koje je nezamjenjiv uslov ruralnog razvoja potrebno je adekvatno zaštititi i racionalno koristiti, pri tome istražiti mogućnosti njegove upotrebe u razvoju različitih djelatnosti i namjena, koje su u funkciji ruralnog razvoja. Cilj i očekivani rezultati istraživanja je upoznati se sa stanjem i problemima koji prijete ovom resursu i definisati mјere koje će se preduzeti u svrhu adekvatnog uređenja i zaštite poljoprivrednog zemljišta radi očuvanja zemljišnog fonda i povećanja njegove proizvodne sposobnosti, racionalnog korišćenja i organizovanja ekonomski održive poljoprivredne proizvodnje. Održivo upravljanje poljoprivrednim zemljištem doprinosi održivom ruralnom razvoju, a cilj je postići ravnotežu između tri glavna elementa održivosti i to ekonomskog, socijalnog i ekološkog. Kao metodi istraživanja koristiće se teorijski metodi; definicija, klasifikacija, indukcija, dedukcija, analiza, sinteza, zatim istorijski metod i komparativna analiza da bi se što detaljnije istražila metodologija prikupljanja i obrade podataka o zemljišnim resursima na području opštine Prnjavor.

Ključne riječi: zemljišni resursi; održivo upravljanje; ruralni razvoj

**"POSSIBILITIES USE EU FUNDS FOR DEVELOPMENT OF AGRO-TOURISM
IN DISTRICT BRCKO "**

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The European Union in different ways and through the structural funds helps developing countries to west Balkan. One of the priority measures under IPA Cross-border cooperation (CBC) (cross border) is the development of tourism. However, the basic problem is how and in what way can a person access and become a user of one of these help programs? Cross-border projects shall include, require regional cooperation and financial resources in the project preparation. Trained personnel are needed for this job ... The purpose of this paper is to draw attention to the possibility of a joint promotion of tourism potential region of Bosnia-ENG-ESP, and a joint approach by the EU funds. The aim is to link the three countries in a single unit. When a tourist boarding the cruise ship, for example in Vienna, sees on his mobile phone the tourist cadastre region of CRO-BiH-SRB (Posavina, Srem region, Sirmium) and already knows and has the information that, for example, in Ilok he will be able to drink good wine, to eat Mangulica meat in Sremska Mitrovica, drink good brandy (rakija) in Brcko, etc. Along the way, if a person gets to see the various additional tourist facilities in the region, is greeted properly and stays in town for a couple of days, that means that we have achieved something good in the tourist offer that we have made. Then we will finally have the financial benefit of our widely acclaimed and various analyses substantiated tourism resources and capacity

Keywords: IPA cross-border cooperation (CBC) project, tourism, Brcko

MOGUĆNOST KORIŠTENJA EU FONDOVA ZA RAZVOJ AGRO-TURIZAMA U BRČKO DISTRIKTU

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Evropska Unija na različite načine i preko strukturnih fondova, pomaže razvoju zemalja Zapadnog Balkana. Jedana od prioritetnih mjera u okviru IPA programa Cros-border coopertion(CBC) (prekogranične saradnje) je razvoj turizma. Međutim, osnovni problem je kako i na koji način pristupiti i postati korisnik ovih programa pomoći? Prekogranični projekti podrazumjevaju, regionalnu saradnju i iziskuju finansijska sredstva u pripremi projekta. Potrebni su obučeni kadrovi za ovaj posao... Smisao ovog rada je skretanje pažnje na mogućnost zajedničke promocije agro-turističkih potencijala regije CRO-BiH-SRB, te zajedničkog nastupa prema EU fondovima. Cilj je povezati zajednički prostor tri države u jednu cjelinu. Kada turist ukrcavajući se putnički brod kruzer primjera radi u Beču, na svom mobilnom telefonu vidi turistički katastar regije CRO-BiH-SRB (posavsko-srem-srijemske regije) i unapred zna da će npr. u Iloku popiti dobro vino, u Sremskoj Mitrovici pojesti meso od Mangulice, u Brčkom popiti dobru rakiju i sl. Uz put vidjeti razne popratne turističke sadržaje regije, bude adekvatno dočekan i zadrži se par dana, znaćemo da smo nešto postigli sa turističkom ponudom. Onda ćemo konačno imati finansijske koristi od naših naveliko hvaljenih i raznim analizama potkrijepljenih turističkih resursa i kapaciteta...

Ključne riječi: IPA fondovi, prekogranična saradnja, projekat, agro-turizam, Brčko

Section 4. Fruit Growing and Viticulture



**THE EFFECT OF POLLENIZERS ON THE FRUIT SET OF APPLE CULTIVARS
'JULYRED', 'ELSTAR' AND 'GOLDEN DELICIOUS CLONE B'**

*Martina Skendrović-Babojelić, Viktorija Strugar,
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The effect of pollenizer ('Gala', 'Idared' and 'Jerseymac') on fruit set of cvs. 'Elstar', 'Julyred' and 'Golden Delicious clone B' was studied. In cv. 'Elstar' highest fruit set was obtained after pollination with cv. 'Gala' (48.93%), and lowest after pollination with cv. 'Idared' (29.86 %). The lowest fruit set in cv. 'Julyred' was obtained after pollination with cv. 'Gala' (10.43 %), and higher after pollination with cvs. 'Idared' and 'Jerseymac'. There was no significant difference between these two pollenizers. The lowest fruit set of cv. 'Golden Delicious Clone B' was obtained after pollination with cv. 'Jerseymac' (8.87 %) and highest with cv. 'Gala' (15.28 %). Cv. 'Elstar' had highest fruit set (30 to 49 %) depending on pollenizer, and cv. 'Golden Delicious clone B' the lowest (9-15 %). The differences in fruit set can be attributed to differences in pollen germination among pollenizers, as well as overlapping in S - alleles.

Keywords: *Malus x domestica* Borkh; pollenizer; fruit set; cultivar

**THE EFFECT OF POLLENIZERS ON THE FRUIT SET OF APPLE CULTIVARS
'JULYRED', 'ELSTAR' AND 'GOLDEN DELICIOUS CLONE B'**

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Istraživan je utjecaj sorti opršivača (Gala, Idared i Jerseymac) na intenzitet zametanja plodova jabuka sorti Elstar, Julyred i Golden delicious 'Klon B'. Kod sorte Elstar najveći postotak zametanja plodova utvrđene je nakon opršivanja polenom sorte Gala (48.93 %), a najmanji kod opršivanja polenom sorte Idared (29.86 %). Najmanji postotak zametanja plodova sorte Julyred utvrđen je nakon opršivanja polenom sorte Gala (10.43 %), dok su veći postotak zametanja utvrđen nakon opršivanje sortom Idared i Jerseymac između kojih nije bilo značajne razlike. Nakon opršivanje cvjetova sorte Golden delicious klon B polenom sorte Jerseymac utvrđen je značajno najmanji postotak zametanja plodova (8.87 %) dok je značajno najveći postotak zametnutih plodova utvrđen nakon opršivanja polenom sorte Gala (15.28 %). Kod sorte Elstar generalno je utvrđen najveći postotak zametanja plodova (30 do 49 %) ovisno o opršivaču, dok je kod sorte Golden delicious 'Klon B' utvrđen najmanji postotak zametanja plodova (9-15 %). Razlike u intenzitetu zametanja plodova mogu biti posljedica različite kljavosti polena pojedinih sorti opršivača i poklapanja S - alela između sorata.

Ključne riječi: *Malus domestica* Borkh; opršivači; zametanje plodova; sorta

INFLUENCE OF DIPHAENILAMINE AND HARVEST DATE ON QUALITY OF APPLE FRUIT STORAGE

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In this work we investigated influence of different concentration of DPA (diphaenil-alanin) and harvest date on the quality of fruit preservation of three apple cultivars (Idared, Fuji and Grenny Smith). Fruits were stored in a cooler with a normal atmosphere at a temperature of 1-2 °C and a relative humidity of 80%. Harvest was done during 3 different dates (24.09., 30.09. and 08.10.). After harvest, fruits were dipped in four different concentration of DPA (control, 1000 ppm, 2000 ppm, 4000 ppm). Quality of stored fruits is represented through, as changes in fruit mass, fruit firmness, content of content of total soluble solids and total acids, as well as percent of scald appearance after six months of storage. Every cultivar in every date of harvest and DPA concentration treatment was represented with 30 fruits, divided into three repetitions. We used iodine-starch test, fruit firmness to determine degree of maturity, and apple fruits shown differences, as a result of different moments of harvest. The smallest mas lost showed cultivar Grenny Smith (4,34%) and the biggest cv. Fuji (12,39%). Influence of DPA treatments on mas lost was not registered. The biggest decrease in fruit firmness after 6 months had cultivar Idared (37,9%), and the smallest cv. Fuji (10,7%). We did not find influence of different harvest date and different DPA concentration on degree of fruit firmness decrease. The highest amount of soluble solids was found in fruits that were not treated with DPA. The influences of harvest date and DPA concentration on the content of total acids after storage were not recorded. At cultivars Fuji and Idared we did not registered appearance of scald.- At cv. Granny Smith the biggest percentage of scald we detected in fruits harvested during first date (11,2%), and the smallest in fruits harvested during third harvest (5,6%). Depending on DPA concentration, the highest percentage of scald had control fruits (16,3%), then fruits treated with 1000 ppm (6,9%), and the lowest fruits treated with 4000 ppm (1,9%).

Keywords: DPA, scald, picking date, apple, cultivars, storage

**UTICAJ DIFENILAMINA I MOMENTA BERBE NA KVALITET ČUVANJA
PLODOVA JABUKE**

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U radu je ispitivan uticaj različite koncentracije difenilamaina (DPA) i datuma berbe na kvalitet čuvanja plodova tri sorte jabuke (Ajdared, Fudži i Greni smit). Plodovi su čuvani u hladnjači sa normalnom atmosferom na temperaturi od 1-2 °C i relativnoj vlažnosti vazduha od 80 %. Berba je obavljena u tri različita termina (15.09., 30.09. i 15.10.). Nakon berbe plodovi su potapani u četri različite koncentracije DPA (kontrola, 1000 ppm, 2000 ppm i 4000 ppm). Kvalitet čuvanja plodova je izražen preko promena u masi ploda, čvrstoći ploda, sadržaju ukupne rastvorljive suve materije i ukupnih kiselina, kao i procentu pojave scalda, nakon šest meseci čuvanja. Svaka sorta u svakoj berbi i pri svakoj koncentraciji DPA bila je zastupljena sa po 30 plodova podeljenih u tri ponavljanja. Pod uticajem različitog momenta berbe plodovi ispitivanih sorti jabuke su ispoljili različiti stepen zrelosti izražen preko jodno-skrobnog testa i čvrstoće ploda. Najmanji gubitak u masi ploda imala je sorta Greni smit (4,34%), a najveći sorta Fudži (12,39%). Posmatrano po berbama, najmanji kalo je bio u drugoj berbi kod sve tri sorte. Uticaj DPA na gubitak u masi ploda nije utvrđen. Najveće smanjenje čvrstoće ploda nakon šest meseci je imala sorta Ajdared (37,9%), a najmanje sorta Fudži (10,7%). Nije utvrđen uticaj različitog datuma berbe i različite koncentracije DPA na smanjenje čvrstoće ploda. Najveći sadržaj rastvorljive suve materije je utvrđen kod onih plodova koji nisu tretirani sa DPA. Uticaj datuma berbe i koncentracije DPA na sadržaj ukupnih kiselina nakon skladištenja nije utvrđen. Kod sorti Fuji i Ajdared nije utvrđeno pojava scalda. Kod sorte Greni smit najveći procenat scalda zabeležen je kod plodova koji su ubrani u prvoj berbi (11,2%), a najmanji kod plodova ubranih u trećoj berbi (5,6%). U zavisnosti od koncentracije DPA, najveći procenat scalda imali su kontrolni plodovi (16,3%), zatim plodovi koji su tretirani sa 1000 ppm (6,9%), a najmanje plodovi koji su tretirani sa 4000 ppm (1,9%).

Ključne reči: DPA, scald, datum berbe, jabuka, sorte, čuvanje

**METAXENIA EFFECT ON POMOLOGICAL AND PRODUCTIVE FEATURES OF
THE 'RAJKA' APPLE CULTIVAR**

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Apple (*Malus × domestica* Borkh.) is the most important species of the genus *Malus* Miller in terms of its economic importance, coming first among the deciduous fruits and fourth among all fruit species in the world, based on the production, trade and consumption. It is generally known that the apple is a self-incompatible fruit species, possessing a gametophytic type of self-incompatibility, within which the outcome of the fertilization is determined by the pollen haploid S-genotype. The base for the successful realization of the cropping potential therefore lies in an adequate combinations of compatible cultivars. The choice of the polliniser-cultivars in the establishment of an apple orchard requires consideration of not only the primary aspects (flowering time; production, quality and transfer of pollen; agro- and pomo-technical requirements, harvest time), but also occasional occurrence of the metaxenia effect, which in certain years may reach significant levels. The paper presents the results of the research into the impact made by the polliniser – ‘Gala Must’, ‘Red Elstar’ and ‘Topaz’ – and the open pollination (O.P.) variant on the pomological (morphometric and chemical) and productive features (yield per tree and yield per unit land area) in the ‘Rajka’ cultivar. The highest fruit weight, height and width, and number of seeds per fruit in the ‘Rajka’ were achieved using the cultivar ‘Gala Must’ as polliniser (150.72 g; 60.24/69.92 mm). The best quality of the ‘Rajka’ fruits, judged by the chemical composition of the fruit, was found in the combination with the ‘Topaz’ (soluble solids content – 13.78%; total sugar content – 11.52%; total mineral content – 0.32%). ‘Rajka’ was achieved the highest average yield per tree and unit land area in the open pollination variant (20.94 kg tree-1; 52.35 t ha-1), while the highest yield among the assessed pollinisers was induced by the ‘Gala Must’ (19.65 kg tree-1; 49.12 t ha-1). Based on the evaluated parameters, it has been recommended that the cultivars ‘Gala Must’ and ‘Topaz’ are the most suitable pollinisers for ‘Rajka’.

Keywords: apple; polliniser-cultivar; fruit quality; yeald

**EFEKAT METAKSENIZE NA POMOLOŠKE I PRODUKTIVNE OSOBINE
JABUKE SORTE 'RAJKA'**

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Jabuka (*Malus × domestica* Borkh.) je ekonomski najznačajnija vrsta roda *Malus* Miller, koja po proizvodnji, prometu i potrošnji zauzima prvo mesto među listopadnim voćem i četvrti među svim vrstama voćaka u svetu. Opšte je poznato da je jabuka samobesplodna vrsta voćaka čija je autoinkompatibilnost gametofitnog tipa u okviru koga haploidni S-genotip polena određuje ishod oplođenja. Stoga su adekvatan izbor kombinacija kompatibilnih sorti i njihov najbolji raspored prema međusobnim odnosima oplođenja osnova za realizaciju potencijala rodnosti. Izbor sorti oprasivača pri zasnivanju zasada jabuke podrazumeva ne samo primarne aspekte (vreme cvetanja produkcija, kvalitet i transfer polena; agro- i pomotehnički zahtevi, vreme zrenja), već i povremenu pojavu efekta metaksenije, koja u pojedinim godinama ispoljava značajan nivo. U radu su prikazani rezultati ispitivanja uticaja sorte oprasivača – 'Gala Must', 'Red Elstar' i 'Topaz', kao i varijante slobodnog oprasivanja (O.P.) na pomološke (morfometrijske i hemijske) i produktivne osobine (prinos po stablu i prinos po jedinici površine) sorte 'Rajka'. Najveća masa, dimenzije ploda i broj semenki u plodu sorte 'Rajka' ostvareni su sa sortom 'Gala Must' kao oprasivačem (150,72 g; 60,24/69,92 mm). Najbolji kvalitet ploda sorte 'Rajka', posmatran kroz hemijski sastav ploda, utvrđen je u kombinaciji sa sortom 'Topaz' (RSM – 13,78%; ukupni šećeri – 11,52%; ukupne mineralne materije – 0,32%). Prosečno najveći prinos po stablu i po jedinici površine sorte 'Rajka' je ostvarila u varijanti slobodnog oprasivanja (20,94 kg stablo-1; 52,35 t ha-1), dok je najveći prinos od ispitivanih oprasivača uslovila sorta 'Gala Must' (19,65 kg stablo-1; 49,12 t ha-1). Na osnovu proučavanih parametara utvrđeno je da su sorte 'Gala Must' i 'Topaz' dobri oprasivači sorte 'Rajka'.

Ključne riječi: jabuka; oprasivač; kvalitet ploda; prinos

**INFLUENCE OF 1-MCP ON THE DYNAMICS OF CHANGE IN THE BASIC
PHYSIOLOGICAL-CHEMICAL PARAMETERS OF APPLE FRUIT DURING
STORAGE**

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The final process in the fruit production is the fruit harvest and proper storage of fruits. It is not enough to produce fruit, but they need to be harvested and kept in good condition so they could be marketed at its best. Thus, this process affects the produce price and profitability of fruit production. According to FAO data, losses in yield of fresh fruit after harvest, depending on the applied post-harvest treatment, range from 5 to 25% in developed countries, and 20 to 50% in developing countries. These losses can not be completely eliminated, but they may be reduced by applying appropriate procedures. One of the most important factors leading to loss of fruit quality after the harvest and during the fruit storage is ethylene, gaseous phytohormone which at low concentrations affect the physiological processes in plant material, thus making them more intense and leads to senescence - aging and ultimately to fruit rot and degradation. Control of the presence of ethylene can be achieved by using preventive measures and using various chemical reagents and techniques. In recent years, in the fruit-growing developed countries, for the control of ethylene in cold storages is used 1-methylcyclopropene (1-MCP), a gas that reacts with the ethylene receptor in plant cells faster than the ethylene itself. As the result the activation mechanism (which lead to fruit senescence) is missing out, and therefore the fruits can be stored for longer time with minimal loss of quality (the smaller intensity of biochemical and physiological processes in fruit). Research results from the fruit-growing developed countries suggest that 1-MCP positively influences the process of fruit and vegetable storage, while no negative effects have been recorded or any adverse occurrences related to environmental and human health. Although 1-MCP is used in over 80 countries, its' use in Bosnia and Herzegovina was not recorded, primarily due to the lack of information about this compound and also due to the lack of research results of influence of 1-MCP on fruit storage process in local conditions. The study evaluates the impact of MCP on the dynamics of change in hardness of fruit flesh and summaries of soluble solids in apples Gold delisches, Pinova, Majrak, Breburn i Melroz during their storage in the NA chamber. After initial measurement, the fruits are worn out from the refrigerator at intervals of 30 days during the four months of storage, or for the measurement of the parameters studied on four occasions. During each measurement after storage of fruits are kept at room temperature 7 days, after which the measurements were made (Shelf life 7d). Researches in this paper indicate that 1-MCP impacts on reducing physiological needs, better storage life after vintage and maintaining the quality of their presentation to the market.

Keywords: apple, storage, 1-methylcyclopropene

Poster presentation
Section 4. *Fruit Growing and Viticulture*
BOOK OF ABSTRACTS

**UTICAJ 1-METILCIKLOPROPENA NA DINAMIKU PROMJENE OSNOVNIH
FIZIČKO-HEMIJSKIH PARAMETARA PLODA JABUKE TOKOM
SKLADIŠTENJA**

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Završni postupak u proizvodnji voćnih plodova je berba i pravilno skladištenje voća. Nije dovoljno samo proizvesti plodove, već ih treba obrati i sačuvati, te u najboljem stanju ponuditi tržištu. Time ovaj postupak u najvećoj mjeri utiče na cijenu i profitablnost same voćarske proizvodnje. Prema podacima FAO, gubici u prinosima svježeg voća nakon berbe, u zavisnosti od primjenjenog tretmana, kreću se od 5 do 25% u razvijenim zemljama, a 20 do 50% u zemljama u razvoju. Navedeni gubici ne mogu se potpuno eliminisati, ali se mogu umanjiti odgovarajućim postupcima. Jedan od najvažnijih faktora koji dovodi do gubitka kvaliteta nakon berbe i tokom skladištenja plodova je etilen, gasoviti fitohormon koji u malim koncentracijama utiče na fiziološke procese u biljnem materijalu, tako što ih intenzivira i dovodi do senescencije – starenja i u konačnici do propadanja plodova i drugih biljnih organa. Kontrola prisustva etilena postiže se preventivnim mjerama kao i upotreborazličitim hemijskim reagensima ili tehnika. U zadnjih nekoliko godina u voćarski razvijenim zemljama, za kontrolu etilena u skladištima koristi se 1-metilciklopropen (1-MCP), gas koji reaguje sa receptorima etilena u biljnim ćelijama brže nego sam etilen, čime izostaje aktivacija mehanizama koji dovode do zrenja biljnih dijelova, a samim tim i plodova voćaka, te se plodovi duže čuvaju uz minimalan gubitak kvaliteta (manji je intenzitet odvijanja biohemijsko-fizioloških procesa u plodovima). Rezultati istraživanja iz voćarski razvijenih zemalja pokazuju da 1-MCP pozitivno utiče na proces skladištenja plodova voća i povrća, pri čemu nisu evidentirane nikakve negativne pojave vezane za zaštitu životne sredine i zdravlje ljudi. Iako se 1-MCP koristi u preko 80 zemalja, njegova upotreba u Bosni i Hercegovini nije zabilježena, prije svega zbog nedostatka informacija o ovom jedinjenju ali i nedostatka rezultata istraživanja uticaja 1-MCP-a na proces skladištenja voćnih plodova u lokalnim uslovima. U radu je proučavan uticaj 1-metilciklopropena na dinamiku promjene tvrdoće mesa ploda i sadržaja rastvorljivih suvih materija u plodovima jabuke sorti Zlatni Delišes, Pinova, Majrak, Breburn i Melroza tokom njihovog skladištenja u NA komorama. Nakon početnog mjerjenja, plodovi su iznošeni iz hladnjaka u intervalima od 30 dana tokom četiri mjeseca skladištenja, odnosno izvršeno je mjerjenje ispitivanih parametara u četiri navrata. Prilikom svakog mjerjenja plodovi su nakon iskladištenja držani na sobnoj temperaturi 7 dana, poslije čega su analizirani (Shelf life 7d). Istraživanja u ovom radu pokazuju da 1-metilciklopropen utiče na smanjenje fizioloških procesa, bolje čuvanje plodova nakon berbe i održavanje njihovog kvaliteta do iznošenja na tržište.

Ključne riječi: jabuka, čuvanje, 1-metilciklopropen

**GENOTYPE SPECIFICITY OF BIOCHEMICAL AND PHYSIOLOGICAL
PARAMETERS OF APPLE FRUITS DEPENDING ON THE FRUIT POSITION
AND EXPOSITION ON THE TREE**

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The influence of fruit position in the crown on the biochemical and physiological processes that occur in fruits immediately after harvest and during storage is a complex issue. In considering this issue it is necessary to take into account the effect of the soil substrate and nutrition of fruit trees, as well as specific training system, harvest, storage conditions and time of their storage life. The paper presents results of research of physiological and biochemical pomological parameters of fruits of different varieties of apples after harvest, depending on the position and exposure of fruit on the tree. The research was carried out in the region Potkozarje - Gradina, Bosnia and Herzegovina, during 2012. Research covers the fruits of following apple varieties: Red Delicious, Golden Delicious, Gala, Idared and Jonagold. A measurement was performed immediately after harvest and after it was stored in a storage chamber with a normal atmosphere (NA). The fruit weight was considered, than fruit flesh firmness (penetrometer value), soluble solids content of the cell sap of fruit flesh (by refractometer value) and the conversion of starch into simple sugars, starch-iodine test. The results show that position and exposure have different influence on pomological characteristics and biochemical and physiological processes in the fruits within varieties of apples and between the studied parameters within one variety. Thus, the average fruit weight after harvest and after their storage is the highest in the uppermost and the lowest in the base area of the tree (in this regard it was noted certain deviation in fruit varieties Gala – base/East, Idared – top/West and Golden Delicious – middle/East). Different trends and interactions are also present in other studied parameters. On the basis of this research it is possible to define the elements of the cropping system, which may result in the desired effect on parameters which are significant for fruit harvesting procedure, storage and marketing in the market, with as little loss in terms of their quality.

Keywords: apple, fruit position, storage.

**GENOTIPSKE SPECIFIČNOSTI BIOHEMIJSKO-FIZIOLOŠKIH PARAMETARA
PLODOVA JABUKE U ZAVISNOSTI OD POZICIJE I EKSPOZICIJE PLODA NA
STABLУ**

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Uticaj pozicije ploda u krošnji na biohemijsko-fiziološke procese koji se odvijaju u plodovima neposredno nakon berbe i tokom skladištenja predstavlja složeno pitanje. Prilikom razmatranja ove problematike neophodno je uzeti u obzir uticaj zemljišnog supstrata i ishrane voćnih stabala, kao i specifičnosti sistema gajenja, berbe plodova, uslova skladištenja i vremenskog perioda njihovog čuvanja u hladnjačama. U radu su dati rezultati istraživanja biohemijsko-fizioloških i pomoloških parametara plodova različitih sorti jabuke nakon berbe, u zavisnosti od pozicije i ekspozicije ploda na stablu. Istraživanje je izvršeno u regionu Potkozarja – lokalitet Gradina, Bosna i Hercegovina, tokom 2012. godine. Istraživanjem su bili obuhvaćeni plodovi sledećih sorti jabuke: Crveni Delišes, Zlatni Delišes, Gala, Džonagold i Ajdared. Mjerenja su vršena neposredno nakon berbe plodova i nakon njihovog skladištenja u hladnjači sa normalnom atmosferom (NA). Posmatrana je masa ploda, zatim tvrdoća mesa ploda (penetrometrijska vrijednost), sadržaj rastvorljivih suvih materija u čelijskom soku mesa ploda (refraktometrijska vrijednost) i stepen konverzije skroba u proste šećere jedno-skrobnim testom. Rezultati istraživanja pokazuju da pozicija i ekspozicija različito utiču na pomološke karakteristike i biohemijsko-fiziološke procese u plodovima kako između ispitivanih sorti tako i između ispitivanih parametara unutar jedne sorte. Tako, prosječna vrijednost mase ploda nakon berbe kao i nakon njihovog skladištenja, najveća je u vršnoj, a najmanja u baznoj zoni stabla (u tom smislu konstatovano je određeno odstupanje kod plodova sorte Gala - baza istok, Ajdared - vrh zapad i Zlatni Delišes - sredina istok). Različite tendencije i interakcije prisutne su i kod ostalih ispitivanih parametara. Na osnovu ovog istraživanja moguće je definisati elemente sistema gajenja, koji mogu imati za rezultat željeni uticaj na parametre ploda značajne za postupak berbe, skladištenja i plasmana na tržište, uz što manje gubitke u pogledu njihovog kvaliteta.

Ključne riječi: jabuka, pozicija u krošnji, skladištenje

**POMOTEHNIKA JABUKE PRI REKONSTRUKCIJI UZGOJNE FORME 1 –
POMOTEHNIČKA ANALIZA HABITUSA STABLA**

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Rekonstrukcija uzgajne forme posle dužeg perioda rasta i plodonošenja u osnovi predstavlja složene pomotehničke zahvate sa jakim rezovima na habitusu nadzemnog sistema. Složenost ovog zahvata ogleda se u činjenici da je habitus stabla u višegodišnjem rastu i plodonošenju izgrađen kao reakcija na kompleksnu i višegodišnju primenu agro- i pomotehničkih tretmana u interakciji sa podlogom kao modifikatorom rasta u datim ekološkim i proizvodnim uslovima. Plan rekonstrukcije stabala mora se bazirati na analizi izgrađenosti strukture habitusa u odnosu na projektovanu uzgajnu formu, a potom i definisanju intenziteta i dinamike pomotehničkih zahvata, kojim se postojeće stanje habitusa može dovesti u rekonstrukcijom projektovanu - inoviranu uzgajnu formu. U ovom radu data je klasifikacija strukture habitusa na podlozi MM106 starog 18-20 godina, formiranih i standardnim agrotehničkim merama održavanih u formi usko vreteno kod sorti ajdared, gloster i melroza, gajenih na području Hercegovine (Ljubinje). Klasifikacija postojećih struktura habitusa identifikovanih kao odstupanje od projektovane uzgajne forme u osnovi je izvedena prema dominantnoj strukturi i obimu zahvata neophodnih za realizaciju planirane rekonstrukcije. Analizom su utvrđena sledeća odstupanja u odnosu na standardnu uzgajnu formu vreteno: stožina formirana sa deformacijama, stožina pod nagibom u rednom prostoru, pojava snažnih skeletnih razgranjenja u baznom delu stabla, prenošenje snage rasta u vršne delove stabla, ogoljavanje stožine, specifičnosti razvoja nosača rodnog i njegovo pozicioniranje na velikoj udaljenosti od stožine. Nakon sistematizacije uočenih odstupanja izvršena je integralna ocena primenjene pomotehnike u zasadu. Na osnovu sprovedenih pomotehničkih analiza habitusa može se zaključiti da je neodgovarajućom pomotehnikom, uspostavljen debalans produktivnosti krošnje. Debalans rasta i rodnosti, se postojećim konceptom rezidbe u zasadu permanentno održava, što dovodi do realizacije nižih prinsa i nemogućnosti da se dugoročno osigura kvalitetna i prinosna proizvodnja plodova jabuke, kao jedan od važnih preduslova za ozbiljan nastup na tržištu.

Ključne reči: jabuka, sorta, pomotehnika

**POMOTEHNIKA JABUKE PRI REKONSTRUKCIJI UZGOJNE FORME 2 –
POMOTEHNIČKI PRISTUP U PROGRAMU REKONSTRUKCIJE**

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U savremenoj voćarskoj proizvodnji prisutni su programi rekonstrukcije standardnih uzgojnih formi kroz sistem rezidbe i prekompoziciju skeletne strukture stabla. Program rekonstrukcije uzgojnih formi u osnovi podrazumeva pomotehničke zahvate na skeletu i drugim delovima drveta na stablu u cilju dovođenja skeletne strukture u oblik poznate (definisane) uzgojne forme. Rekonstrukcija ima za cilj podizanje nivoa produktivnosti i kvaliteta plodova. Rekonstrukcija uzgojne forme sprovodi se u cilju povećanja bruto prinosa po jedinici površine zasada i učešće plodova I i ekstra klase, kao i bolju obojenost plodova. U ovom radu izvršena je analiza primena pomotehničkih tretmana u programu rekonstrukcije stabala iz uzgojne forme usko vreteno sa dominantnom kratkom rezidbom u uzgojnu formu sa dugom rezidbom i skeletnom strukturu saglasno uzgojnoj formi solakse, kao i uticaj primenjene rekonstrukcije habitusa stabla na prinos i kvalitet plodova. Primena pomotehničkih tretmana kroz program rekonstrukcije habitusa uzgojne forme usko vreteno, izvršena je kod sorti ajdared, gloster i melroza, gajenih na području Hercegovine (Ljubinje). Sve sorte su kalemljene na podlozi MM106 i starosti su 18-20 godina. Uvažavajući postignute rezultate drugih istraživača u prethodnom periodu u programima rekonstrukcije, kao i stanje stabala u oglednom zasadu, tokom trogodišnjeg perioda primenjen je veći broj pomotehničkih tretmana kako bi rekonstrukcija bila uspešno sprovedena. Sortne specifičnosti u građi habitusa stabala imale su značajan uticaj na intenzitet i primenu pojedinih pomotehničkih tretmana tokom programa rekonstrukcije. Primjenjeni pomotehnički tretmani mogu se uslovno sistematizovati u tri grupe: a) pomotehnički tretmani uklanjanja snažne skeletne strukture u bazi stožine; b) pomotehnički tretmani kojima je tretirana središnja zona neposredno iznad prvih skeletnih bočnih razgranjenja i c) pomotehnički zahvati kojima je tretiran vršni deo stabla. Program rekonstrukcije osim zahvata u periodu mirovanja podrazumevao je i intenzivnu primenu tretmana u toku vegetacije. Rekonstrukcija uzgojne forme tokom trogodišnjeg perioda ispitivanja, uticala je pozitivno na obnavljanje rodnog drveta i kumulativno povećanje prinosa koje se za posmatrani period kretalo od 27,67%, kod sorte ajdared do 74,03% kod sorte gloster.

Ključne reči: jabuka, sorta, pomotehnika

PHYSICO-CHEMICAL PROPERTIES OF AUTOCHTHONOUS APPLE CULTIVARS

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Eleven autochthonous apple cultivars traditionally grown in Bosnian agro-climatic conditions were analyzed. There are no available data about their morphological, pomological and technological traits. The aim of this study is to determine their main postharvest physico-chemical quality attributes, namely, moisture, pH, fruit firmness, total soluble solids, titratable acidity, fruit color and ascorbic acid. Vitamin C contents were found in low concentrations, from 0.75 mg/100g to 2.30 mg/100g. Titratable acidity (TA) expressed as malic acid content (%) ranged from $0.23\pm0.01\%$ to $1.02\pm0.01\%$ and is in complete agreement with corresponding pH values (3.16-4.39). Total soluble solids, fruit firmness and moisture showed significant variations among cultivars. The presented results are part of the study addressing the main physico-chemical characteristics of the locally grown autochthonous cultivars whose traits could be used for further breeding programs.

Keywords: autochthonous apple cultivars, postharvest physico-chemical properties, ascorbic acid

Acknowledgements: This work is part of the project "The characterization of apple germplasm" supported by the Ministry of Science and Technology of Republic of Srpska (project contract no 19/6-020/961-158-1/12).

FIZIČKO-HEMIJSKE KARAKTERISTIKE AUTOHTONIH SORTI JABUKA

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Analizirano je jedanaest autohtonih sorti jabuka koje se tradicionalno uzgajaju u bosanskim agro-klimatskim uslovima. S obzirom da nema podataka o njihovim morfološkim, pomološkim i tehnološkim osobinama, cilj ovog rada je određivanje osnovnih fizičko-hemijskih parametara nakon branja, kao što su: vлага, pH, tvrdoća ploda, rastvorljive suve materije, ukupan sadržaj organskih kiselina, boja ploda i sadržaj vitamina C. Sadržaj vitamina C je nizak i kreće se u rasponu od 0.75 mg/100g do 2.30 mg/100g. Ukupan sadržaj organskih kiselina izražen preko jabučne kiseline se kreće u rasponu od 0.23±0.01% do 1.02±0.01% i potpuno je u skladu sa utvrđenim pH vrijednostima (3.16-4.39). Sadržaj rastvorljivih suvih materija, tvrdoća ploda i sadržaj vlage su znatno varirali među sortama. Prezentovani rezultati su dio studije koja se bavi fizičko-hemijskim osobinama lokalnih autohtonih sorti, čije osobine se mogu iskoristiti za buduće uzgojne programe.

Ključne riječi: autohtone sorte jabuke, fizičko-hemijske osobine ploda, askorbinska kiselina

INFLUENCE OF 1-METHYLCYCLOPROPENE ON THE STORING ABILITY OF PEAR

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Contemporary fruit production cannot be imagined without appropriate storing capacities (ULO, ULE, DCA reefers). It is necessary to produce high quality fruits, pick them within optimal period and store in appropriate conditions, in order to enter the market in the period when they reach optimal price, to reach the expected economic effect. One of important factors which influence the process of storing the fruit is the phytohormone ethylene gas, which in small concentrated amounts lead to activating processes aimed for fruit senescence (aging), which finally lead to their decay. Therefore, the ethylene control, immediately after picking and during the storage of fruit, is essential for maintenance of their quality to the moment of their entrance to the market. Before, the ethylene control in reefers was conducted by various technological procedures, whose basic characteristics were related to weak efficiency, complicated procedures and high applying prices. Significant step forward in blocking the ethylene effect on stored fruit was made by introduction of 1-methylcyclopropene (1-MCP). 1-MCP is a gas of similar chemical structure as ethylene, which reacts with ethylene receptors on a cell level itself. Thus, the ethylene effect is blocked, by which activation of the enzymes, which are responsible for senescence of fruit, is omitted or notably delayed. Concentration in which 1-MCP manifest its effect is very low. When using 1-MCP in procedures with fruit or herbal parts picking, numerous factors should be considered, before all: herbal species, types, growing phases, time span from picking to treatment, etc. In this work, we present the results of the examination of the 1-MCP influence on the maturing and storing the fruits of pear, types Bonita, Butira, Santa Maria, Clap Favorite, Williams, Gelert. With analysis of the results of the examinations we can claim that the mass loss during the storage of the fruits exposed to the 1-MCP effect, is significantly lesser than the fruits not exposed to the 1-MCP effect (control group of fruits), then, fruits exposed to the 1-MCP effect have larger stiffness of the fruit flesh than the control group of fruits, than is their fruit maintains stiffness of the flesh and those sorts of fruit are able to be stored for a longer period. Examination in this work indicate that the usage of 1-MCP in fruit growing has its defense in purpose of better storage of fruit after picking and quality maintenance to their market entrance. We emphasize simple application of the 1-MCP and the absence of any demaging influence of this mean on people or environment.

Keywords: pear; storage; 1-methycyclopropene

UTICAJ 1-METILCIKLOPROPENA NA SKLADIŠNU SPOSOBNOST KRUŠKE

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Savremena voćarska proizvodnja ne može se zamisliti bez odgovarajućih skladišnih kapaciteta (ULO, ULE, DCA hladnjače). Neophodno je proizvesti plodove visokog kvaliteta, obrati ih u optimalnom vremenu i uskladištiti u odgovarajućim uslovima, kako bi bili ponuđeni tržištu u vrijeme kada postižu najveću cijenu, čime se ostvaruje očekivani ekonomski efekat. Jedan od važnih faktora koji utiče na proces čuvanja voća je gasoviti fitohormon etilen, koji u malim koncentracijama dovodi do aktiviranja procesa usmjerenih ka senescenciji (starenju) plodova, što u konačnici dovodi do njihovog propadanja. Zbog toga je kontrola etilena neposredno nakon berbe i tokom skladištenja plodova voćaka od presudnog značaja za očuvanje njihovog kvaliteta do iznošenja na tržište. Ranije se kontrola etilena u hladnjačama vršila različitim tehnološkim postupcima, čije su osnovne karakteristike vezane za slabu efikasnost, komplikovanu proceduru i visoku cijenu aplikacije. Značajan iskorak u blokiranju djelovanja etilena na uskladišteno voće učinjen je uvođenjem 1-metilciklopropena (1-MCP). 1-MCP je gas slične hemijske strukture kao etilen, koji reaguje sa receptorima etilena na ćelijskom nivou brže nego sam etilen. Na ovaj način se blokira dejstvo etilena, čime izostaje ili se značajno usporava aktivacija enzima koji dovode do senescencije plodova. Koncentracije u kojima 1-MCP ispoljava dejstvo su veoma niske. Kod upotrebe 1-MCP-a u postupcima sa plodovima ili biljnim djelovima nakon berbe, treba uzeti u obzir brojne faktore, prije svega biljnu vrstu, sortu, fazu razvoja, vrijeme od berbe do tretiranja itd. U radu su dati rezultati istraživanja uticaja 1-MCP-a na proces dozrjevanja i skladištenja plodova kruške, sorte Bonita, Butira, Trevuška, Santa Maria, Klapov ljubimac, Viljamovka, Gelertova. Analizom rezultata istraživanja možemo konstatovati da je ubitak u masi (kalo) tokom skladištenja, kod plodova izloženih djelovanju 1-MCP-a, značajno manji u odnosu na plodove koji nisu izloženi djelovanju 1-MCP-a (kontrolnu grupu plodova), zatim plodovi izloženi djelovanju 1-MCP-a imaju veću tvrdoću mesa ploda od kontrolne grupe plodova, odnosno njihovo meso ploda duže održava čvrstoću i takvi plodovi se duže čuvaju. Istraživanja u ovom radu pokazuju da upotreba 1-MCP-a u voćarstvu ima opravdanje u svrhu boljeg čuvanja plodova nakon berbe i održavanja njihovog kvaliteta do iznošenja na tržište. Posebno treba istaknuti jednostavnu aplikaciju 1-MCP-a i odsustvo bilo kakvog štetnog uticaja ovog sredstva na životnu sredinu i ljude.

Ključne riječi: kruška, skladištenje, 1-metilciklopropen

**BIOACTIVE COMPOUNDS AND ANTIOXIDANT ACTIVITY OF
AUTOCHTHONOUS PEAR CULTIVARS**

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The aim of the study was to quantify the total phenolics, total flavonoids and to evaluate antioxidant activity in eleven autochthonous Bosnian pear cultivars. The total phenolic contents determined by the Folin-Ciocalteu assay showed the significant inter-cultivar variations, from 120.88 ± 4.85 to 678.51 ± 6.35 mg gallic acid equivalent (GAE)/100g fresh fruit. Similarly, the total flavonoids measured spectrophotometrically, using the aluminum chloride colorimetric assay were found in the wide range of 33.34 ± 0.71 – 186.36 ± 1.88 mg catechin equivalent (CE)/100g fresh fruit. A high correlation was found among total phenolics and antioxidant activity determined using the DPPH (2,2-diphenyl-1-picrylhydrazyl) method. The best total antioxidant capacity expressed as the effective concentration at which DPPH radical was scavenged by 50% (IC₅₀) was found in cultivar Mioljnjača (4.85 mg fresh fruit/mL), which had the highest content of total phenols and total flavonoids.

Keywords: autochthonous pear cultivars, total flavonoid and phenolic content, antioxidant activity

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**BIOAKTIVNE KOMPONENTE I ANTOOKSIDATIVNA AKTIVNOST
AUTOHTONIH SORTI KRUŠAKA**

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Cilj rada je određivanje sadržaja ukupnih fenola, ukupnih flavonoida i evaluacija antioksidativne aktivnosti jedanaest bosanskih autohtonih sorti kruške. Sadržaj ukupnih fenola određen Folin-Ciocalteu metodom je znatno varirao između sorti, od 120.88 ± 4.85 do 678.51 ± 6.35 mg ekvivalenta galne kiseline (GAE)/100g svježeg voća. Slično tome, i ukupni flavonoidi, određeni spektrofotometrijski metodom sa aluminijum hloridom, su imali širok raspon vrijednosti, od 33.34 ± 0.71 do 186.36 ± 1.88 mg ekvivalenta katehina (CE)/100g svježeg voća. Utvrđena je jaka korelacija između sadržaja ukupnih fenola i antioksidativne aktivnosti određene pomoću DPPH (2,2-difenil-1-pikrilhidrazil) metode. Najbolji antioksidativni kapacitet izražen kao efektivna koncentracija pri kojoj se ugasi 50% DPPH radikala (IC₅₀) je imala sorta Mioljnjača (4.85 mg svježeg voća/mL), koja je imala i najveći sadržaj ukupnih fenola i ukupnih flavonoida.

Ključne riječi: autohtone sorte kruške, ukupni flavonoidi i fenoli, antioksidativna aktivnost

**MORPHOLOGICAL CHARACTERISTICS OF SEEDLING OF VARIOUS WILD
PERA (*PYRUS COMMUNIS L.*) GENOTYPES**

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In our climate and soil conditions wild pears seedling (*Pyrus communis L.*) is usually used as rootstock for pear. Advantage of wild pear over quince, which is also used as rootstock for pear, is its higher resistance to low temperature, better drought tolerance, higher resistance to *Erwinia amylovora*. Understanding of the morphological characteristics of seedlings is very important when choosing rootstocks. Seedlings growth, along with the environmental factor impact, primarily depends on the genotype characteristics. Each rootstock itself is characterized by morphological and physiological characteristics that are less or more variable. The values of quantitative properties like height and thickness, root length and mass of seedlings can be measured. Uniformity of seedlings is an important characteristic that must be addressed in the selection work. In 2011 the research was conducted on one-year seedlings of nine wild pear genotypes. All tested genotypes, from which seeds were taken, are located in approximately the same environmental conditions. Selected genotypes differ in habit, maturation time and morphological characteristics of the fruit. After growing season, height, thickness, internodes length, and root system weight of the one-year seedlings are measured. Uniformity of seedlings was determined by the coefficient of variation for each tested characteristic. The results show that there are differences in the characteristics of seedlings, both between the genotypes of wild pear, and within a single genotype. Average seedlings height was in the range of 54.57 to 24.93 cm. Seedlings of all tested genotypes have uniform thickness, and internodes length of 0.98 to 1.46 cm. The root system of generative rootstocks has developed one primary root and next to it a couple of lateral secondary roots. Length of the primary roots is uniform (average 33.95 cm). Genotypes differ in the development of lateral root and hence the difference in root weight of tested seedlings, which is in the range of 14.80 to 25.70 g. Single data related to the studied parameters of seedling characteristics, as well as statistical analysis of the same, showing large variability in height and thickness. Length of internodes and length of root system has shown less variability. Seeds from genotypes that give uniform seedlings.

Keywords: genotyp; wild pear; seedling; vigour; variability

**MORFOLOŠKE KARAKTERISTIKE SIJANACA RAZLIČITIH GENOTIPOVA
DIVLJE KRUŠKE (PYRUS COMMUNIS L.)**

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U našim agroekološkim uslovima kao podloga za krušku najčešće se koristi sijanac divlje kruške (*Pyrus communis L.*). Prednost divlje kruške u odnosu na dunju, koja se takođe koristi kao podloga za krušku, je u njenoj većoj otpornosti na niske temperature i bolje podnošenje suše, kao i njena veća otpornost prema Erwinia amylovora, prouzrokovaču bakteriozne plamenjače. Poznavanje morfoloških osobina sijanaca može biti od velikog značaja pri izboru podloge za kalemjenje. Priroda rasta sijanaca, njihova visina, debljina i bujnost, pored uticaja faktora spoljašnje sredine, prvenstveno zavise od karakteristika genotipa. Svaka generativna podloga odlikuje se samoj sebi svojstvenim morfološkim i fiziološkim osobinama koje pokazuju veću ili manju varijabilnost. Vrijednosti kvantitativnih osobina sijanaca se mogu izmjeriti, kao što je visina i debljina sijanca, zatim dužina i masa korijena. Ujednačenost sijanaca je važna karakteristika kojoj se mora posvetiti pažnja u selekcijskom radu. Istraživanjima tokom 2011. godine obuhvaćeni su jednogodišnji sijanci od devet genotipova divlje kruške. Svi ispitivani genotipovi, sa kojih je sakupljano sjeme, se nalaze u približno sličnim agroekološkim uslovima. Odabrani genotipovi se razlikuju po habitusu, vremenu sazrijevanja i morfološkim karakteristikama ploda. Po završetku vegetacije, na jednogodišnjim sijancima su izvršena mjerena visine, debljine, dužine internodija, dužine i mase korjenovog sistema. Ujednačenost sijanaca je utvrđena koeficijentom varijacije za svaku ispitivanu osobinu. Rezultati istraživanja pokazuju da postoje razlike u osobinama sijanaca, kako između ispitivanih genotipova divlje kruške, tako i unutar jednog genotipa. Prosječna visina sijanaca je u intervalu od 54,57 do 24,93 cm. Sijanci svih ispitivanih genotipova su ujednačene debljine, a dužina internodija je od 0,98 do 1,46 cm. Korijenov sistem kod generativne podloge ima razvijenu jednu glavnu žilu i pored nje nekoliko bočnih. Dužina glavnog korijena je ujednačena i prosječno iznosi 33,95 cm. Između genotipova postoje razlike u razvijenosti bočnih žila pa i otuda razlika u masi korijena ispitivanih sijanaca, koja se nalazi u intervalu od 14,80 do 25,70 g. Podaci vezani za ispitivane parametre osobina sijanaca, kao i statistička analiza istih, pokazuju da je velika varijabilnost kod osobina visine i debljine sijanaca. Manja varijabilnost je iskazana kod parametara dužine internodija i dužine korjenovog sistema. Za proizvodnju generativnih podloga treba koristiti sjemenke od genotipova koji daju ujednačenije sijance po porastu i bujnosti.

Ključne riječi: genotip; divlja kruška; sijanac; bujnost ; varijabilnost

**NEW RESULTS IN PLUM (*PRUNUS DOMESTICA L.*) BREEDING IN FRUIT
RESEARCH INSTITUTE-ČAČAK**

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The main activity of the Fruit Research Institute Čačak is development new cultivars of continental fruit species. The most important place refers to the breeding of domestic plum (*Prunus domestica L.*). Fourteen plum cultivars were developed through different breeding programs. Fourteen plum cultivars were developed since 2008, i.e. ‘Čačanska Rana’, ‘Čačanska Lepotica’, ‘Čačanska Najbolja’, ‘Čačanska Rodna’, ‘Čačanski Šećer’, ‘Valjevka’, ‘Jelica’, ‘Valerija’, ‘Boranka’, ‘Timočanka’, ‘Mildora’, ‘Krina’, ‘Zlatka’ and ‘Pozna Plava’. The newest cultivar ‘Nada’ are named and released in 2012. The most important characteristics of this cultivar are: moderate vigor; medium late and abundant flowering; early and highly cropping; late ripening time; big, attractive fruits with dark blue skin colour and intense bloom; multi use value of fruit; economic tolerance to Plum pox virus (PPV). Three cultivars-candidates are under procedure of releasing. A detailed study of large number of plum hybrids in experimental orchards of Fruit Research Institute-Čačak is performed. The most important hybrids are 38/62/70 ('Hall' x 'California Blue'), IV/63/81 ('Large Sugar Prune' x 'Scoldus'), 22/17/87 ('Čačanska Najbolja' x 'Zh'ita Butilcovidna'), 34/41/87 ('Valjevka' x 'Čačanska Lepotica'), obtained in Program for development new plum cultivars resistant/tolerant to PPV. These hybrids flowered during the first and second decade of April, medium to very abundant, under the environmental conditions of Čačak region. In terms of tree growth studied hybrids varied from dwarf to very vigor. Yield per tree varied depending on tree vigor. Ripening time of studied hybrids was between first decade of July and first decade of September and fruit size was between medium to very large. The chemical properties of the fruit were positively correlated with the time of ripening. Within evaluated hybrids minor to moderate symptoms of red leaf spot and rust were determined, while symptoms of fruit rot were observed occasionally. Typical symptoms of PPV were mild or absent depending on genotype.

Keywords: plum; breeding; fruit quality; hybrids

**NOVI REZULTATI U OPLEMENJIVANJU ŠLJIVE (PRUNUS DOMESTICA L.) U
INSTITUTU ZA VOĆARSTVO ČAČAK**

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Osnovna delatnost u Institutu za voćarstvo – Čačak je stvaranje novih sorti kontinentalnih vrsta voćaka. Najznačajnije mesto pripada oplemenjivanju domaće šljive (*Prunus domestica L.*) i kroz različite oplemenjivačke programe je stvoreno 15 sorti. Do 2008. godine je priznato 14 sorti: ‘Čačanska rana’, ‘Čačanska lepotica’, ‘Čačanska najbolja’, ‘Čačanska rodna’, ‘Čačanski šećer’, ‘Valjevka’, ‘Jelica’, ‘Valerija’, ‘Boranka’, ‘Timočanka’, ‘Mildora’, ‘Krina’, ‘Zlatka’ i ‘Pozna plava’. U 2012. godini je priznata sorta ‘Nada’, čije su najznačajnije karakteristike: umerena bujnost; srednje pozno i obilno cvetanje; rano prorodevanje, redovna i visoka rodnost; kasno vreme zrenja ploda; krupan atraktivni plod, tamnoplavе boje pokojice sa intenzivnim pepeljkom; višenamenska upotrebljiva vrednost ploda; tolerantnost prema virusu šarke šljive (PPV). U postupku priznavanja se nalaze tri kandidat sorte. U eksperimentalnim zasadima Instituta za voćarstvo–Čačak se detaljno proučava i veći broj hibrida šljive, među kojima najveću pažnju zaslužuju hibridi nastali u okviru programa stvaranja novih sorti otpornih/tolerantnih prema PPV [38/62/70 (‘Hall’ x ‘California Blue’), IV/63/81 (‘Large Sugar Prune’ x ‘Scoldus’), 22/17/87 (‘Čačanska najbolja’ x ‘Zh’lta Butilcovidna’), 34/41/87 (‘Valjevka’ x ‘Čačanska lepotica’)]. U agroekološkim uslovima Čačka proučavani hibridi cvetaju tokom prve i druge dekade aprila, srednje do veoma obilno. U pogledu bujnosti rangiraju se od kržljavih do veoma bujnih, sa čim u vezi varira i visina prinosa po stablu. Plodovi proučavanih hibrida sazrevaju u intervalu od prve dekade jula do prve dekade septembra, a u pogledu krupnoće variraju od srednje do veoma krupnih. Heminski sastav ploda je u pozitivnoj korelaciji sa vremenom zrenja. U zavisnosti od genotipa, u poljskim uslovima se uočavaju blago do srednje izraženi simptomi karakteristični za plamenjaču i rđu šljive, sporadično se uočava pojava truleži ploda, dok simptoma karakterističnih za PPV ili nema ili su blago izraženi.

Ključne riječi: šljiva; oplemenjivanje; hibridi; kvalitet ploda

**SIGNIFICANCE HONEY BEE IN POLLINATION AND INCREASE OF OLD
CULTIVARS OF PLUM AND APPLE YIELDS**

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Farmers and beekeepers want the bees to pollinate crops more efficiently. For this purpose specially honey bee colonies are prepared, because pollination of most crops falls early in the season, when there is not an abundance of bees in the beehive. A lot of fruit species has enormous significance for the bees and the development of their colonies in early spring (hazel, almond, cornelian cherry, plum...) and for preparation for the main pasture. In our conditions the honey bees participate to over 85% in the pollination of fruit trees, and all the other pollinators of 14 – 15 %. The aim of this work is to show the percentage of pollinated ones, that means germinated fruits of old plum cultivars, with and without bees, and to see the influence on marked trees yields of examined cultivars. In this paper are presented two-years examination (2010 and 2011) the role of honey-bee in polination of same old cultivars plum and apple the Upper Polimlje region. Before flowering the flowers on isolate branches with net and the branches where the bees had access are numbered. After flowering and pollination, the fruits on marked branches are numbered. On cv Komperuša the percentage of fruits on non-isolated branches was 84 and on isolated ones 37,87. From the whole number of fruits on cv Crveni piskavac before harvest 23,55 % was there on non-isolated branches, and on the isolated 11,58 %, which shows us that yield is bigger 50 % if the polination is done by bees.

Keywords: Honey bee, pollination, plum, apple, yield.

**ZNAČAJ PČELA U OPRAŠIVANJU I POVEĆANJU PRINOSA STARIH SORTI
ŠLJIVE I JABUKE**

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Poljoprivrednici i pčelari žele da pčele što efikasnije oprase poljoprivredne kulture. U tu svrhu se posebno pripremaju pčelinja društva, jer opašivanje većine kultura pada rano u sezoni, kada se u košnici ne nalazi obilje pčela radilica. Dosta voćnih vrsta ima ogroman značaj za pčele, za njihov rani razvoj društva u rano proljeće (lijeska, badem, drijen, džanarika...) i pripremu za glavnu pašu. U našim uslovima u opašivanju voćaka medenosne pčele učestvuju sa preko 85 %, dok na sve ostale opašivače otpada 14-15 %. Cilj ovog rada je da se izračuna razlika u % opašenih, odnosno zametnutih plodova kod starih sorti šljive i jabuke, sa i bez prisustva pčela, te utvrdi uticaj na prinos obilježenih stabala ispitivanih sorti. U ovom radu su prikazani rezultati dvogodišnjeg istraživanja (2010 i 2011. godine), uloge pčela u opašivanju nekih starih sorti šljiva i jabuka u Gornjem Polimlju. Prije cvjetanja izbrojani su cvjetovi na granama koje su izolovane mrežom od tila i na granama gdje su pčele imale slobodan pristup. Nakon cvjetanja i opašivanja izbrojani su plodovi na obilježenim granama. Kod sorte Komperuša procenat zametnutih plodova na neizolovanim granama bio je 84 %, a na izolovanim 37,87 %. Od ukupnog broja zametnutih plodova, kod sorte Crveni piskavac, pred berbu je ostalo 23,55 % na neizolovanim nasuprot 11,50 % na izolovanim granama, što ukazuje da je prinos za oko 50 % veći ako opašivanje vrše pčele.

Ključne riječi: medenosna pčela, opašivanje, šljiva, jabuka, prinos

SEEDLINGS PRODUCTION OF SELECTED CORNELIAN CHERRY GENOTYPES (*CORNUS MAS L.*) BY GRAFTING

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In the breeding program at the Faculty of Agriculture in Novi Sad for many years, intensive work on the selection of genotypes from natural populations cornelian cherry and secondary provenance and on finding the fastest and most convenient way of production of quality planting material of the biggest selection cornelian cherry. Cornelian cherry is a wild cherry is extremely suitable for growing organic concept, but due to lack of quality planting material is spread on crop land. To this end, we investigated possibilities of grafting method on the selection of cornelian cherry sleeping bud. Grafted a total of 370 two-year old rootstocks of cornelian cherry in august 2011. with five selections (R1, SKC, Apatinski rani, Bačka and PPC1). For fall 2012. the success of grafting was investigated and determined the parameters of the quality of the obtained seedlings (average height and diameter of trees in the amount of crown and the average number and length of root formed vessels). The seedlings, stem cornelian cherry trees and plants was carried out during the growing season with a phytosanitary inspection has not revealed the presence of pathogens or pests. On average for all teams, the success of grafting was 59.67%, while the best selection depending on the success achieved in the Apatinski rani (80%) and Bačka (72%). Selections R1 and SKC had approximately the same admission (58% and 61%) while the lowest was recorded at admission PPC1 (36%). R1 seedlings had the highest level (904.60 mm), the average diameter of the trees (10.84 mm) and the lowest number (11) and the length of root diseases (101.0 mm). Apatinski rani seedling height had the average level for the test selection (735.21 mm), the maximum diameter (13.58 mm) and the largest number (20) and root length formed vessels (141.3 mm). Produced seedlings were planted in varietal collection at the Experimental Field of the Institute, which is the first time being in this region, where it continues monitoring and testing. Based on the obtained results, applied method of grafting gives good quality planting material selection cornelian cherry and can be recommended for mass production.

Keywords: Cornelian cherry (*Cornus mas L.*) selection; grafting; seedlings

**PROIZVODNJA SADNICA SELEKCIJONISANIH GENOTIPOVA DRENA
(CORNUS MAS L.) KALEMLJENJEM**

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U okviru oplemenjivačkog programa Departmana za voćarstvo, vinogradarstvo, hortikulturu i pejzažnu arhitekturu Poljoprivrednog fakulteta u Novom Sadu već duži niz godina se intenzivno radi na selekciji genotipova drena iz prirodne populacije i sekundarnih provenijencija, kao i na iznalaženju najbržeg i najpogodnjeg načina prizvodnje kvalitetnog sadnog materijala izdvojenih krupnoplodnih selekcija drena. Dren je šumska voćna vrsta izuzetno pogodna za gajenje u organskom konceptu, ali usled nedostatka kvalitetnog sadnog materijala nije raširena na gajenim površinama. U tom cilju je ispitana mogućnost kalemljenja selekcija drena metodom na spavajući pupoljak. Okalemljeno je ukupno 370 dvogodišnjih sejanaca drena u avgustu 2011. godine sa pet izdvojenih selekcija (R1, SKC, Apatinski rani, Bačka i PPC1). Na jesen 2012. godine ispitana je uspešnost kalemljenja i utvrđeni su parametri kvaliteta dobijenih sadnica (prosečna visina i prečnik sadnice u visini korenovog vrata i prosečan broj i dužina formiranih korenskih žila). Na sejancima, matičnim stablima i sadnicama drena vršen je tokom vegetacije fitosanitarni pregled pri čemu nije ustanovljeno prisustvo patogena ni štetočina. U proseku za sve selekcije, uspešnost kalemljenja je iznosila 59,67%, dok je zavisno od selekcije najbolji uspeh postignut u prijemu kod selekcija Apatinski rani (80%) i Bačka (72%). Selekcije R1 i SKC su imale približno isti prijem (58% odnosno 61%) dok je najslabiji prijem zabeležen kod PPC1 (36%). Sadnice R1 selekcije imale su najveću visinu (904,60 mm), prosečan prečnik sadnice u visini korenovog vrata (10,84 mm) i najmanji broj (11) i dužinu korenskih žila (101,0 mm). Sadnice selekcije Apatinski rani su imale visinu sadnice u nivou proseka za ispitivane selekcije (735,21 mm), najveći prečnik (13,58 mm) kao i najveći broj (20) i dužinu formiranih korenskih žila (141,3 mm). Proizvedene sadnice su posadene u kolekcioni zasad na Oglednom polju Departmana, koji je prvi takav zasad na ovim prostorima, gde se nastavlja dalje praćenje i ispitivanje. Na osnovu preliminarnih rezultata može se zaključiti da primjenjeni metod kalemljenja daje kvalitetan sadni materijal selekcija drena te da se može preporučiti za masovnu proizvodnju, ali svakako i nastaviti dalje unapređenje navedenog.

Ključne riječi: dren (Cornus mas L.); selekcija; kalemljenje; sadnica

**SUSCEPTIBILITY OF SWEET CHERRY CULTIVARS TO RAIN INDUCED
FRUIT CRACKING IN THE REGION OF SARAJEVO**

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Susceptibility of 5 sweet cherry cultivars, grafted on Gisela 5, to rain induced fruit cracking was studied in the region of Sarajevo, during a two – year period (2010 – 2011). Testing of fruit cracking was done using index by Christensen. In the cultivars tested were found significant differences in cracking index. All the cultivars had the highest fruit cracking index in 2010 year. The highest susceptibility to rain induced fruit cracking showed cultivars ‘Burlat’ a during both years. Cultivars ‘Kordia’, ‘Regina’, ‘Karina’ and ‘Schneider's Späte Knorpelkirsche’ were moderately susceptible to fruit cracking.

Keywords: sweet cherry; cultivar; fruit cracking index.

OSETLJIVOST SORTI TREŠNJE NA PUCANJE PLODOVA U USLOVIMA SARAJEVA

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Tokom dvogodišnjeg perioda (2010 – 2011), u uslovima Sarajeva, proučavana je osetljivost na pucanje plodova pet sorti trešnje, kalemjenih na podlozi Gizela 5. Osetljivost na pucanje je određivana na osnovu indeksa pucanja plodova. U periodu ispitivanja su utvrđene razlike u pogledu osetljivosti na pucanje plodova kako između sorti tako i između godina ispitivanja. Naime, kod svih ispitivanih sorti zabeležene su veće vrednosti indeksa pucanja plodova tokom 2010. godine. Sorta Burlat je pokazala najveću osetljivost na pucanje plodova tokom obe godine ispitivanja, dok su sorte Kordija, Regina, Karina i Šnajderova kasna prema vrednostima indeksa pucanja ploda tokom godina ispitivanja pripadale grupi umereno osetljivih sorti.

Ključne riječi: trešnja; sorta; indeks pucanja ploda.

**PHENOLOGICAL PROPERTIES OF RED AND WHITE CurrANT CULTIVARS
(RIBES RUBRUM L.)**

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In this study were shown results of phenological properties of red and white currants in environment Obrenovačka Posavina. Observation were done in the collective orchard of 11 red and 5 white currant cultivars, cultivated in shrub form with planting distance from 1,8 x 0,8 m. During three-year studies (2007-2009 year) the following parameters of phenological phases were monitored: date of the first leaf emergence, date of inflorescence emergence, date of initiation and full flowering, date of the first berry set and date of berry ripening – fruit harvest. Phenological properties were determined by international descriptors for red and white currant (CPVO-TP/52/1 – UPOV, 2004). Cultivars of red and white currant begining in the growing season in the half of March. The earliest cultivar was Junifer (8th of March) and the latest was Viktoria (26th of March). Phenological phase of flowering were began in the end of March and beginning of April, average all cultivars on the 31st of March. According to the flowering time all cultivars were sorted to: early flowering – flowered before on the 26th of March (Junifer and Stanza), middle flowering – flowered between on the 27th of March and 1st of April (Jonkheer van Tets, London Market, Mirana, Primus, Witte Pare, Witte aus Juteburga, White Champange and Rondom) and late flowering – flowered after the 2nd of April (Makosta, Slovakia, Rovada, Redpoll, Viktoria and Rolan). Berry ripening phase was beginning average on the 22nd of June. The earliest cultivar was Junifer (9th of June) and the latest was Redpoll (4th of July). The range between average date of the earliest and the latest ripening cultivar was 25 days. Average duration of phases of growth and development of berries of red and white currant cultivars was 67 days. Shortest duration of this phase had cultivar Jonkheer van Tets - 60 days, the longest cultivar Redpoll - 75 days. In addition of biological properties of cultivars, on the duration of the phase of growth and development of berries significant effect had a weather conditions in different years of study.

Keywords: currant; leaf emergence; flowering time; ripening berries

FENOLOŠKE OSOBINE SORTI CRVENE I BELE RIBIZLE (RIBES RUBRUM L.)

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U radu su prikazani rezultati ispitivanja fenoloških osobina sorti crvene i bele ribizle u uslovima Obrenovačke Posavine. Osmatranja su vršena u kolepcionom zasadu 11 crvenih i 5 belih sorti ribizle, sađenih u sistemu žive ograde sa rastojanjem od 1,8 x 0,8 m. Od fenoloških tačaka praćene su: početak listanja, pojava cvasti, cvetanje, zametanje i sazrevanje bobica. Fenološke osobine određivane su pomoću međunarodnog deskriptora za crvenu i belu ribizlu (CPVO-TP/52/1 – UPOV, 2004). Sorte crvene i bele ribizle ulazile su u period vegetacije polovinom marta Počinjale su da listaju od 08. 03. (džunifer) do 26. 03. (viktorija). Fenološku fazu cvetanja započinjale su krajem marta i početkom aprila (u proseku 31. 03). Prema vremenu cvetanja sorte su svrstane na: ranocvetne – cvetale pre 26. 03. (džunifer i stanca), srednjecvetne – cvetale od 27. 03. do 01. 04. (jonker van tets, london market, mirana, primus, bela perla, bela iz iteburga, bela šampanjska i rondom) i poznocvetne – cvetale posle 02. 04. (makosta, slovakija, rovada, redpul, viktorija i rolan). Faza sazrevanja bobica prosečno je nastupala 22. 06. Najranije su sazrevali plodovi sorte džunifer (09. 06), a najpozniye plodovi sorte redpul (04. 07). Raspon između prosečnog datuma sazrevanja plodova najranije i najpozniye sorte iznosio je 25 dana. Prosječno trajanje faze rasta i razvića bobica sorti crvene i bele ribizle iznosio je 67 dana. Najkraće trajanje ove faze imala je sorta jonker van tets – 60 dana, a najduže sorte redpul – 75 dana. Pored bioloških svojstava sorte, na trajanje faze rasta i razvića bobica značajno su uticale i meteorološke prilike u pojedinim godinama ispitivanja

Ključne riječi: ribizla; listanje; cvetanje; sazrevanje plodova

**THE INFLUENCE OF CANE PINCHING ON PRODUCTION TRAITS OF
PRIMOCANE FRUITING RASPBERRY CULTIVARS**

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Primocane fruiting raspberries produce fruit on lateral branches at the top of first-year canes in late summer and autumn. Their importance in the season extension and easier growing technology, as well as the best prices obtained for berries produced late in the season has been confirmed (Milivojević et al., 2011). The research was designed to evaluate the effect of removing the growing tip of primocanes ("pinching"), when those reach about 80 cm tall, on ripening time, productivity and physical fruit traits in ten raspberry cultivars ('Autumn Bliss', 'Lyulin', 'Polana', 'Polka', 'Himbo Top', 'Ruby', 'Rossana', 'Porrana Rosa', 'Golden Bliss' and 'Heritage'). This measure is considered as important to stimulate higher productivity, whereas harvest time is often delayed. Studies were conducted at the Experimental station "Radmilovac", a collective raspberry orchard of the Faculty of Agriculture, Belgrade University, in 2009. The orchard was established in 2006 in the form of a hedgerow system without trellis. Canes were simply mowed down early each spring and the crop was only born on the primocanes during the summer and fall. The obtained results showed that tipping of primocanes has been found to increase yield in five studied cultivars. The highest fruit yield was recorded in both unpinched and pinched primocanes of cv. 'Heritage' (174,6 g and 296,8 g/cane, respectively), whereas fruit weight only showed lower values by applying this measure in cvs. 'Heritage', 'Golden Bliss' and 'Lyulin'. Keeping the canes pinched also affected later beginning of ripening time, ranging from 9 days ('Polka') to 80 days ('Ruby') in comparison to the control treatment.

Keywords: raspberry, cultivar, removing the growing tip, yield, fruit quality

**UTICAJ ZAKIDANJA VRHOVA IZDANAKA NA PROIZVODNA SVOJSTVA
REMONTANTNIH SORTI MALINE**

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Remontantne sorte maline donose rod tokom kasnog leta i jeseni na fruktifikacionim prirastima u vršnoj zoni jednogodišnjih izdanaka. Njihov značaj se ogleda u prođenjoj sezoni berbe i jednostavnoj tehnologiji gajenja, kao i visokoj ceni plodova koji stižu kasnije na tržište (Milivojević et al., 2011). U radu je ispitivan uticaj zakidanja vrhova jednogodišnjih izdanaka, koje je izvedeno kada su oni dostigli visinu oko 80 cm, na vreme zrenja, produktivnost i fizičke osobine ploda kod deset remontantnih sorti maline ('Autumn Bliss', 'Lyulin', 'Polana', 'Polka', 'Himbo Top', 'Ruby', 'Rossana', 'Porrana Rosa', 'Golden Bliss' i 'Heritage'). Ova mera se smatra važnom za povećanje produktivnosti, dok se njenom primenom vreme berbe često odlaže. Ispitivanja su izvedena tokom 2009. godine u kolekcijom zasadu maline na OD "Radmilovac", Poljoprivrednog fakulteta, Univerziteta u Beogradu. Zasad je zasnovan 2006. godine po sistemu žive ograde, bez naslona. Izdanci su uklanjani do osnove rano u proleće svake godine, tako da je plodonošenje bilo isključivo na novim jednogodišnjim izdancima tokom leta i jeseni. Dobijeni rezultati su pokazali da je zakidanje vrhova izdanaka povećalo prinos kod pet ispitivanih sorti. Najveći prinos je registrovan na kontrolnim i pinciranim izdancima sorte 'Heritage' (174,6 g i 296,8 g/izdanku, po redosledu), dok je masa ploda primenom ove mere pokazala niže vrednosti jedino kod sorti 'Heritage', 'Golden Bliss' i 'Lyulin'. Zakidanje vrhova izdanaka je takođe uticalo i na kasniji početak zrenja, koji se kretao u rasponu od 9 dana ('Polka') do 80 dana ('Ruby') u odnosu na kontrolni tretman.

Ključne riječi: malina, sorta, zakidanje vrha izdanka, prinos, kvalitet ploda

PRODUCTION OF ACTINIDIA (*Actinidia sp.*) PLANTING MATERIAL

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Kiwi (*Actinidia* sp.) is a type of fruit that has increasingly grown and out of the optimum manufacturing areas. It has been popular as a decorative plant giving abundant yields of juicy fruit rich in vitamin C. The objective of this study was to analyse the production technology of actinidia planting material. The production of the planting material started in 2005, using vegetative propagation from mature cuttings. Vegetative propagation from mature cuttings involves a specific technology and requires controlled conditions. Cuttings are taken during dormancy, most frequently in February, and trimmed to about 20 cm in length (3-4 buds), with a slant cut made below the basal bud. After immersion into a phytohormone, cuttings are placed into sterile sand substrate in warm beds. A solution of indole-β-butyrlic acid (IBA) is used at a concentration of 2500 ppm. After three months, the rooted cuttings are transplanted into PVC bags containing an adequate substrate. The callused cuttings are left in the substrate until rooting takes place. The transplanted rooted cuttings are moved into the open in June. During the growing season, irrigation and fertilisation are applied. At the end of the growing season (in mid-November), after leaf shedding, the plants are stored under cold sunlit conditions until spring. Then, they are ready to be planted in their permanent location. The percentage of rooted cuttings over a period of seven years ranged from 30-40% across years.

PROIZVODNJA SADNOG MATERIJALA AKTINIDIJE (ACTINIDIA SP.)

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Aktinidija (Actinidia sp.) je vrsta voćaka koja se poslednjih godina sve više gaji i izvan optimalnog proizvodnog područja. Svoju popularnost duguje dekorativnom izgledu same biljke i obilju sočnih plodova koji obiluju vitaminom C. Cilj rada je analizirati tehnologiju proizvodnje sadnog materijala aktinidije. Proizvodnja sadnog materijala aktinidije započeta je 2005.godine. Način proizvodnje je vegetativnim razmnožavanjem zrelim reznicama. Razmnožavanje zrelim reznicama ima specifičnu tehnologiju i zahteva kontrolisane uslove. Reznice se skidaju u periodu mirovanja, najčešće u februaru. Dužina reznice je oko 20 cm (3-4 pupoljka) sa sa kosim rezom ispod bazalnog pupoljka. U pripremljen supstrat (sterilan pesak) u toplim lejama stavljaju se reznice koje se prethodno potapaju u fitohormon. Koristi se rastvor indol-β-butерne kiseline (IBA) u koncentraciji 2500 ppm. Nakon tri meseca ožljene reznice se pikiraju i presađuju u PVC kese sa odgovarajućim supstratom. Kalusirane reznice se još ostavljaju u supstratu, dok se ne ožile. Presađene ožljene reznice se iznose na otvoreno tokom juna meseca. U toku vegetacije se zalivaju i prihranjuju. Na kraju vegetacije (sredinom novembra) kad su sadnice aktinidije zbacile lišće, unose se u hladne i svetle prostorije gde se čuvaju do proleća. Nakon toga su spremne za sadnju na stalno mesto. Procenat ožiljenih rezница, tokom perioda od sedam godina, kretao se u rasponu od 30-40% iz godine u godinu.

PRODUCTION CHARACTERISTICS OF THE FRUIT OF HAZEL (*CORYLUS AVELLANA L.*), CULTIVARS GROWN IN TERMS OF BANJA LUKA REGION

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In the wider region of Banja Luka in the last few years there has been an increase in setting up of young hazel orchards. During the setting up of hazel plantations were used introduced hazel cultivars which varietal characteristic in these production conditions were not studied yet. It is known that in the world there are neither standard hazel cultivars nor standard pollinators, but they are determined by the ecological conditions of the region in which they are grown. Study of the production characteristics of hazel cultivars grown in the ecological conditions of Banja Luka region has an aim to create a database which will facilitate the selection of cultivars when setting up new plantations. This research study covered bearing and fruit production characteristics of 12 hazel cultivars: Avellino, Jean, Istrian round, Hall's giant, Imperial di Trebisonda, Bollwiller, Multiflorum, Tonda gentile romana, Ludolf zellernuss, Gustav zellernuss, Apolda and Tankoljuskasti. The experiment was conducted in two hazel plantations of collection type in the area of Banja Luka where agro-technical measures were performed to a lesser extent, and there was no irrigation system in the orchards. The research was conducted during year 2011 and year 2012, where we have studied the production characteristic of fruits: fruit weight, kernel weight and the kernel percentage. Yields' analysis of 12 researched hazel cultivars, in ecological conditions of Banja Luka region indicated the following:

- Only three cultivars were bearing fruits in both years of research: Avellino, Hall's Giant and Imperial di Trebisonda;
- Six cultivars were bearing fruits only in year 2011, they were not bearing fruits in year 2012: Jean, Istrian round, Bollwiller, Multiflorum, Tonda gentile romana and Gustav Zellernuss;
- Three of the cultivars were not bearing fruits at all in none of the researched years: Ludolf Zellernuss, Apolda and "Tankoljuskasti".

The issues of regular fruit bearing of observed cultivars is obviously an opened question from the standpoint of microclimatic condition for growing hazelnuts in this region.

Key word: hazel, production characteristics, productivity.

**PROIZVODNE KARAKTERISTIKE PLODA LIJESKE (*CORYLUS AVELLANA L.*),
KOD SORTI GAJENIH U USLOVIMA BANJALUČKE REGIJE**

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U širem okruženju Banjaluke u poslednjih nekoliko godina došlo je do podizanja više mlađih zasada lijeske (*Corylus avellana L.*). Pri podizanju zasada korištene su introdukovane sorte na kojima nije izvršeno proučavanje njihovih sortnih karakteristika u ovim proizvodnim uslovima. Pri tom, poznato je da u svijetu ne postoje standardne sorte za gajenje kao ni opravivači, nego se one određuju prema ekološkim uslovima regije u kojima se uzgajaju. Proučavanje proizvodnih karakteristika sortimenta lijeske gajenog u ekološkim uslovima banjalučke regije ima za cilj stvaranja baze podataka koja će olakšati odabir sortimenta prilikom podizanja novih zasada. Rad je obuhvatio istraživanje plodonošenja i proizvodnih karakteristika ploda kod 12 sorti lijeske: Avelino, Žan, Istarski okrugli, Halski džin, Trebizonda, Bolvijeri, Multiflorum, Tonda đentile romana, Ludolf, Gustav celjski, Apolda i Tankoljuskasti. Ogled je postavljen u dva zasada lijeske kolekcionog tipa na području Banja Luke u kojima se agrotehničke mjere izvode u manjoj mjeri, a u zasadima ne postoji sistem za navodnjavanje. Istraživanje je realizovano tokom 2011 i 2012. godine, a proučene su proizvodne karakteristike plodova: masa ploda, masa jezgre i randman jezgre. Analiza rodnosti 12 ispitivanih sorti lijeske, u uslovima banjalučke regije pokazuje sledeće:

- samo tri sorte su plodonosile u obadve godine ispitivanja: Avelino, Halski džin i Trebizonda;
- šest sorti je plodonosilo samo u 2011. godini, odnosno nije plodonosilo u 2012. godini: Žan, Istarski okrugli, Bolvijeri, Multiflorum, Tonda đentile romana i Gustav celjski;
- tri sorte nisu dale plodove u obe godine ispitivanja: Ludolf, Apolda i Tankoljuskasti;

Pitanje redovnog plodonošenja posmatranih sorti evidentno je otvoreno pitanje sa stanovišta mikroklimatskih uslova za uzgoj lijeske na ovim prostorima.

Ključne riječi: lijeska, proizvodne karakteristike, rodnost,

**INDICATORS OF GRAPE QUALITY OF PINOT NOIR CULTIVAR GROWN IN
THE WINE GROWING REGION OF GROCKA IN SERBIA**

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Different parameters can show the quality of the grapes. Besides the sugar content, total acids and their ratios, quality of grapes grown for wine production greatly depends on some phenolic compounds found in the berry. Ecological factors can cause variations of indicators which are important for the quality of grape. Locality-specific ecology affects not only the physiological processes but also the quality of grapes relating to changes in the properties of the cluster and berry, sugar content, acids, colored and aromatic compounds. This paper shows the results of elements of grape quality for Pinot Noir cultivar grown in the wine growing region of Grocka (Radmilovac locality - 44° 45' 24,66" N; 20° 34' 54,50" E) in Serbia. In a three year long period (2009-2011) the following were tested: sugar content (%) and content of total acids in grape juice (g/l), in a 2009 and 2010: content of phenol (mg GAE/g), content of anthocyanin (mg malvidin-3-glucoside/g) in the skin, pulp and berry seeds, as well as antioxidant activity (%). Data from automatic weather station located in EF 'Radmilovac' were used for the analysis of weather conditions (temperature and precipitation) during the observed period. Statistically significant differences were determined in the sugar content with respect to the year of investigation ($F(2,27) = 9.479$, $p = 0.001$). Based on subsequent LSD test, the year of 2011 was different in comparison to 2009 and 2010. There were no statistically significant differences in the total acid content with respect to the years of investigation. The highest content of total phenol in grape seeds was 273.02 mg GAE/g and 317.11 mg GAE/g in 2009 and 2011, respectively. The content of anthocyanin in berry skin was relatively equal in the investigated period (about 10 mg malvidin-3-glucoside/g). The extract of grape seed from 2009 had the highest antioxidant activity (94.17%). Based on the results of the analyses it was concluded that under the same or similar agroecological conditions Pinot Noir cultivar had good quality of grape grown for wine production. However, significant influence of climate on the quality parameters was observed in the period of analysis.

Keywords: Pinot Noir; grape quality; sugar content; total acids; antioxidant activity

**POKAZATELJI KVALITETA GROŽĐA SORTE BURGUNDAC CRNI GAJENE U
GROČANSKOM VINOGORJU U SRBIJI**

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Različiti parametri predstavljaju merilo kvaliteta grožđa. Pored sadržaja šećera, ukupnih kiselina i njihovog odnosa, za kvalitet grožđa namenjenog spravljanju vina od velikog značaja je i sadržaj pojedinih fenolnih jedinjenja u bobici. Pod uticajem ekoloških faktora može doći do odstupanja pokazatelja značajnih za kvalitet grožđa. Uticajući na fiziološke procese, ekološki potencijal lokaliteta u velikoj meri utiče i na kvalitet grožđa koji se ogleda u promeni svojstava grozdja i bobice, sadržaju šećera, kiselina, bojenih i aromatičnih jedinjenja. U ovom radu prikazani su rezultati elemenata kvaliteta grožđa kod sorte Pinot Noir gajene u gročanskom vinogorju (lokalitet Radmilovac - 44° 45' 24,66" N; 20° 34' 54,50" E) u Srbiji. U trogodišnjem periodu (2009-2011) ispitivani su sadržaj šećera (%) i sadržaj ukupnih kiselina u širi (g/l), a u 2009. i 2010. godini: sadržaj fenola (mg/GAE/g), sadržaj antocijana (mg malvidin-3-glukozida) u pokožici, pulpi i semenkama bobice, kao i antioksidativna aktivnost (%). Za analizu meteoroloških uslova (temperatura i padavine) tokom posmatrane tri godine korišćeni su podaci sa automatske meteorološke stанице koja je instalirana na OD „Radmilovac. Utvrđena je statistički značajna razlika u sadržaju šećera u odnosu na godinu ($F(2,27) = 9,479$, $p = 0,001$). Naknadnim LSD testom ustanovljena je razlika između 2011. godine u odnosu na 2009. i 2010. godinu. Kod sadržaja ukupnih kiselina nije bilo statistički značajne razlike između ispitivanih godina. Najveći sadržaj ukupnih fenola imale su semenke grožđa od 273,02 mg/GAE/g (2009. godina) do 317,11 mg/GAE/g (2011. godina). Sadržaj antocijana u pokožici bobice u ispitivanim godinama bio je približno ujednačen (oko 10 mg malvidin-3-glukozida). Najveću antioksidativnu aktivnost imao je ekstrakt semenki grožđa u 2009. godini (94,17%). Rezultati analize ukazuju da sorta Pinot Noir u istim ili sličnim agroekološkim uslovima ostvaruje dobar kvalitet grožđa nemanjenog za proizvodnju crvenog vina, ali da na pojedine parametre kvaliteta značajan uticaj imaju klimatski činioci u godinama ispitivanja.

**FERTILITY VARIATION OF PROKUPAC CULTIVAR UNDER INFLUENCE OF
DIFFERENT ROOTSTOCKS**

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Prokupac is autochthonous black wine Serbian variety, which originate takes from Prokuplje surrounding. It is often found under the synonyms: Kameničarka, Rekovačka crnka, Nikodimka, Rskavac, Prokupka and Niševka. It is characterized with strong vigor and yielding capacity, which manifests as a well provided or low fertility soil. Prokupac shoots are developed and strong with standing growth. Prokupac also can be grown at lower training systems without post system. Yielding varieties whereat should be emphasized that the lowest buds on a shoot are with good fertility. For Prokupac is appropriate short pruning on which provides excellent yield. The above mentioned characteristics are under the direct influence of rootstock on which the variety is grafted. Examination were carried out in the vineyard on "Radmilovac"- Experimental field Faculty of agriculture in Belgrade. Aim of this research was to detect effects of three rootstocks (K 5BB, SO4 and W 41B) on Prokupac fertility. In this paper are presented results of four years tests that showed variation of different fertility parameters depending on the rootstock. Rootstock K 5BB had the highest impact on the number of developed shoots per vine (12) and number of productive shoots per vine (10,7). Higher percentage of productive shoots was recorded on rootstock SO4 (93,1). In comparison to other two rootstocks (5BB K and Š 41B), on the same rootstock was recorded higher values for the following parameters: number inflorescences per bud (1,6), number of inflorescences per developed shoot (1,79) and the number of inflorescences per productive shoot (1, 95). 41B rootstock had the highest impact on percent of developed shoot (95,4), number of clusters per vine (18,7) and cluster mass (173,5 g).

Keywords: Prokupac; rootstock; K 5BB; SO4; Š 41B

**VARIRANJE RODNOSTI SORTE PROKUPAC POD UTICAJEM RAZLIČITIH
LOZNIH PODLOGA**

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Prokupac je autohtona crna vinska sorta Srbije koja poreklom vodi iz okoline Prokuplja. Sreće i pod sinonimima: Kameničarka, Rekovačka crnka, Nikodimka, Rskavac, Prokupka i Niševka. Odlikuje se izraženom bujnošću i rodnošću koja se ispoljava kako na dobro obezbeđenim zemljištima tako i na siromašnim zemljištima. Lastari prokupca su razvijeni i jaki sa uspravnim porastom pa se može gajiti na nižim uzgojnim oblicima bez naslona. Rodna je sorta pri čemu su i najniža okca na lastaru veoma rodna usled čega se preporučuje kratka rezidba (kondir na kondir). Pomenute osobine su pod direktnim uticajem lozne podloge na kojoj je sorta kalemljena. Ispitivanja su obavljena u kolekcionom vinogradu Oglednog dobra "Radmilovac" Poljoprivrednog fakulteta u Beogradu, pri čemu je ispitivan uticaj tri lozne podloge (K 5BB, SO4 i Š 41B) na rodnost sorte Prokupca. U radu su prikazani rezultati četvorogodišnjeg ispitivanja koji su pokazali variranje parametara rodnosti u zavisnosti od lozne podloge. Lozna podloga K 5BB imala je najveći uticaj na broj razvijenih lastara po čokotu (12) i broj rodnih lastara po čokotu (10,7). Veći procentualni udeo rodnih lastara zabeležen je na loznoj podlozi SO4 (93,1). Na istoj podlozi zabeležene su veće vrednosti u odnosu na ostale podloge K 5BB i Š 41B za sledeće parametre: broj cvasti po okcu (1,6), broj cvasti po razvijenom lastaru (1,79) i broj cvasti po rodnom lastaru (1,95). Podloga Š 41B imala je najveći uticaj na % razvijenih lastara (95,4) broj grozdova po čokotu (18,7) i na masu grozda (173,5 gr).

Ključne riječi: Prokupac; lozna podloga; K 5BB; SO4; Š 41B

**YIELD POTENTIAL OF PROKUPAC VARIETY IN THE CONDITIONS OF NIŠ
VINEYARD AREA**

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Prokupac is an autochthonous grapevine variety primarily cultivated in the south and southeast of Serbia. Its biological characteristics make its cultivation possible even without the use of trellises, when in goblet-like form, which significantly facilitates its cultivation. Quality wines are produced from this variety. Given its production importance, Prokupac variety was the research topic of a number of examinations aimed at raising production rates and the selection of the clones with enhanced economic and technological characteristics. This paper illustrates some basic indicators of yield potential and the quality of Prokupac variety, cultivated in Niš vineyard area. Yield potential and grape quality were analyzed during 2009 and 2010 in the collection vineyard of the Center for Viticulture and Winemaking in Niš. Apart from determining the mean dates of the most important phenophases of growth and development, the yield potential and grape quality of Prokupac variety were determined through the screening of the following indicators: the number and percentage of buds, number and percentage of fruiting grape shoots, coefficient of fertility, grape crop per square unit, number of berries, average berry mass, number of caps in a berry, sugar levels and total acid amounts in grapes. The main indicators for the quality of Prokupac variety in this research show that this variety belongs to a group of varieties suitable for quality wine production. The average length of vegetation period is 170 days. The average yield of Prokupac variety during the two-year period varied between 8,612 and 12,779 kg/ha. Sugar levels remained satisfactory (18-20%). The acquired study results show that Prokupac variety can be successfully cultivated in the conditions of Niš vineyard area.

Keywords: variety, phenophases of development, grape quality

RODNI POTENCIJAL SORTE PROKUPAC U USLOVIMA NIŠKOG VINOGORJA

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Prokupac je autohtona sorta vinove loze koja se najviše uzgaja na području južne i jugoistočne Srbije. Biološke karakteristike sorte Prokupac omogućavaju uzgoj i bez naslona u formi peharastog uzgojnog oblika, što značajno olakšava njeno gajenje. Od ove sorte se dobijaju kvalitetna vina. Zbog značaja u proizvodnji, sorte Prokupac je bila predmet većeg broja ispitivanja u cilju podizanja nivoa proizvodnje i izdvajanja klonova poboljšanih privredno-tehnoloških karakteristika. U ovom radu prikazani su osnovni pokazatelji rodnog potencijala i kvalitet grožđa sorte Prokupac gajene u niškom vinogorju. Rodni potencijal i kvalitet grožđa analiziran je tokom 2009. i 2010. u kolekcionom vinogradu Centra za vinogradarstvo i vinarstvo u Nišu. Pored određivanja srednjih datuma nastupanja najznačajnijih fenofaza rasta i razvoja, rodni potencijal i kvalitet grožđa sorte Prokupac određen je praćenjem sledećih pokazatelja: broj i procenat kretanja okaca, broj i procenat rodnih lastara, koeficijent plodnosti, prinos grožđa po jedinici površine, broj grozdova, prosečna masa grozda, broj bobica u grozdu i sadržaj šećera i ukupnih kiselina u grožđu. Osnovni pokazatelji kvaliteta sorte Prokupac u istraživanju, ukazuju da sorta Prokupac pripada grupi sorata od čijeg se grožđa mogu proizvoditi kvalitetna vina. Prosečna dužina vegetacije iznosi 170 dana. Prosečan prinos sorte Prokupac tokom dvogodišnjeg perioda istraživanja kretao se u rasponu od 8,612 do 12,779 kg/ha. Sadržaj šećera u grožđu bio je na zadovoljavajućem nivou (18 - 20%). Dobijeni rezultati pokazuju da se sorta Prokupac može vrlo uspešno gajiti u proizvodnim uslovima niškog vinogorja.

Ključne reči: sorta, fenofaze razvoja, kvalitet grožđa

**WINE QUALITY OF INTERSPECIES HYBRIDS
CULTIVATED IN NIŠ VINEYARD AREA**

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World production is characterized by a large number of distinctions in the process of grape growing, such as variety, climatic and soil factors, method of production etc., which, together with various approaches in the technological processes of grape processing, result in a myriad of end products. This paper shows basic indicators for wine quality of interspecies hybrids Lela, Petra, Zlata, Rani rizling and Mila, cultivated in Niš vineyard area. The research was conducted in a sample vineyard and laboratory complex of The Center for Viticulture and Winemaking in Niš from 2004 to 2005. Through the process of microvinification, a wine was produced from the grapes of the chosen varieties, and it was used for the purposes of quality analyses. Italian Riesling was used as a control variety. Apart from the quality of the grapes, the levels of sugars and acids were also determined. The quality of wine was analysed through the determination of: the amount of alcohol, amount of reducing substances, sugar-free extract levels, total acid content, mineral and phenol content. The quality of the chosen varieties varied between quality and high quality during the two-year period. Mila variety had the lowest average sugar amount in its grapes – 19,08% (17,07% in 2005 and 21,09 in 2004), while Petra variety had the highest amount of 23,2% (21,09% in 2005, and 25,32% in 2004). Petra variety had the highest alcohol content (13,84 vol%), and was followed by Golden Riesling (13,47 vol%), Liza (12,63 vol%) and Lela (12,24 vol%), while the lowest alcohol content was found in Zlata (11,28 vol%) and Mila (11,25 vol%). From all the varieties, only the latter two had lower alcohol content than the standard (Italian Riesling). All varieties produced higher alcohol content in 2004 than in 2005. The chemical analysis was complemented with a sensory evaluation in order to provide a more complete insight into the quality of all the chosen varieties. All the chosen varieties produced high quality wines, and the wines all belong to dry wines, for their sugar levels was around or lower than 4 grams per liter. Petra's specific flavor and high sugar amount place it among varieties which can be used for dessert wine production.

Keywords: variety, grape quality, wine quality

KVALITET VINA INTERSPECIES HIBRIDA U USLOVIMA NIŠKOG VINOGORJA

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Svetsku proizvodnju vina karakteriše veliki broj specifičnosti u procesu uzgoja loze kao što je sorta, klimatski i zemljivođišni faktori, način proizvodnje, što zajedno sa različitim pristupima u tehnološkom procesu prerade grožđa rezultuje ogromnom paletom krajnjeg proizvoda. U ovom radu su prikazani osnovni pokazatelji kvaliteta vina interspecies hibrida Lela, Petra, Zlata, Liza, Rani rizling i Mila gajenih u uslovima niškog vinogorja. Ispitanje je sprovedeno u oglednom vinogradu i laboratorijskom kompleksu Instituta za vinogradarstvo i vinarstvo u Nišu tokom 2004-2005. godine. Od grožđa ispitivanih sorti je procesom mikrovinifikacije proizvedeno vino koje je poslužilo za analizu kvaliteta a kao kontrola korišćena je sorta Rizling italijanski. Osim kvaliteta vina određeni su sadržaj šećera i ukupnih kiselina u grožđu, kao sirovine za dobijanje vina. Kvalitet vina analiziran je korz određivanje: sadržaj alkohola u vinu, sadržaj redukujućih materija, sadržaj ekstrakta bez šećera, sadržaj ukupnih kiselina, sadržaj mineralnih materija i sadržaj fenolnih materije. Kvalitet grožđa ispitivanih sorti tokom dvogodišnjeg perioda kretao su u granicama od kvalitetnog do visokokvalitetnog. Najniži prosječni sadržaj šećera u grožđu je imala sorta Mila 19,08% (17,07% u 2005. i 21,09 u 2004. godini), a najviši sorta Petra 23,2% (21,09% u 2005. odnosno 25,32% u 2004. godini). Vino sorte Petra imalo je najveći sadržaj alkohola (13,84 vol%), zatim Rani rizling (13,47 vol%), Liza (12,63 vol%) i Lela (12,24 vol%), dok je najniži sadržaj alkohola zabeležen kod sorti Zlata (11,28 vol%) i Mila (11,25 vol%). Od ispitivanih sorti samo su vina sorte Zlata i Mila imale manji sadržaj alkohola u odnosu na standard (Rizling italijanski). Sve ispitivane sorte imale su veći sadržaj alkohola u 2004. godini u odnosu na 2005. Hemisna analiza dopunjena je senzornom analizom kako bi se stekao potpuniji uvid u kvalitet vina ispitivanih sorti. Sve ispitivane sorte dale su visok kvalitet vina i vina pripadaju grupi suvih, jer je sadržaj šećera u vinu bio oko ili niži od 4 g/l. Specifična aroma i visok sadržaj šećera sorti Petra svrstavaju u grupu sorti od kojih se mogu spravljati i desertna vina.

Ključne reči: sorta, kvalitet grožđa, kvalitet vina

**THE ECOLOGICAL CONDITIONS USED TO PREDICT THE BEGINNING OF
FLOWERING OF ŽILAVKA VARIETY IN MOSTAR VINEYARD AREA**

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Flowering is one of the most sensitive phenophases of grapevine development, and it can be significantly affected by climate typical for the period. Temperature conditions that precede the beginning of flowering are of great, if not of critical importance for the commencement of this phenophase. Temperatures higher than 15oC serve the processes of pollination and fertilization. The beginning of grapevine flowering is of utmost importance to defining the dynamics of realization of the crucial argo- and ampelotechnic measures in a vineyard. This paper illustrates one model of predicting the beginning of Žilavka variety flowering, based on the analysis of temperature conditions in Mostar vineyard area. To construct the model which is to be used to estimate the beginning of Žilavka variety's flowering depending on the previous month's temperature sum, the data of Mostar Weather Station for the period of 2002 to 2010 was used. Based on the number of days between the budding and flowering (Y) and the value of the coefficient C (x) calculated from the ratio between the temperature sum of the month preceding the flowering and the number of days between the beginning of budding and the moment when flowering begins, the best adjusted regression equation was calculated. This square equation is given as: $Y = 143,01 + (-16,55x) + 0,70x^2$; $Sy = 2,69$; $r = -0,96^{**}$ The testing of the significance of the difference between the actual number of days passed between the budding and flowering, and the theoretical number for the same period calculated by applying the above equation, shows that there are no significant differences, which illustrates how this function can be successfully applied as a model to estimate the moment of Žilavka variety's flowering in Mostar vineyard area.

Keywords: grapevine, variety, temperature sum, the beginning of flowering

**EKOLOŠKI USLOVI U FUNKCIJI PREDVIĐANJA DATUMA POČETKA
CVTANJA SORTE ŽILAVKA U MOSTARSKOM VINOGORJU**

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Cvetanje je jedna od najosjetljivih fenofaza razvoja vinove loze na koju veliki značaj mogu imati klimatski uslovi koji vladaju u tom periodu. Na početak fenofaze cvetanja veliki, ako ne i presudni značaj imaju temperaturni uslovi u periodu koji predhodi samom cvetanju. Temperature iznad 15oC pogoduju procesu oprašivanja i oplodnje. Početak cvetanja vinove loze ima veliki značaj u definisanju dinamike realizacije najvažnijih agro- i ampelotehničkih mera u vinogradu. U radu je prikazan model predviđanja datuma početka cvetanja sorte Žilavka baziranog na analizi temperaturnih uslova koji vladaju u mostarskom vinogorju. Za izradu modela za prognozu datuma početka cvetanja sorte Žilavka u zavisnosti od temperaturne sume meseca koji prethodi cvetanju, korišćeni su podaci meteorološke stanice Mostar za period 2002-2010. godina. Na osnovu podataka o broju dana proteklih između početka pupanja i početka cvetanja (Y) i vrednosti koeficijenta "C" (x) dobijenog iz odnosa temperaturne sume meseca koji prethodi nastupanju cvetanja i broja dana između početka pupanja i momenta početka cvetanja, izračunata je najbolje prilagođena jednačina regresije. Ova jednačina kvadratnog tipa glasi: $Y = 143,01 + (-16,55x) + 0,70x^2$; $Sy = 2,69$; $r = -0,96^{**}$. Testiranje značajnosti razlika između stvarnog broja dana proteklog od momenta početka pupanja do nastupanja cvetanja i teoretskog broja za isti period, dobijenog primenom navedene jednačine regresije, pokazuje da ne postoji značajna razlika, što pokazuje da se ova funkcija veoma uspešno može primeniti kao model za prognozu momenta nastupanja cvetanja sorte Žilavka u mostarskom vinogorju.

Ključne riječi: vinova loza, sorta, temperaturna suma, početaka cvjetanja

**THE INFLUENCE OF DIFFERENT STRAINS OF YEAST ON WINE WITH
RESIDUAL SUGAR**

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Alcoholic fermentation is a complex biochemical process. The main products of yeast cells' enzymes activities are ethyl alcohol (ethanol), carbon dioxide and heat. Also, there is a variety of other products that are divided into primary and secondary nus-products. The rate and course of fermentation depends on numerous factors. The first of all, amount of sugar in the must, temperature, selected yeast, pH, presence of nutrients, and others. Stuck fermentation continues to be discussed subject due it has always been a major problem in winemaking. The production of fortified wines was definitely a response to difficult final stages of fermentation and the ensuing microbial accidents, especially in countries with warm climates. These wines were rapidly stabilized by the addition of pure alcohol. Around the world, many of these wines disappeared as progress in microbiology permitted the elaboration of dry wines. In some cases, a modification of vine varieties has produced grapes that have high sugar concentrations. These grapes are more difficult to ferment than past varieties. In other cases, winemakers have recently realized that sluggish fermentations spread over several months are not recommended for making wine. The aim of this study was to ensure regular fermentation course in wine with residual sugar by using different selected wine yeasts (Lallemand, Canada) and certain amounts of nutrients. Modern oenology recommends using selected cultures of wine yeasts with adequate nutrients based on adoptable ammonia salts: di-Ammoniumphosphat, Ammoniumsulphat, thiamin (Vitamin B1), and cell wall membrane. Those results in subsequent fermentation, reduced amounts of residual sugar, and stability of obtained wine. It was concluded that the samples with selected wine yeasts and adequate amounts of ammonium-based nutrients have had a higher alcohol yield. Beside that, wine with a lower sugar content represented more stable products, especially from microbiological point of view.

Keywords: wine, selected yeast, nutrients, fermentation, sugar

**EFFECT OF LOW TEMPERATURE TREATMENT ON CHROMATIC
STRUCTURE AND COPIGMENTATION OF ANTHOCYANINS IN RED WINE
GAMAY NOIR**

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Investigation results of the effect of low temperature treatment (+ 4 and - 4°C) on changes of color substances in red wine are presented in this paper. Exposure of the wine to low temperature resulted in the decrease of color intensity, and the increase of hue (especially expressed on -4°C). The percentage contribution of yellow and blue color increases after cooling, while the contribution of red color decreases. The share of color polymerized pigments increased, while the share of monomeric and co pigmented anthocyanins decreased after the cooling of wine. Significant increase of polymers was detected at +4°C compared with the increase of polymers at -4°C, where the precipitation of polymers take place. The highest values of spectral shape have the wines before being submitted to the low temperature treatment. After the low temperature treatment this value decreased, indicating that effected on wine aging. The content of Cn-3G, Dp-3G and acylated anthocyanins decreased at low temperature, while the share of particularly Mv-3G increased.

Keywords: red wine, low temperature, chromatic structure, copigmentation of anthocyanins

**UTICAJ PRIMENE NISKIH TEMPERATURA NA HROMATSku STRUKTURU I
KOPIGMENTACIJU ANTocijANA U CRVENOM VINU GAME CRNI**

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U ovom radu su prikazani rezultati uticaja primene niskih temperatura (+4 i -4°C) na promene bojenih materija u crvenom vinu. Izlaganje vina niskim temperaturama dovelo je do smanjenja intenziteta uz istovremeno povećanje nijanse boje (posebno izraženo sa temperaturom od -4°C). Procentualno učešće žute i plave boje povećava se nakon hlađenja, dok se učešće crvene boje smanjuje. Sa hlađenjem vina frakcija boje polimerizovanih pigmenata se povećava, a udeo monomernih i kopigmentovanih antocijana smanjuje. Znatno povećanje polimera bilo je na temperaturi na +4°C, nego na temperaturi od -4 °C, jer je došlo do taloženja polimera. Veće vrednosti oblika spektra ima vino pre tretiranja vina niskim temperaturama. Nakon uticaja niskih temperatura ova vrednost se smanjuje, što ukazuje da one utiču na starenje vina. Niža temperatura smanjuje zastupljenosti cijanidin-3-glukozida i delfnidin-3- glukozida, kao i acilovanih antocijana, dok se posebno uvećao udeo malvidin-3-glukozida.

Ključne reči: crveno vino, niska temperatura, hromatska struktura, kopigmentacija antocijana

ISOLATION AND SPECIFICITY OF ERWINIA AMYLOVORA BACTERIOPHAGES

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Fire blight, caused by *Erwinia amylovora*, is the most destructive disease of pome fruits in Serbia. Due to the lack of efficient bactericides, alternative disease control strategies are needed. Investigation of bacteriophages, viruses that attack bacteria, is a fast-expanding area of research in plant protection. Being widespread natural bacterial enemies, simple for cultivation, host-specific, suitable for integration with other control practices, human and environment friendly, bacteriophages provide a great advantage for the application over other classical bactericides. Samples for bacteriophage isolation were collected from different localities near Belgrade, during 2010. Isolation was attempted from leaves of host plants with or without fire blight symptoms (apple, pear, quince and medlar), rhizosphere soil, and from irrigation water. Flasks containing 50ml nutrient broth and 2.5g CaCO₃ were inoculated with 200µl water-suspension of each of six *E. amylovora* strains from a 24h nutrient agar culture. To enrich phage populations, samples of either irrigation water (50ml), plant tissue (5g) or soil (10g) were added to bacterial cultures and incubated on rotary shaker for 24h at 27°C. Aliquots (1ml) of the enrichment culture were centrifuged at 16000g for 5min to remove cells and debris. The supernatant was treated with chloroform (10% v/v) for 20 min and resulting suspensions were stored at 4°C. Presence of phages in samples was detected by “spot test”, pipetting 5µl of suspensions onto NYA medium surface, previously inoculated with *E. amylovora* strains. Following purification, phage specificity was tested to 40 *E. amylovora* strains originated from Serbia. Bacteriophages specific to *E. amylovora* were isolated from 7 out of 35 samples. Three phage strains were isolated from water, three strains from symptomless pear leaves and one strain from apple leaves with characteristic symptoms. All phages were specific to all *E. amylovora* strains but some differences in their virulence were revealed. Our results showed that bacteriophages specific to *E. amylovora* can be isolated from various substrates. Since they lysed *E. amylovora* strains originating from different hosts and localities, they represent a good candidate for future use in biological control of fire blight.

Ključne riječi: bacteriophages; *Erwinia amylovora*; biological control; isolation; specificity

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**STUDYING ERWINIA AMYLOVORA STRAINS FROM SERBIA FOR
STREPTOMYCIN AND KASUGAMYCIN RESISTANCE AND COPPER SULFATE
SENSITIVITY IN VITRO**

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Fire blight, caused by the Gram-negative bacterium *Erwinia amylovora*, is the most destructive disease of many rosaceous plants including apple, pear and quince. Copper compounds are routinely used in Serbia to control number of plant diseases, including fire blight. In Serbia, application of antibiotics is not allowed for plant protection, although they have been a mainstay for fire blight management in USA for many years. However, intensive use of antibiotic resulted in the development of streptomycin resistance in *E. amylovora* populations. The objectives of this study were to assess the effects of copper sulfate on *E. amylovora* population and to determine possible existence of streptomycin or kasugamycin-resistant strains of this bacterium in Serbia. A total of 40 strains of *E. amylovora*, isolated from eight plant species grown in 12 locations in Serbia were studied. A 24-hour old *E. amylovora* colonies grown on Nutrient Agar (NA) were suspended in sterile distilled water to approximately 107 CFU/ml. Droplets of 3µl of each strain was spotted on the surface of solid NA medium amended with 100 or 200 µg/ml of copper sulfate, streptomycin or kasugamycin. *Xanthomonas euvesicatoria*, strain E-3, resistant to these antibiotics and copper was used as a positive control. The plates were incubated for 48h at 27°C prior to visual examination of bacterial growth. Results of these experiments showed that all tested strains (except E-3) were sensitive to streptomycin and kasugamycin, since their growth was inhibited by 100 µg/ml of these antibiotics. However, all strains grew in presence of 100 µg/ml of copper sulfate and 28 strains tolerated 200 µg/ml of copper sulfate. Thus, 70% of Serbian *E. amylovora* population was tolerant to 1.2mM of copper sulfate, which corresponds to the rate used in the field applications. This study indicate that copper tolerance may be developing in Serbia due to intensive use of this compound in fire blight control. However, besides different copper compounds growers in Serbia have no alternatives for chemical control of fire blight, and therefore rely mostly on preventive measures.

This research was supported by project III46008, Ministry of Education, Science and Technological Development, Serbia.

**"BOIS NOIR" PHYTOPLASMA AND AUCHENORRYNCHA SPECIES IN
BOSNIA AND HERZEGOVINA VINEYARDS**

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"Bois noir" (BN) phytoplasma was identified in grapevine during several monitoring of vineyards in north-western and southern (west and east Herzegovina) Bosnia and Herzegovina (B&H). In addition, *Reptalus cuspidatus* (Fieber), was also collected and identified as dominant Auchenorrhyncha species in grasses surrounding vineyards in north-western region and *Dictyophara europaea* (Linnaeus) in East Herzegovina of B&H. Previous monitoring and picture about presence and distribution of grapevine yellows GY phytoplasmas in vineyards of Srpska district of B&H is completed but information from west Herzegovina vineyards, the main viticulture center is still lacking. Therefore, in 2011 an extended survey was conducted in west Herzegovina vineyards to provide further insight into GY epidemiology in B&H vineyards. During July 2011 in two vineyards in Mostar and Popovo polje hemipteran insects were collected using sweep nets and mouth-aspirators from grapevine and weeds present in vineyards inter-rows and borders. In addition, during July and September 2011, grapevine samples were collected in four areas of West Herzegovina (45 samples in Mostar, Čapljina, Ljubuški and Popovo polje). Several Auchenorrhyncha species were identified on the basis of morphological characteristics using taxonomic keys whereas *Reptalus quinquecostatus* (Dufour) (Cixiidae, Cixiinae) and *Dictyophara europaea* (Linnaeus) (Dictyopharidae, Dictyopharinae) were the predominant ones. Plant samples were submitted to the molecular analyses (nested-PCR followed with RFLP) and showed that 15 out of 45 grapevine samples were infected with stolbur phytoplasma tuf type-b. During the survey of vineyards in B&H we did not recorded presence of *Hyalesthes obsoletus*, the reported vector of BN. Nevertheless, BN disease spreads actively also in areas where *H. obsoletus* does not occur, and a few other hopper species were previously identified as potential BN vectors e.g. *Reptalus panzeri*, *Reptalus quinquecostatus* and *Dictyophara europaea*. Therefore, identified *R. quinquecostatus* and *D. europaea* could act as potential vectors of BN phytoplasma in Herzegovina vineyards.

Keywords: grapevine; molecular analyses; stolbur; vectors

**FITOPLAZMA "CRNO DRVO" I VRSTE IZ SERIJE AUCHENORRYNCHA U
VINOGRADIMA BOSNE I HERCEGOVINE**

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Fitoplazma crno drvo (Bois noir, BN) je identifikovan u vinovoj lozi tokom monitoringa vinograda u sjevero-zapadnim i južnim (zapadna i istočna Hercegovina) dijelovima Bosne i Hercegovine (BiH). Takođe, *Reptalus cuspidatus* (Fieber) je sakupljen i identifikovan kao dominantna vrsta iz serije *Auchenorrhyncha* u utrinama vinograda u sjeverozapadnom regionu, a *Dictyophara europaea* (Linnaeus) u istočnoj Hercegovini. Tokom prethodnih monitoringa dobio se jasan uvid o prisustvu i rasprostranjenosti fitoplazmi, prouzrokovaca žutila vinove loze (grapevine yellows, GY) u vinogradima Srpske. Međutim, kako je malo podataka o fitoplazmama u vinogradima zapadne Hercegovine, koja je glavni vinogradarski centar. Iz tog razloga tokom 2011. godine izvršen je detaljan pregled vinograda na području zapadne Hercegovine kako bi se dobio detaljan uvid o GY epidemiologiji u BiH. Tokom jula 2011. godine hemiptere su sakupljane uz pomoć ekshhaustora i insekatske mreže sa vinove loze i utrine u dva vinograda u Mostaru and Popovom polju. Dodatno, u julu i septembru iste godine uzimani su uzorci vinove loze sa četiri lokaliteta u zapadnoj Hercegovini (45 uzoraka u Mostaru, Čapljini, Ljubuškom i Popovom polju). Više vrsta iz serije *Auchenorrhyncha* su identifikovane na osnovu morfoloških karakteristika koristeći ključeve za identifikaciju, dok su *Reptalus quinquecostatus* (Dufour) (Cixiidae, Cixiinae) i *Dictyophara europaea* (Linnaeus) (Dictyopharidae, Dictyopharinae) bile najzastupljenije vrste. Biljni uzorci podvrgnuti molekularnim analizama (nested-PCR followed with RFLP) su pokazali prisustvo stolbur fitoplazme tuf tipa-b u 15 od 45 uzoraka vinove loze. Tokom svih dosadašnjih pregleda vinograda u BiH nismo utvrdili prisustvo *Hyalesthes obsoletus* Signoret, znatičnog vektora BN. Ipak, BN bolest je raširena i u područjima gdje nema H. obsoletus. Neke druge hemiptere su identifikovane kao potencijalni BN vektori npr. *Reptalus panzeri*, *Reptalus quinquecostatus* and *Dictyophara europaea*. Prema tome, identifikovani R. quinquecostatus i D. europaea bi mogli predstavljati potencijalne vektore BN fitoplazme u hercegovačkim vinogradima.

Ključne riječi: vinova loza; molekularne analize; stolbur; vektori

**EFFECT OF EMULSIFIABLE CONCENTRATE (EC) OF THYME ESSENTIAL
OIL ON MONILINIA FRUCTICOLA**

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¹, Marija Stevanović¹, Mila Grahovac²

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Development of modern fungicides and improved storage technologies during 1960s and 1970s have significantly extended the shelf life of fruit after harvest. However, postharvest losses, caused by fungal diseases, still vary from estimated 5-20% in the United States to more than 50% in developing countries. In addition, the use of fungicides is restricted due to consumers' demand for less chemical residues on fresh produce. Application of substances of natural origin, like essential oils, could be a desirable solution, safe for both human health and the environment. Our previous investigations have shown that thyme essential oil has a great potential to be used as a crop protectant against some of postharvest apple fruit pathogens. Among 56 tested oils, including tea tree oil which is already on the market, volatile phase of the thyme oil exhibited the highest toxicity. The aims of this study were to develop a stable and safe formulation of thyme essential oil, convenient for practical application and to test its effect on *Monilinia fructicola* as a model organism. An emulsifiable concentrate (EC) of thyme essential oil was obtained by blending carrier oil phases (esterified rape seed oil) (80%), T oil (10%), and mixture of nonionic emulsifiers (10%). Before application, physical properties of the formulation were determined. Effectiveness of the obtained product was assessed in a biotest performed on mature apple fruits inoculated with *M. fructicola* 15 minutes (I) and 24h (II) after the treatment application.

Physical parameters of the formulated essential oil (density, pH, emulsion stability, persistent foam) indicated that the formulation had appropriate properties for emulsifiable concentrate. Laboratory experiments revealed that the effect of the formulated product on the disease incidence was significantly lower than the effect of the fungicide iprodione which was used for comparison. However, the efficacy of the product was consistent (49.7% (I) and 54.2% (II)) and not affected by the inoculation delay, suggesting that evaporation of the oil from the treated surface was successfully decreased. This investigation will be continued in the same direction in order to improve the efficacy of the product. Project III 46008.

**FLIGHT DYNAMICS OF RHAGOLETIS CERASI L. AND INFLUENCE OF THE
ADULT ABUNDANCE ON THE INFESTATION OF THE CHERRY VARIETIES**

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The aim of this study is to establish the time of adult emergence, dynamics and flight duration, as well as the influence of adult abundance of the European cherry fruit fly (*Rhagoletis cerasi* L.) on the fruit infestation of 19 cherry varieties in the area around Skopje, Republic of Macedonia, in 2008 and 2009. The dynamics of the population of *Rhagoletis cerasi* L. is tracked using yellow sticky traps set on 10 cherry trees. The flight of the cherry fruit fly in the area around Skopje starts in the first half of May and lasts till the first half of July. The flight duration of the fly in 2008 is 65 days and it has two flight picks, while in 2009 the flight duration is 50 days and it has one flight pick. A strong positive correlation is determined in 2008 and a medium strong positive correlation is determined in 2009 between the abundance of the fly and the fruit infestation percentage of the cherry varieties.

Keywords: *Rhagoletis cerasi* L.; European cherry fruit fly; flight dynamics; fly abundance

**PRAĆENJE DINAMIKE LETA RHAGOLETIS CERASI L. I UTICAJ BROJNOSTI
IMAGA NA ZARAZU KOD RAZLIČITIH SORATA TREŠNJE**

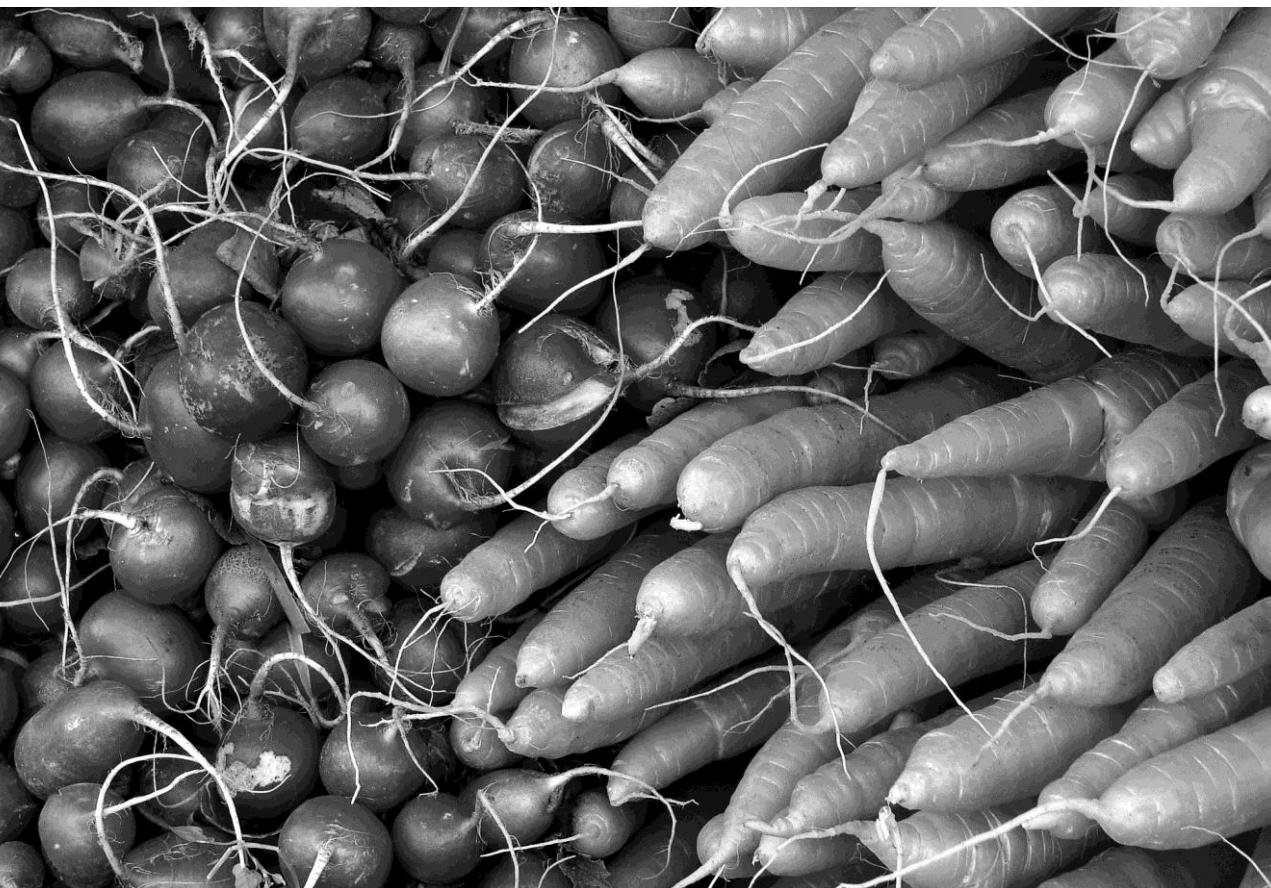
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Cilj istraživanja je utvrđivanje vremena pojave, dinamike i dužine leta imaga, kako i uticaj brojnosti imaga trešnjine muhe na zarazu plodova kod 19 sorata trešnje u okolini Skoplja, Republika Makedonija, u 2008 i 2009 godini. Dinamika leta je praćena žutim lepljivim mamcima postavljenim na 10 stabala unutar voćnjaka. Let trešnjine muhe počinje u prvoj polovini maja i traje do prve polovine jula. Dužina leta imaga u 2008 godini iznosi 65 dana i ima dva maksimuma, dok u 2009 godini traje 50 dana i ima jedan maksimum. Utvrđeno je postojanje jake pozitivne korelacije za 2008 i srednje jake pozitivne korelacije za 2009 godinu između abudantnosti trešnjine muhe i procenta zaraze plodova.

Ključne riječi: Rhagoletis cerasi L.; trešnjina muha; dinamika leta imaga; abudantnost trešnjine muhe

Section 5. Vegetable Production



THE EFFECT OF REGULATED DEFICIT IRRIGATION (RDI) ON PLANT GROWTH AND WATER REGIME IN POTATO UNDER FIELD CONDITIONS

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The aim of this study was to determine the effect of regulated deficit irrigation (RDI) on potato growth and plant water regime in the field conditions and to compare these effects with the conventional method of irrigation. The field potato (*Solanum tuberosum L.* cv Liseta) experiments were conducted during 2007. and 2008. In 2007. a static approach in regulated deficit irrigation technique was applied and the plants were irrigated with 70% of water compared to plants that are optimally irrigated (FI) during the whole season, while a dynamic approach was applied in 2008. where the amount of water for irrigation was reduced from 70% to 50% during the last 3 weeks of the irrigation period. During these two seasons, the following parameters were measured: water potential and stomatal conductance, plant height, leaf area and leaf area index (LAI). The results showed that in the both seasons the regulated deficit irrigation didn't significantly affect the plant growth parameters as plant height, leaf area and LAI compared with optimally irrigated plants, but the differences were expressed between individual harvests. Analysis of the plant water regime parameters point to the differences between two seasons in a way that in 2007. the chemical signals were more responsible for the reduction of stomatal conductance, while in a 2008. season the reduction of stomatal conductance was followed by a decrease of leaf water potential that indicated the hydraulic drought signals.

Keywords: regulated deficit irrigation (RDI); potato; plant growth; water regime

**UTICAJ REGULISANOG DEFICITA NAVODNJAVA (RDN) NA RAST
BILJAKA I VODNI REŽIM KROMPIRA GAJENOG U POLJSKIM USLOVIMA**

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Cilj ovog istraživanja je bio utvrditi uticaj regulisanog deficitia navodnjavanja (RDN) na rast krompira i vodni režim biljaka u poljskim uslovima i poređenje ovih uticaja sa konvencionalnim načinom navodnjavanja. Ogled u poljskim uslovima sa krompirom (*Solanum tuberosum L.cv Liseta*) praćen je 2007 i 2008. godine. U toku 2007. godine primjenjen je statički način navodnjavanja gdje su biljke u toku cijele sezone navodnjavane sa 70% vode u odnosu na biljke koje su optimalno navodnjavane, dok je u 2008. primjenjen dinamički način gdje je količina vode smanjena sa 70% na 50% u posljednje tri sedmice navodnjavanja. U toku ogleda praćeni su parametri: vodni potencijal i provodljivost stoma, visina biljaka, površina listova i indeks lisne površine (LAI). Rezultati su pokazali da u obje ispitivane sezone regulisani deficit navodnjavanja nije značajno uticao na parametre rastenja: visinu biljaka, površinu listova i LAI u poređenju sa optimalno navodnjavanim biljkama, ali su se razlike pojavile između pojedinih žetvi. Analiza parametara vodnog režima ukazuje na razlike između dvije sezone, gdje su u 2007. hemijski signali bili više odgovorni za redukciju provodljivosti stoma nego u 2008. gdje je smanjenje provodljivosti stoma bilo praćeno sa opadanjem vodnog potencijala listova što ukazuje na hidraulične signale suše.

Ključne riječi: regulisani deficit navodnjavanja (RDI); krompir; rast biljaka; vodni režim

**EFFICACY OF CHEMICAL WEED CONTROL IN POTATO (SOLANUM
TUBEROSUM L.)**

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In this paper the results of efficiency of combined application of six herbicides in weed control in potato were presented. The study was done during 2007 and 2008 in Kolašin (Drijenak village), on acid brown soil, at an altitude of about 900 m. In the experiment the following herbicides were examined: S-metalachlor, Bentazone, Acetohlor, Flurochloridone, Metribuzin and Dimetenamid-P. The study was conducted in the Kennebec variety crop. In two-years examination of potato agrophytocenosis in Kolašin vicinity 24 weed species were recorded (23 in 2007 and 18 in 2008). Among the registered weed species the most common are: Convolvulus arvensis (23 in 2007 and 21 ind.m-2 in 2008), Chenopodium album (26 and 14), Polygonum persicaria (14 and 9), Sinapis arvensis (14 and 8), Galinsoga parviflora (13 and 9), Bilderdykia convolvulus (8 and 11), Amaranthus retroflexus (8 and 11) and Setaria viridis (5 i 9). All applied herbicides had satisfactory effect in decreasing number and biomass of weeds. In all investigated combinations of herbicides significantly higher tuber yield was achieved comparing to the control.

Keywords: potato; efficacy; herbicides; weeds; yield

**EFIKASNOST HEMIJSKOG SUZBIJANJA KOROVA U KROMPIRU (SOLANUM
TUBEROSUM L.)**

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U radu su predstavljeni rezultati proučavanja efikasnosti kombinovane primjene šest herbicida na zakoravljenost usjeva krompira. Ogledi su izvedeni tokom 2007. i 2008. godine u Kolašinu (Drijenak), na kiselo smeđem zemljištu na nadmorskoj visini od oko 900 m. Ispitivana je efikasnost sljedećih herbicida: S-metalachlor, Bentazone, Acetohlor, Flurochloridone, Metribuzin and Dimetenamid-P. Ispitivanja su obavljena u usjevu sorte Kennebec. U dvogodišnjim proučavanjima evidentirane su 24 korovske vrste (23 u 2007. i 18 u 2008. godini). Među registrovanim korovskim vrstama najzastupljenije su: Convolvulus arvensis (23 in 2007. i 21 ind.m-2 u 2008.), Chenopodium album (26 i 14), Polygonum persicaria (14 i 9), Sinapis arvensis (14 i 8), Galinsoga parviflora (13 i 9), Bilderdykia convolvulus (8 i 11), Amaranthus retroflexus (8 i 11) and Setaria viridis (5 i 9). Svi primijenjeni herbicidi imali su zadovoljavajući efekat u redukciji broja i biomase korova. Sve proučavane kombinacije hemijskog suzbijanja korova dale su značajno veći prinos krtola u poređenju sa kontrolom.

Keywords: krompir; efikasnost; herbicidi; korovi; prinos

**THE EFFECT OF VARIETY AND PRODUCTION METHODS ON THE NITRATE
CONTENT IN LETTUCE**

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Certain trials, the effect of variety and different production methods on the content of damaging substances i.e. nitrate in lettuce leaf were carried out on the experimental field of the Faculty of Agriculture in East Sarajevo during the period of three years. The trial was set in a randomized block-system with three replications and the plot size of 2,4 m² (0,3x8m). Three lettuce varieties (Archimeds RZ, Santoro RZ, Kibou RZ) were analyzed in the trial. Each row of variety was tested in the following variants of covering: planting on soil that was not covered, mulching with PE-black folium before planting; agro-textile - covering of plants with agro textile (17gr) after planting; combination of mulching + agro textile. The three-year researches have shown that the production method and variety significantly affect the nitrate content. An average nitrate content was 2196,33 mg/kg on the control variant, and 2526,24 mg/kg on agro textile. Leafy lettuce of oak leaf type „Kibou“ had lower nitrate content (2176,85 mg/kg) compared to „Archimed“ (2843,05 mg/kg) and „Santoro“ (2221,37 mg/kg).

Keywords: lettuce; variety; production method; quality

UTICAJ SORTE I NAČINA PROIZVODNJE NA SADRŽAJ NITRATA U SALATI

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Na oglednom polju Poljoprivrednog fakulteta Istočno Sarajevo u trogodišnjem periodu izvršena su ogledna istraživanja, uticaj sorte i različitih načina proizvodnje na sadržaj štetnih materija tj.nitrata u listu salate. Ogled je postavljen po slučajnom blok sistemu u četiri ponavljanja sa veličinom ogledne parcele od 2,4m² (0,3x8m). U ogledu su bile zastupljene tri sorte salate (Archimeds RZ, Santoro RZ, Kibou RZ) . Svaki red sorte je bio podvrgnut sljedećim varijantama pokrivanja : kontrola-sadnja na nepokrivenom zemljištu; malčovanje pred sadnju sa PE-crnom folijom; agrotekstil-pokrivanje biljaka nakon sadnje agrotekstilom (17 grama); kombinacija malčovanje + agrotekstila. Trogodišnja istraživanja su pokazala da način proizvodnje i sorta značajno utiče na sadržaj nitrata. Prosječan sadržaj nitrata na kontrolnoj varijanti iznosio je 2196,33 mg/kg, a na agrotekstilu 2526,24 mg/kg .Lisnata salata u tipu hrastovog lista „Kibou“ imala je manji sadržaj nitrata (2176,85 mg/kg) u odnosu na „Archimed“ (2843,05 mg/kg) i „Santoro“ (2221,37 mg/kg).

Ključne riječi: salata; sorta; način proizvodnje; kvalitet

**INFLUENCE OF MULCHING AND COVER ON NITRATE CONTENT IN
LETTUCE (*LACTUCA SATIVA L.*)**

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Vegetable production in greenhouses is one of the most intensive in the plant production. The main reason why the lettuce (*Lactuca sativa L.*) is one of the leading vegetable crops for production in protected areas are small biological requirements for the growth conditions, a relatively short vegetation, intensive growth of leaf rosette and leaves heads in a short period of time. Lettuce is one of the vegetable species that belongs to the group of nitrophilous vegetables and that has expressed a preference to adopt nitrate. In an experiment designed in the greenhouse at the test fields of the Agricultural Institute in Banja Luka in the year 2010 and 2011 is tested, the influence of soil mulching and plants covering the nitrate content in lettuce. The experiment was conducted in a randomized block system, with six varieties in four replications, and for planting lettuce varieties Devonia. The study included mulching proces with the following variants: control (V1), black PE film (V2), white PE film (V3), black PE film and agrotextile (V4), white PE film and agrotextile (V5) and agrotextile (V6). The results show that the ground covering with indirect plant covering with agrotextile decreased the nitrate content in lettuce. Nitrate content ranged from 1350 mg/kg in the variant with mulching and indirect plant covering with agrotextile to 4170 mg/kg in the variant with mulching covering.

Keywords: protected areas, mulching, agrotextile, nitrates, *Lactuca sativa L.*

**UTICAJ MALČOVANJA I PREKRIVANJA NA SADRŽAJ NITRATA U SALATI
(LACTUCA SATIVA L.)**

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Proizvodnja povrća u zaštićenom prostoru ubraja se u najintenzivnije u biljnoj prozvodnji. Osnovni razlog zašto je salata (*Lactuca sativa L.*) jedna od vodećih povrtarskih vrsta za proizvodnju u zaštićenim prostorima su mali biološki zahtjevi za uslovima uspijevanja, relativno kratka vegetacija, intenzivan porast lisne rozete i listova glavice u kratkom vremenskom periodu. Salata je jedna od povrtarskih vrsta koja pripada grupi nitrofilnog povrća i koja ima izraženu sklonost ka usvajanju nitrata. U ogledu postavljenom u plasteniku na ekonomiji Poljoprivrednog instituta u Banja Luci, tokom 2010. i 2011. godine ispitivan je uticaj malčovanja zemljišta i pokrivanja biljaka na sadržaj nitrata u salati. Ogled je postavljen po slučajnom blok rasporedu, s šest varijanti u četiri ponavljanja, a za sadnju je korištena sorta salate Devonia. U istraživanje je bio uključen materijal za malčovanje sa sljedećim varijantama: kontrola (V1), crna PE folija (V2), bijela PE folija (V3), crna PE folija i agrotekstil (V4), bijela PE folija i agrotekstil (V5) i agrotekstil (V6). Dobijeni rezultati pokazuju da je nastiranje zemljišta uz neposredno pokrivanje biljaka agrotekstilom uticalo na smanjenje sadržaja nitrata u salati. Sadržaj nitrata se kretao od 1350 mg/kg u varijanti nastiranoj crnom folijom i neposrednim pokrivanjem biljaka agrotekstilom do 4170 mg/kg u varijanti nastiranoj crnom folijom.

Ključne riječi: zaštićeni prostor, malčovanje, agrotekstil, nitrati, *Lactuca sativa L.*

ANTIMICROBIAL ACTIVITY OF TOMATO ETHANOL EXTRACTS

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Tomato (*Lycopersicon esculentum* Mill.) are not only nutritious and dietetic products, but they also have a wider significance for the organism as prophylactics. To determine the antimicrobial activity of the three tomato extracts S1,S2,S3 as the test organisms, *Staphylococcus aureus* ATCC 25923, *Klebsiella pneumoniae* ATCC 13883, *Escherichia coli* ATCC 25922, *Proteus vulgaris* ATCC 13315, *Salmonella enteritidis* (D) ATCC 13076, *Bacillus subtilis* ATCC 6633, *Candida albicans* ATCC 10231, *Aspergillus niger* ATCC 16404. Antimicrobial activity was determined and microdilution method. The extracts possess significant antimicrobial activity. The results indicate that the best antimicrobial activity has S2 extract from the strain *Aspergillus niger* and *Bacillus subtilis* at a concentration of 19.53 mg / ml of extract, while S1 is 78.12 mg / ml for all strains tested except *Proteus mirabilis* and *Staphylococcus aureus*.

Keywords: tomato; extracts; antimicrobial activity

**ANTIMIKROBNA AKTIVNOST ETANOLNIH EKSTRAKATA NEKIH SORTI
PARADAJZA**

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Plodovi paradajza (*Lycopersicon esculentum* Mill.) ne samo da imaju hranljivu i dijetetsku ulogu već imaju široki profilaktički značaj u organizmu. Antimikrobna aktivnost je ispitana na dobijenim ekstraktima S1,S2,S3 na tri sorte paradajza. Kao test mikroorganizmi korišćene su čiste kulture: *Staphilococcus aureus* ATCC 25923, *Klebsiella pneumoniae* ATCC 13883, *Escherichia coli* ATCC 25922, *Proteus vulgaris* ATCC13315, *Salmonela enteritidis* (D) ATCC 13076, *Bacillus subtilis* ATCC 6633, *Candida albicans* ATCC 10231, *Aspergillus niger* ATCC 16404. Mikrodilucionom metodom određene su minimalne inhibitorne koncentracije (MIC). Upoređeno je i antimikrobno delovanje ekstrakta sa referentnim antibiotikom amracinom za bakterije i antimikotikom nistatinom za gljive. Cilj rada je utvrditi mogućnost primene ovih ekstrakata kao konzervanasa u industriji hrane. Dobijeni rezultati pokazuju da ekstrakti paradajza ispoljavaju značajnu antimikrobnu aktivnost. Dobijeni rezultati ukazuju da najbolju antimikrobnu aktivnost poseduje ekstrakt S2 iz na sojeve *Aspergillus niger* i *Bacillus subtilis* u koncentraciji od 19,53 µg/ml dok kod ekstrakta S1 je 78,12 µg/ml na sve ispitivane sojeve osim na *Proteus mirabilis* i *Staphilococcus aureus*.

Ključne riječi: paradajz; ekstrakti; antimikrobna aktivnost.

**EFFECT OF THE AGE AND PLANTING AREA OF TOMATO SEEDLINGS FOR
LATE FIELD PRODUCTION ON THE PHYSIOLOGICAL BEHAVIORS OF
PLANTS**

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The purpose of this investigation was to establish the influence of the age and planting area of the seedlings for late field tomato production on the physiological behaviors, photosynthetic intensity and productivity of tomato plants. The variants with 20-25, 30-35, 40-45 day seedlings cultivated in containers with 40,66 and 104 cells and planting area respectively 44, 28, 17 cm² were tested. It was found that the age of seedlings and size of the planting area significantly influence on the studied physiological characteristics and photosynthetic productivity of the plants. The biological yield was the highest in variant with 20-25 day seedlings grown in container with 66 cells. In the same variant the highest values of the leaf-gas exchange were reported. The increase of content of plastid pigments was established when the seedlings age decreased. In generalizing the highest biological and physiological productivity was established about 20-25 day seedlings grown in containers with 66 cells.

Keywords: container, substrate, plastid pigments, leaf-gaze exchange

**ASSESSMENT OF YIELD AND STABILITY OF PERSPECTIVE BULGARIAN
BREEDING LINES PEPPER WITH CONIC SHAPE**

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The main goal of the present study was to estimate new perspective Bulgarian conic lines pepper about yield and stability of the yield with purpose to be present for Government variety testing and to be included in new breeding programs. Three years experiments were carried out in Experimental fields of Agricultural University, Plovdiv, Bulgaria with eight new perspective consolidated hybrids of sweet pepper. About a standard was used a typical Bulgarian variety Kurtovska kapia 1619. The plants were grown according to the conventional technology for middle early field production for South Bulgarian condition. Four harvests were done – one of green fruits and three of red ripening fruits. The total yield, weight and length of fruit were determined. The stability of yield (Ysi) by the methods Kang was calculated. The lines with the highest yield were 200055-10 and 20007A-10 with productivity of 5034.1 kg/da and 4881.3 kg/da respectively. The index of yield stability was highest 7 about following breeding lines 20007A-10 and 200049-10. The lines 200055-10, 20007A-10, and also 200056-10 are suitable to be including in new selection programs for more successfully breeding.

Keywords: adaptability, productivity, selection, fruit, index of stability, Kang (YSi)

**PHYTOPATHOGENS CAUSING WILT IN PEPPER - DISTRIBUTION,
SYMPTOMS AND IDENTIFICATION**

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In 2012 evaluation on the development and spread of phytopathogens, causing wilt in pepper was conducted. Observations were carried out under field conditions and natural infectious background in the Plovdiv region. In laboratory conditions were isolated and identified four phytopathogenic fungi of the genus Rhizoctonia, Fusarium, Verticillium and Phytophthora. The results of the analysis showed that the highest percentage of pepper wilt caused by the fungus - Rhizoctonia solani. The study was conducted on a bilateral project between IPGR - Sadovo and Heilongjiang Academy of Agricultural Sciences, Harbin, Republic of China.

Keywords: pepper accessions, wilting, soil phytopathogens

**THE MOST IMPORTANT HARMFUL ORGANISMS IN VEGETABLE
PRODUCTION IN GREENHOUSES IN MONTENEGRO AND PESTICIDES
RESIDUE ANALYSIS**

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From 2009 monitoring of pesticides residues in food of plant origin has been ordinarily conducted in Montenegro. Monitoring is performed according to national legislation and EU Directives. Besides this regular monitoring, Phytosanitary Directorate also supports special programmes in order to insure healthy and safety food. In 2012 surveillance of the most important harmful organisms during cultivation of different vegetables in greenhouses has been done as well as sampling of plant material for residues examination of plant protection products (pesticides) in them. Surveys and inspections of greenhouses were performed on 8 localities settled at the territory of Podgorica, Danilovgrad and Bar municipalities. Eleven samples were collected in total and three of them were pepper, two tomato samples and one sample of lettuce, cucumber, common bean, cauliflower and broccoli. Problems caused by certain harmful organisms in greenhouses were recorded and samples for pesticide residues analysis were taken. Analysis of pesticide residues were made by laboratory of Centre for ecotoxicological research with multiresidual method (EN 15662:2009, Determination of pesticide residues using GC-MS and/or LC-MS/MS following acetonitrile extraction/partitioning and clean-up by dispersive SPE – QuEChERS-method). Based on examination of different vegetable species and according to agricultural producers statements it is found that the most important harmful organisms are: in pepper Verticillium wilt (caused by *Verticillium dahliae*), Phytophthora blight (*Phytophthora capsici*), Fusarium wilt (*Fusarium oxysporum*), pepper downy mildew (*Leveillula taurica*), western flower thrips (*Frankliniella occidentalis*) and aphids; in tomato late blight of tomato (*Phytophthora infestans*), tomato leaf miner (*Tuta absoluta*), tetranychid mites (*Tetranychidae*); in cucumber downy mildew (*Pseudoperonospora cubensis*); in lettuce aphids and thrips; in common bean anthracnose (*Colletotrichum lindemuthianum*), mites and aphids; in cauliflower and broccoli cabbage butterfly (*Pieris brassicae*). Pesticide residues analysis confirmed that in eight samples there were no active ingredient (a.i.), while in three samples one active ingredient was found. In the first tomato sample a.i. chlorpyrifos in quantity of 0,043 mg/kg was found, in the second tomato sample there was a.i. propargite in quantity of 0,150 mg/kg, and in pepper sample a.i. boscalid in quantity of 0,097 mg/kg was recorded. Establishes quantities of active ingredients did not exceed limit values of maximum residue limits (MRLs) in the food of plant origin. All samples taken for analysis were safe and could be placed into the market.

Keywords: vegetables; harmful organisms; monitoring of pesticides residues

NAJZNAČAJNIJI ŠTETNI ORGANIZMI U GAJENJU POVRĆA U PLASTENICIMA U CRNOJ GORI I ANALIZA OSTATAKA PESTICIDA

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U Crnoj Gori se od 2009. godine redovno sprovodi monitoring rezidua pesticida u hrani biljnog porijekla, koji se izvodi na osnovu nacionalnog zakonodavstva i direktiva Evropske unije. Pored redovnog monitoringa, Fitosanitarna uprava podržava i posebne programe u cilju obezbjedivanja zdravstveno bezbjedne hrane. Tokom 2012. godine obavljeno je praćenje najznačajnijih štetnih organizama u gajenju različitih vrsta povrća u zaštićenom prostoru i uzimanje uzoraka u cilju ispitivanja ostataka sredstava za zaštitu bilja (pesticida) u njima. Obilasci i pregled plastenika obavljeni su na osam lokaliteta koji se nalaze na teritoriji opština Podgorica, Danilovgrad i Bar, a uzeto je ukupno 11 uzoraka. Od uzetih uzoraka tri su bila uzorci paprike, dva uzorka paradajza i po jedan uzorak zelene salate, krastavca, boranije, karfiola i brokole. U plastenicima su evidentirani problemi koje uzrokuju pojedini štetni organizmi, i uzimani su uzorci za analizu rezidua pesticida. Analizu rezidua pesticida obavila je laboratorija Centra za ekotoksikološka ispitivanja Crne Gore multirezidualnom metodom (EN 15662:2009, Determination of pesticide residues using GC-MS and/or LC-MS/MS following acetonitrile extraction/partitioning and clean-up by dispersive SPE-QuEChERS-method). Na osnovu pregleda povrća i izjava proizvođača utvrđeno je da su najznačajni štetni organizmi: na paprići zeleno uvenuće (uzročnik *Verticillium dahliae*), plamenjača paprike (*Phytophthora capsici*), fuzariozno uvenuće (*Fusarium oxysporum*), pepelnica paprike (*Leveillula taurica*), kalifornijski trips (*Frankliniella occidentalis*) i vaši; na paradajzu plamenjača paradajza (*Phytophthora infestans*), miner paradajza (*Tuta absoluta*), grinje paučinari (*Tetranychidae*); na krastavcu plamenjača krastavca (*Pseudoperonospora cubensis*); na salati lisne vaši i tripsi; na boraniji antraknoza (*Colletotrichum lindemuthianum*), grinje i vaši; na karfiolu i brokoli veliki kupusar (*Pieris brassicae*). Analizom ostataka pesticida utvrđeno je da u osam uzoraka nije bilo ni jedne aktivne materije (a.m.), dok je u tri uzorka pronađena po jedna aktivna materija. U jednom uzorku paradajza pronađena je a.m. hlorpirifos u količini 0,043 mg/kg, u drugom uzorku paradajza bilo je a.m. propargit u količini 0,150 mg/kg, u uzorku paprike a.m. boskalid u količini 0,097 mg/kg. Ustanovljene količine aktivnih materija nisu prelazile granične vrijednosti maksimalno dozvoljenih količina (MDK) u hrani biljnog porijekla. Svi uzorci koji su uzeti na analizu bili su zdravstveno ispravni i mogli su se iznositi na tržište.

Ključne riječi: povrće; štetni organizmi; monitoring rezidua pesticida

**EFFECT OF CROP DENSITY AND HYBRIDS ON THE QUALITY OF SWEET
MAIZE**

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Research was conducted during the year of 2005 at the experimental estate "Radmilovac" of the Faculty of Agriculture of the University of Belgrade. The experiment was set up in four replications in a randomised complete block design. Four sweet maize hybrids (ZP 231su, ZP 504su, Shimmer and Challenger) were examined using three densities (50, 60 and 70 thousand plants/ha). The following parameters were determined: number of ears per plant, ear weight, weight and output of seed per ear. Densities and hybrids showed a significant impact on the examined parameters. The highest number of ears per plant, averagely for all hybrids, was achieved in crop densities of 50 thousand/ha (1.8), whereas as regards hybrids, the highest value of this parameter amounted to 1.7 (ZP 504su), and the lowest 1.3 (Shimmer). Similarly, regarding other parameters the highest values were recorded at the lowest density, and the lowest values at the highest density. The hybrids Shimmer and Challenger are characterised by greater ear weight and seed per ear compared with autochthonous selections. The lowest seed output, averagely for all hybrids, was found in the greatest density and amounts to 60%. The hybrids ZP 504su and Shimmer are distinguished by the highest output of seed per ear which amounts to 66%.

Keywords: sweet maize; density; hybrid; seed weight; seed output

UTICAJ GUSTINE USEVA I HIBRIDA NA KVALITET KUKURUZA ŠEĆERCA

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Istraživanja su obavljena tokom 2005. godine na Oglednom školskom dobru „Radmilovac“ Poljoprivrednog fakulteta Univerziteta u Beogradu. Ogled je postavljen u četiri ponavljanja po slučajnom blok sistemu. Ispitivana su četiri hibrida kukuruza šećerca (ZP 231su, ZP 504su, Shimmer i Challenger) u tri gustine (50, 60 i 70 hiljada biljaka/ha). Određeni su sledeći parametri: broj klipova po biljci, masa klipa, masa i randman zrna u klipu. Gustine i hibridi su pokazali značajan uticaj na ispitivane parametre. Najveći broj klipova po biljci, u proseku za sve hibride, ostvaren je u gustini useva od 50 hiljada biljaka/ha (1,8), dok je kod hibrida, najveća vrednost ovog parametra iznosila 1,7 (ZP 504su), a najmanja 1,3 (Shimmer). I kod ostalih parametara najveće vrednosti su zabeležene pri najmanjoj gustini, a najniže pri najvećoj. Značajno većom masom klipa i zrna u klipu odlikuju se hibridi Shimmer i Challenger u odnosu na domaće selekcije. Najniži randman zrna, u proseku za sve hibride, ostvaren je u najvećoj gustini i iznosi 60%. Sa najvećim radmanom zrna u klipu izdvajaju se hibridi ZP 504su i Shimmer gde on iznosi 66%.

Ključne riječi: kukuruz šećerac; gustina; hibrid; masa zrna; randman zrna

REACTIONS OF DIFFERENT GENOTYPES OF SPRING GARLIC ON THE GROWTH CONDITIONS

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Reaction of garlic to environmental conditions is very expressed, so it is important to take account of the introduction of genotypes from one region to another. Garlic is propagated vegetatively (cloves) by us, and the bulbs are only formed under conditions of a long day, any change in environmental conditions leading to changes in the growth and development of garlic. The aim of this study was to determine how genotypes of spring garlic respond to changing environmental conditions. As the material which were used four genotypes from different regions (two local population of garlic from the Republic of Srpska, two from Serbia: local population from Subotica and sort Labud). The experiment was appointed in Drinić, in the village Bare (N44°31'15,1"; E016°24'16,8"; 655 m NV). All tested genotypes respond to changing conditions on growth with all the traits (bulb mass, diameter bulbs, height bulbs, number of dried leaves, diameter clove, height clove, clove mass) resulted in statistically significant differences. The lowest variations in observed traits were in a in local populations from Drinić while the greatest differences were in the local population from Subotica. These changes were reflected primarily in the formation of a small number of cloves, less weight, which resulted in getting smaller bulbs.

Keywords: garlic, bulbs, trait (characteristic), morphological changes

REAKCIJA RAZLIČITIH GENOTIPOVA PROLJEĆNOG BIJELOG LUKA NA USLOVE USPIJEVANJA

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Reakcija bijelog luka prema uslovima spoljašnje sredine je veoma izražena, te je veoma važno voditi računa o introdukciji genotipova iz jednog regionala u drugi. S obzirom da se bijeli luk kod nas razmnožava isključivo vegetativno (čenovima) i da lukovicu formira u uslovima dugog dana, svaka promjena uslova sredine dovodi do promjena u rastu i razvoju bijelog luka. Zato je i cilj ovog rada bio utvrditi na koji način genotipovi proljećnog bijelog luka reaguju na promjenu uslova sredine. Kao materijal korištena su četiri genotipa proljećnog bijelog luka iz različitih regionala (dvije domaće populacije iz Republike Srpske, s Hrgudom i iz Drinića, te dvije iz Srbije, domaća populacija iz Subotice i sorta Labud). Ogled je postavljen u Driniću, selo Bare (N44°31'15,1"; E016°24'16,8"; 655 m NV). Svi ispitivani genotipovi su reagovali na promjenu uslova uspijevanja. Kod svih ispitivanih osobina (masa lukovice, prečnik lukovice, visina lukovice, broj ovojnih listova lukovice, broj čenova, prečnik čena, visina čena, masa čena) utvrđene su statistički značajne razlike. Najmanja variranja ispitivanih osobina utvrđena su kod domaće populacije iz Drinića, dok su najveće razlike bile kod domaće populacije iz Subotice. Te promjene ogledale su se, prije svega, u formirajući manjeg broja čenova, manje mase, što je rezultiralo i dobijanje sitnijih lukovica.

Ključne riječi: bijeli luk, lukovica, osobine, morfološke promjene

**INFLUENCE OF THE FOLIAR FERTILIZERS ON THE SOME PHYSIOLOGICAL
PARAMETERS OF ZUCCHINI SQUASH (CUCURBITA PEPO L. VAR.
GIROMONTIA)**

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The main aim of this study was to investigate the influence of various complex foliar fertilizers on the leaf-gas exchange parameters, and leaf pigment content of zucchini squash. The experiments were carried out during the period 2007-2009, on Experimental field of Department of Horticulture at the Agricultural University of Plovdiv, Bulgaria. Variety Izobilna F1 was used as an object of the experiments. The field experiments were done by randomized block design with four replications. Complex foliar fertilizers Fitona 3, Hortigrow and Humustim, without soil fertilization and in background on soil fertilization N16P16K16 were investigated. Leaf-gas exchange parameters and leaf pigment content were determined. The results of this experiment indicate that foliar fertilization with complex foliar fertilizers Fitona 3, Hortigrow and Humustim influence leaf-gas exchange, especially photosynthetic rate and leaf pigment content. The lowest rates of photosynthesis and leaf chlorophyll content were observed in the non-fertilized zucchini plants (control). It was established that foliar fertilization with 0.3% Humustim along with soil fertilization N16P16K16 enhanced parameters of leaf-gas exchange and leaf pigment content.

Keywords: foliar fertilizers, leaf-gas exchange, photosynthetic rate, zucchini, *Cucurbita pepo L. var. giromontia*

**EFFECT OF MULCH AND NON-MULCH ON MELON (CV. CAMPERO) CROP
COEFFICIENT AND DURATION OF THE GROWING SEASON MEASURED
WITH TWO WEIGHING LYSIMETERS**

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A study on melon (cv. Campero) was conducted under different management practices, mulch and non-mulch conditions. The experiment has been done in Southern Italy, Policoro, experimental station "E. Pantenelli" of Bari University and CNR-Bari in 1999. The main purpose of the experiment was to construct Kc curve for mulched and non-mulched melon in order to compare Kc values and duration of the growing season with the FAO Irrigation and Drainage Paper 56. The determination of initial season Kc value (Kc ini), mid-season Kc value (Kc mid) and late season Kc value (Kc end) has been determined. Kc ini is calculated as the product of the table Kc ini and a wetting function (fw). The mid-season and Kc end was adjusted according to FAO 56 by means of air relative humidity and wind speed. The adjusted data compared with the FAO calculations showed that the main difference was due to a different duration of the growing season. FAO 56 proposed 120 days for a growing season of melon in Mediterranean region starting from May. For the non-mulch melon, the season started on May 11 and finished on August 2 (84 days), which was 36 days shorter than proposed by FAO. For mulch melon, the season started on May 11 and finished on July (69 days), which was 51 days shorter than proposed by FAO. This could be explained by warmer Policoro weather conditions which cause shorter growing season for non-mulch and mulch melon. The use of mulch reduced duration of growing season.

Keywords: melon (cv. Campero); crop coefficient; duration of the growing season; temperature; mulching; climate

**EFFECT OF MULCH AND NON-MULCH ON MELON (CV. CAMPERO) CROP
COEFFICIENT AND DURATION OF THE GROWING SEASON MEASURED
WITH TWO WEIGHING LYSIMETERS**

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Keywords: melon (cv. Campero); crop coefficient; duration of the growing season; temperature; mulching; climate

**COMPARISON OF SOME WATERMELON (*Citrullus lanatus Thunb.*)
HYBRIDS IN REPUBLIC OF MACEDONIA**

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Watermelon is traditionally grown vegetable in Republic of Macedonia. National Variety List has numerous of registered varieties and hybrids of watermelon. Prior to their introduction into commercial production, all foreign hybrids and newly created varieties are examined in order to determine the stages of growth, yield and characteristic of fruit. The experiment was set on experimental plots of Institute of agriculture in Skopje. In the period of 2005 to 2009, 21 varieties and hybrids of watermelon were observed as followed: Romanza F1, AC 20 F1, PS 1100 F1, Scherezada in 2005; CLX 3003, CLX 3010, Joker F1, Carmen F1 in 2006; Lady F1, Trophy F1, Fletta F1, Marabella F1, Super Crimson Sweet OP, Fantasy F1 in 2007; Crimson Ruby F1, 9G 2572, 9G 2592, 9G 2524 in 2008; Colosseo F1, Caravan F1, Montana F1 in 2009. As a standard variety was used Crimson Sweet. In 2005 AC 20 F1 gave higher yield (59,7t/ha) than the standard variety (31,42t/ha). In 2006, CLX 3010 exceeded significantly higher yield 65,8 t/ha in comparison to standard variety 46,3 t/ha. In 2007 all examined varieties gave better results than the standard variety. In 2008 Crimson Ruby F1 gave higher yield (42,7 t/ha) than the standard variety (36,8t/ha). In 2009 Montana F1 was more yielded (67,5 t/ha) then the standard variety (62,2 t/ha). All examined varieties and hybrids gave stable characteristics and were registered in the National Variety List for commercial production.

Keywords: watermelon, hybrids, yield

PROPAGATION SAGE (*SALVIA OFFICINALIS L.*) WITH GREEN CUTTINGS

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Successful breeding is one of the most important tasks of plant producers. Vegetative propagation of medicinal and aromatic plants are mainly used when the seed germination is low, less than 50%. The aim of this study was to determine the effect of commercial agents (Rhizopon I) containing auxin IBA on rooting green cuttings of sage (*Salvia officinalis L.*). The study was conducted in the greenhouse of the Faculty of Agriculture, University of Banja Luka during the period April - July 2012th year. The experiment consisted of 60 cuttings of sage, of whom 30 cuttings treated with hormones for rooting and 30 cuttings were planted directly into the substrate and served as a control option. During the test are recorded morphological parameters of growth and development of plants like plant height (cm) and number of leaves, while on the end of the experiment recorded root length (cm), fresh weight (g) and dry weight of plants (g). Statistical analysis shows that plants treated with the agent for rooting (Rhizopon I) have significantly higher values of all parameters of growth and development in relation to the control of the same plant.

Keywords: medical and aromatic plants; cuttings; auxin; morphological parameters

**RAZMNOŽAVANJE ŽALFIJE (SALVIA OFFICINALIS L.) ZELENIM
REZNICAMA**

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Uspješno razmnožavanje predstavlja jedan od najvažnijih zadataka proizvođača bilja. Vegetativni način razmnožavanja ljekovitog, aromatičnog i začinskog bilja uglavnom se koristi kada je klijavost sjemena niska, manja od 50 %. Cilj ovog istraživanja bio je utvrditi uticaj komercijalnog sredstva (Rhizopon I) koji sadrži auksin indol buternu kiselinu IBA, na ukorjenjavanje zelenih reznic žalfije (*Salvia officinalis L.*). Istraživanje je provedeno u stakleniku Poljoprivrednog fakulteta, Univerziteta u Banjoj Luci u periodu april - jul 2012. godine. Ogled se sastojao od 60 reznica žalfije, od kojih su 30 reznica tretirane sa hormonom za ukorjenjavanje, a 30 reznica posaćene su direktno u supstrat i služile su kao kontrolna varijanta. Tokom trajanja ogleda evidentirani su morfološki parametri rasta i razvoja biljaka, odnosno visina biljaka (cm) i broj listova, dok je na kraju ogleda evidentirana dužina korjena (cm), svježa masa biljaka (g) i suva masa biljaka (g). Statističkom obradom podataka utvrđeno je da biljke tretirane sa sredstvom za ukorjenjavanje (Rhizopon I) imaju značajno veće sve ispitivane parametre rasta i razvoja u odnosu na iste kontrolne biljke.

Ključne riječi: ljekovito i aromatično bilje; auksin; reznice; morfološki parametri

**INFLUENCE OF BIOSTIMULATORS TO THE QUALITY OF HYSSOP NURSERY
PLANTS (HYSSOPUS OFFICINALIS L.)**

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There are various biostimulators in the contemporary plant production which have effect on plant development. Biostimulators influence better seed germination and incite biological activities of plants, simultaneously influencing the plant, root and soil microflora. Active biostimulators substances, characterized by high protein content, are of natural origin and they have been produced by enzymatic hydrolysis. Since quality planting is a precondition to a successful production, intensive production methods, namely various natural stimulators, have been applied to find new technological solutions, which is the goal of the research. The experiment was carried out in a greenhouse of the Faculty of Agriculture of Belgrade during 2011. Hyssop nursery plants (*Hyssopus officinalis L.*) was produced in V 9B (ø 9 cm) type pots. Stender A – 250 was used as seed and nursery plants production seeding substrate. Viva, Actiwave and Radifarm were the biostimuli added in nursery plants production, in the quantities of 2 and 4 ml. The experiment included seven versions, watering being the control one. Biostimuli Viva and Radifarm were used to water the planting each 10 days, while Radifarm was used for the same purpose each 15 days. Hyssop nursery plants production lasted 72 days. Upon the completion of the experiment, the following planting quality parameters were analyzed: plant height, number of side branches, plant weight, root length and root weight. Research results indicate considerable, positive effect of the use of natural biostimulators in the production of hyssop nursery plants. The best quality of nursery plants was achieved when Radifarm biostimulus was used in the dosage of 4 ml/l. Viva biostimulus had the weakest effect on the nursery plants quality parameters.

Keywords: biostimulators; nursery plants; quality; hyssop

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**UTICAJ BOSTIMULATORA NA KVALITET RASADA MILODUHA
(HYSSOPUS OFFICINALIS L.)**

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U savremenoj biljnoj proizvodnji prisutni su različiti biostimulatori koji utiču na razvoj biljaka. Biostimulatori utiču na bolju klijavost semena, a predstavljaju i pokretače biološke aktivnosti biljaka, istovremeno delujući na biljku, koren i na mikrofloru zemljišta. Aktivne materije biostimulatora su prirodnog porekla, a dobijene su enzimatskom hidrolizom i odlikuju se visokim sadržajem proteina. Kako je kvalitetan rasad uslov uspešne proizvodnje cilj istraživanja bio je iznalaženje novih tehnoloških rešenja primenom intenzivnih načina proizvodnje i to upotrebom različitih prirodnih biostimulatora. Ogled je sproveden u stakleniku Poljoprivrednog fakulteta u Beogradu tokom 2011. godine. Rasad miloduha (*Hyssopus officinalis L.*) je proizveden u saksijama tipa V 9B (ø 9 cm). Kao supstrat za setvu semena i proizvodnju rasada korišćen je Stender A – 250. Prilikom proizvodnje rasada dodavani su sledeći biostimulatori: Viva, Activwave i Radifarm u količinama od 2 i 4 ml. U ogledu je ukupno bilo sedam varijanti, a kontrolnu je činila zalivanje vodom. Biostimulatori Rasad je zalivan biostimulatorima Viva i Radifarm na svakih 10 dana, a Radifarm-om na svakih 15 dana. Proizvodnja rasada miloduha trajala je 72 dana. Nakon završenog ogleda analizirani su sledeći parametri kvaliteta rasada: visina biljke, broj bočnih grana, masa biljke, dužina korena i masa korena. Rezultati istraživanja ukazuju na značajan, pozitivan, efekat upotrebe prirodnih biostimulatora u proizvodnji rasada miloduha. Najbolji kvalitet rasada postignut je upotrebom biostimulatorka Radifarm i to u dozi od 4 ml/l. Od ispitivanih biostimulatora najslabiji efekat na parametra kvaliteta rasada ostvario je Viva biostimulator.

Ključne riječi: biostimulatori; kvalitet rasada; miloduh

Dobijeni rezultati istraživanja su sastavni deo Projekta III46001 koje finansira Ministarstvo prosvete, nauke i tehnološkog razvoja Republike Srbije.

**THE EFFECT OF DIFFERENT PRODUCTION METHODS ON YIELD OF
PEPPER**

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The most widely used method of production of pepper seedlings from bare wire and container seedlings, and more pepper production is expanding direct seeding. Depending on the agro-ecological conditions in the production of pepper is applied fertilization and mulching and cover the Agril. The goal of the use of complex agricultural practices is to obtain a higher yield. It is for this purpose the research was aimed at determining the effect of different sized agricultural practices on the yield of pepper. An experiment where the pepper seedlings produced from goloh vessels, container seedlings and direct seeding. All these varieties are grown in the open field, greenhouse with foil and straw mulching and cover the agril. The results clearly indicate that the use of containerized seedlings resulted in the highest yield. Mulching with foil and cover the Agril cropping measures that contribute to a higher yield of pepper. Straw mulching can have a negative impact on yield, depending on climatic conditions.

Keywords: peppers, seedlings, direct seeding, mulching, agril, yield.

Section 6. Animal Husbandry



THE INFLUENCE OF TEMPERATURE HUMITIDY INDEX OF THE AMOUNT OF COW'S MILK

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Centuries long experience has shown, and decades-long measurements have confirmed that there was no significant difference in the yield of milk on the farm during the year. These variations are correlated with a number of factors. Some of them are biological (are related to characteristics of breeds and individual cows), but a large number of groups are abiotic (Ambient conditions). With regard to biological factors difficult and slow to change, the aim of this study was to investigate the influence of environment conditions on the yield of milk on selected farms. The farm "Stari Tamis" near Belgrade was chosen. There are daily milked 200 to 220 cows. About 95% of cows are the Holstein-Friesian and Simmental remained. Over 35% of cows in first lactation, and less than 5% had previously had five lactations. Using Comparative analysis, the results were observed that in the period January - May cows give significantly greater amount of milk (average of 22.19 liters per cow per day) compared to the period August - November (average of 19.10 liters per cow per day). Month of June and December are transition periods. Milk yield during the two months is at the level of 20.64 liters per cow per day. The difference in milk yield for the two periods was on average 3.10 liters per cow per day. When we look at the summer months only (June, July and August), the average of 1.05 liters of cows give more milk in the days when THI is under 74 compared to the days when THI over the 84th More precisely stated: when the calculated value of THI under 74 was 19.75 liters of milk yield per cow per day, when the value is above 84, THI is 18.69 liters of milk yield per cow per day. Given that the total fluctuation of milk production during the year was 3.10 liters per cow, it is clear that with almost 30% in it affects the temperature humidity index.

Keywords: cows, temperature humitidy index, stress, milk production

UTICAJ TEMPERATURNO VLAŽNOG INDEKSA NA KOLIČINU KRAVLJEG MLEKA

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Viševekovna iskustva su pokazala, a višedecenijska merenja su potvrdila da postoji značajno odstupanje u prinosu mleka na farmi tokom godine. Ta odstupanja su u korelaciji sa velikim brojem faktora. Neki od njih su biološki (vezani su za karakteristike rase i pojedinačnih krava), ali je veliki broj iz grupe abiotičkih (ambijentni uslovi). S obzirom da se biološki faktori teško i sporo menjaju, zadatak ovog rada je bio da ispita uticaj ambijentnih uslova na prinos mleka, na odabranoj farmi. Izabrana je farma „Stari Tamiš“ kraj Beograda. Ovde se svakodnevno pomuze 200 do 220 krava. Oko 95% krava je holštajn-frizijske, a ostale su simentalske rase. Preko 35% krava je u prvoj laktaciji, a manje od 5% je do tada imalo pet laktacija. Uporednom analizom rezultata uočeno je da u periodu januar – maj krave daju značajno veću količinu mleka prosečno 22,19 litara po kravi i danu) u odnosu na period avgust – novembar (prosečno 19,10 litara po kravi i danu). Juni i decembar mesec su prelazni periodi. Mlečnost tokom ova dva meseca je na nivou od 20,64 litara po kravi i danu. Razlika u mlečnosti za ova dva perioda iznosi u proseku 3,10 litara po kravi i danu. Kada se posmatraju samo letnji meseci (jun, jul, avgust) prosečno krave daju 1,05 litara mleka više u danima kada je ITV ispod 74 u odnosu na dane kada je ITV iznad 84. Preciznije izraženo: kada je izračunata ITV vrednost ispod 74 ostvarena mlečnost je 19,75 litara po kravi i danu; kada je vrednost ITV iznad 84 mlečnost je 18,69 litara po kravi i danu. S obzirom da je ukupno kolebanje mlečnosti tokom godine bilo 3,10 litara po kravi, jasno je da sa gotovo 30% u njemu utiče indeks temperaturske vlažnosti.

Ključne riječi: krave; temperaturno vlažni indeks; stres; proizvodnja mleka

**CHANGES OF CONCENTRATION OF ORGANIC MILK INGREDIENTS AND
THEIR RATIOS DURING DIFFERENT PERIODS OF STANDARD LACTATION**

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Aim of study was to determine changes of concentration of organic milk ingredients and their ratios during different periods of standard lactation. A total of 566 Holstein cow in the first ($n = 439$), second ($n = 116$), or with three or more lactations ($n = 11$) was studied. Standard lactation period of 305 days was divided into equal periods of fifteen days, so a total of 20 periods of lactation has been tested. Concentrations of milk fat, protein, lactose and urea were determined in all milk samples, and the data on daily milk yield records were taken from the farm records. On the basis of these data, milk fat: protein and milk fat: lactose ratios were calculated. The average milk yield was the highest in the eighth (36.16 ± 5.99 liters), and the lowest in the nineteenth period (25.84 ± 3.58 liters). The average concentration of milk fat was highest in the first ($4.31 \pm 0.69\%$) and lowest in the tenth period ($3.50 \pm 0.24\%$). The lowest average concentration of the protein was found in the fifth ($2.97 \pm 0.26\%$) and the highest in the eighteenth and twentieth period ($3.38 \pm 0.25\%$). The average concentration of lactose varied within narrow boundaries and statistically significant difference was not found between the different lactation periods. The lowest average concentration of urea was found in the first (2.87 ± 0.43 mmol/l) and the highest in the tenth period (4.22 ± 0.64 mmol/l). Average milk fat: protein ratio was highest in the second (1.361 ± 0.189) and the lowest in the thirteenth period (1.120 ± 0.093) with a downward trend towards the end of lactation. Average milk fat: lactose ratio was highest in the first (0.918 ± 0.153), and lowest in the tenth period of investigation (0.746 ± 0.453), and also had a declining trend from the beginning to the end of lactation. The concentration of milk fat was above the upper physiological limit for this breed of cattle throughout the whole lactation period, while concentrations of other organic milk ingredients were within physiological limits, with the exception of the protein concentration in the period of 61-75 days of lactation. Based on these data it can be concluded that a diet of cows on examined farm was not sufficient to their needs in terms of dry matter and energy, which reflects negatively on their productive potential, reproductive performances and length of their productive life.

Keywords: milk, organic ingredients, lactation

KRETANJE I ODNOS KONCENTRACIJA ORGANSKIH SASTOJAKA MLJEKA TOKOM RAZLIČITIH PERIODA STANDARDNE LAKTACIJE

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Cilj rada bio je da se ustanovi kretanje i odnos koncentracija organskih sastojaka mlijeka tokom različitih perioda standardne laktacije. Ukupno je ispitano 566 krava holštajn rase u prvoj (n=439), drugoj (n=116), odnosno sa tri i više laktacija (n=11). Period standardne laktacije od 305 dana je podijeljen na periode od po petnaest dana, tako da je ispitano ukupno 20 perioda laktacije. U svim uzorcima mlijeka određene su koncentracije mlijeko masti, proteina, lakoze i uree, a podaci o dnevnoj mlijekočnosti uzeti su iz evidencije farme. Na osnovu dobijenih podataka, izračunati su odnosi mlijeko mast : proteini i mlijeko mast : lakoza. Prosječna mlijekočnost bila je najviša u osmom ($36,16\pm5,99$ litara), a najniža u devetnaestom periodu ($25,84\pm3,58$ litara). Prosječna koncentracija mlijeko masti bila je najviša u prvom ($4,31\pm0,69$ %) a najniža u desetom periodu ($3,50\pm0,24$ %). Najniža prosječna koncentracija proteina ustanovljena je u petom ($2,97\pm0,26$ %), a najviša u osamnaestom, odnosno dvadesetom periodu ($3,38\pm0,25$ %). Prosječna koncentracija lakoze kretala se u uskim granicama i nije ustanovljena statistički značajna razlika između ispitanih perioda. Najniža prosječna koncentracija uree ustanovljena je u prvom ($2,87\pm0,43$ mmol/l), a najviša u desetom periodu ($4,22\pm0,64$ mmol/l). Prosječan odnos mlijeko mast : proteini je bio najviši u drugom ($1,361\pm0,189$) a najniži u trinaestom periodu ($1,120\pm0,093$) i imao je trend opadanja prema kraju laktacije. Prosječan odnos mlijeko mast : lakoza bio je najviši u prvom ($0,918\pm0,153$), a najniži u desetom periodu ispitivanja ($0,746\pm0,453$), i takođe je imao trend opadanja od početka prema kraju laktacije. Koncentracija mlijeko masti tokom cijele laktacije bila je iznad gornje fiziološke granice za ovu rasu goveda, dok su se koncentracije ostalih organskih sastojaka mlijeka nalazile unutar fizioloških granica, sa izuzetkom koncentracije proteina u periodu od 61-75 dana. Na osnovu prikazanih podataka može se zaključiti da ishrana krava na ispitanoj farmi nije prilagođena potrebama životinja u pogledu sadržaja suve materije i energije, što se nepovoljno odražava na njihov proizvodni potencijal, reproduktivne karakteristike i trajanje proizvodnog života.

Ključne riječi: mlijeko, organski sastojci, laktacija

**EFFECT OF SEASON AND CATEGORY ON UTERINE WEIGHT REACHING
SEXUAL MATURITY IN GILTS**

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In intensive pig production one of the basic requirements for reaching effective reproduction is to achieve and provide a sufficient number of good pregnant gilts in order to replace and repair the sow herd base. This gilts at the fertile inseminations despite the high genetic predisposition for certain productive and reproductive features, must have a minimum age, body weight, backfat thickness and an optimum status of reproductive activity. One of the most actual problem in modern pig production is the high percentage of culled sows, which amounts to 30%, and on our farms up to 50%. The aim of this work is to conclude that category of fattening gilts in a relation to breeding gilts showing a statistically significant positive difference in the uterine weight. This indicates that the special treatment is required for fattening gilts compared to breeding gilts in terms of nutrition, housing and timely grouping animals. We investigated the influence of season and the category on the uterine weight to achieve puberty in gilts. For the testing data were used in 592 gilt before reaching puberty, the first and the second estrus cycle. The research was made at the cold and warm seasonal period of the year. Gilts were assigned in to two groups (breeding and fattening). All gilts were sacrificed within 210 days of age for examination of their genitals. It was determined that the uterine weight have a positive influence to the achievement of sexual maturity in gilts. The results show that the breeding and fattening gilts that have made the first and second estrous cycle in the cold season had a greater weight of the uterus in relation to gilts that entered estrus in the warm season. The statistical significance of the weight of the uterus between breeding and fattening gilts were made in the cold and the warm seasonal period within the gilts before reaching puberty and the gilts in the first oestrous cycle ($58,85 \pm 12,43$ b; $248,62 \pm 144,39$ a)

Keywords: uterus capacity; breeding gilts; fattening gilts ;puberty; sexual maturity

**UTICAJ SEZONE I KATEGORIJE NA MASU UTERUSA KOD POSTIZANJA
PUBERTETA U NAZIMICA**

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U intenzivnoj proizvodnji svinja jedan od osnovnih preduslova za postizanje efikasne reprodukcije je obezbeđivanje dovoljnog broja kvalitetnih suprasnih nazimica za remont krmača u osnovnom zapatu. Ove nazimice kod fertilnog osemenjavanja, pored visoke genetske predispozicije za određena produktivna i reproduktivna svojstva, moraju posedovati minimalnu starost, telesnu masu, debljinu leđne slanine, kao i optimalan status reproduktivne aktivnosti. Jedan od najčešće prisutnih problema u modernom svinjarstvu je visok procenat izlučenih krmača, koji se kreće oko 30% a na našim farmama i do 50%. Svrha ovog rada je da objasni da su tovne nazimice u poređenju sa priplodnim pokazale statistički značajne razlike u težini uterusa. Ovo ukazuje da je neophodan poseban tretman za tovne nazimice u odnosu na priplodne što se tiče načina ishrane, smeštaja i pravovremenog grupisanja istih ako je poznato da tovne nazimice postižu pubertet znatno ranije u odnosu na priplodne. Ispitan je uticaj sezone i kategorije na masu uterusa kod postizanja puberteta u nazimica. Ispitivanje je vršeno na 592 nazimice i to: prepubertetske, u prvom i drugom estrusnom ciklusu. Ispitivanje je vršeno u toplom i hladnom periodu godine. Nazimice su podeljene u dve grupe i to (priplodne i tovne). Sve nazimice su žrtvovane sa 210 dana starosti radi ispitivanja polnih organa post mortem. Utvrđeno je da masa uterusa ima pozitivan uticaj na postizanje puberteta kod nazimica. Rezultati pokazuju da su priplodne i tovne nazimice u prvom i drugom estrusnom ciklusu u hladnoj sezoni imale znatno veću težinu uterusa u odnosu na nazimice koje su ušle u estrus u toplom periodu godine. Ostvarena je statistički značajna razlika u težini uterusa između priplodnih i tovnih nazimica u toploj i hladnoj sezoni i to kod prepubertetskih nazimica, kao i nazimica u prvom estrusnom ciklusu ($58,85 \pm 12,43$ b; $248,62 \pm 144,39$ a)

Ključne riječi: kapacitet uterusa; priplodne nazimice; tovne nazimice; pubertet

**RELATIONSHIP BETWEEN QUALITATIVE CHARACTERISTICS AND
SOMATIC CELL COUNT OF BULK MILK SAMPLES FROM CZECH FLECKVIEH
AND HOLSTEIN DAIRY COWS**

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Objective of this research was monitored relationship between somatic cell count on qualitative characteristics of milk from two breeds. During the period of 3.1. 2012 to 18.1. 2013 were analysed 36 bulk milk samples obtained in herd of Holstein cows from University farm in Žabčice situated in a lowland Moravian area (GPS 49°0'51.786"N, 16°36'14.809"E) at the altitude of 179 m. Same number of bulk milk samples were analysed in herd of Czech Fleckvieh cows from Moravian farm GenAgro Říčany, a.s (GPS 49°12'32.319"N, 16°23'42.666"E) in the altitude of 349 m. Samples were analysed in Central laboratory of milk analyses Brno-Chrlice. Samples were taken three times a month. Monitored parameters were follows: somatic cell count (SCC), content of fat, protein content, casein content, lactose content, solids non fat content, urea content and freezing point of milk. Based on the correlation coefficients was found that in case of Holstein breed (average SCC 231 ths.ml-1) with increasing somatic cell count statistically significantly decreases content of fat ($r = -0.40; P < 0.05$), lactose ($r = -0.39; P < 0.05$) and solids non fat ($r = -0.41; P < 0.05$). Difference between others parameters were not statistically significant ($P > 0.05$). In the analyses of milk produced by dairy cows of the Czech Fleckvieh breed (average SCC 280 ths.ml-1) were not found statistically significant ($P > 0.05$) relationship between somatic cell count and qualitative characteristics of milk.

Keywords: somatic cell count; milk composition; Czech Fleckvieh; Holstein

Acknowledgment: This research was supported by grant project FA MENDELU IGA TP 2/2013

**EFFECT OF BREED, MILK COMPOSITION AND MILK QUALITY
PARAMETERS ON FREEZING POINT OF MILK**

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The aim of this research was to evaluate the effect of breed (Czech Fleckvieh and Holstein cattle), milk composition and milk quality parameters on the freezing point. Overall 72 bulk tank milk samples were analyzed in the period of 3.1. 2012 to 18.1. 2013. Samples were taken three times per month from two farms. The herd on the first farm consisted solely of Holstein dairy cows. The farm is situated in the village of Žabčice in a lowland area (GPS 49°0'51.786"N, 16°36'14.809"E) at the altitude of 179 m. On GenAgro Říčany a.s. only purebred dairy cows of the Czech Fleckvieh breed were raised. The farm is situated in a lowland region in the village of Říčany, Moravia, Czech Republic (GPS 49°12'32.319"N, 16°23'42.666"E) in the altitude of 349 m. Measured parameters were follows: freezing point, protein, casein, fat, lactose, solids non-fat and urea and somatic cell count. The samples were measured in the Central laboratory Brno-Chrlice. On the first farm (in Žabčice), the average value of freezing point was -0.526 °C. On the second farm (in Říčany), the average value of freezing point was -0.530 °C. On both farms ($n = 72$), the average value of freezing point was -0.528 °C. Based on the correlation of bulk milk samples of Holstein breed was found with decreasing (improving) freezing point increases protein content ($r = -0.39$, $P < 0.05$), casein content ($r = -0.36$, $P < 0.05$), lactose content ($r = -0.57$, $P < 0.01$) and content of solids non-fat ($r = -0.55$, $P < 0.01$). In bulk milk samples from Czech Fleckvieh was observed with decreasing freezing point increases content of lactose ($r = -0.57$, $P < 0.01$) and solids non-fat content ($r = -0.42$, $P < 0.05$). Other parameters and qualitative indicators were not significantly affected by freezing point ($P > 0.05$).

Keywords: freezing point; milk; milk composition; qualitative parameters of milk; Holstein; Czech Fleckvieh

Acknowledgments: This research was supported by grant project FA MENDELU IGA TP 2/2013.

**EFFECT OF NUMBER OF LACTATION ON MILK QUALITY AND
COMPOSITION OF CZECH FLECKVIEH BREED**

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In this study we evaluated of the changes in the amount and composition of milk in dependence on number of lactation of Czech Fleckvieh dairy cows. Observation occurred in the company ZEAS Nedakonice, a.s. All the selected dairy cows had finished their third lactation, and no one lactation was shorter than 280 days, so 232 cows were analyzed altogether. For the assessment and evaluation of individual effects of milk production there were used the results from cow checklists from years 2007 - 2009. We found that the cows on first lactation had 6270 kg of milk at average, the cows on second lactation had 7048 kg of milk at average and cows on third lactation had 7344 kg of milk at average. It is apparent that increasing of lactation also increases milk production in kilograms, which was also high statistically significant ($P < 0.01$). A increased production tendency of milk fat (first lactation 247.4 kg, second lactation 276.9 kg and third lactation 282.7 kg) and also proteins (first lactation 217.0 kg, second lactation 253.6 kg and third lactation 256.0 kg). In the production of fat and protein there was found a statistically significant difference ($P < 0.01$) only between the first and other lactations. With progressing lactation the content of fat was decreased in % (first lactation 3.99%, second lactation 3.94% and third lactation 3.88%). Statistically significant influence ($P < 0.01$) was confirmed between first and third lactation, and between second and third lactation. The effect of number of the lactation on the content of protein in % was not statistically significant ($P > 0.05$).

Keywords: Number of lactation; milk composition; Czech Fleckvieh

Acknowledgments: This research was supported by grant project FA MENDELU IGA TP 2/2013.

**PROCESS OPTIMIZATION OF THE MILK PRODUCTION FROM LARGE-
SCALE DAIRY FARMS IN RUSSIA**

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Efficient management of the dairy cattle herd at the big farms is a key to success in high figures of milk production. Key factors are reproduction management, feeding and breeding. Big amount of dairy cattle from Europe, USA, Canada and Australia was delivered to the Russian Federation during few last years. Big farms have faced some problems due to change of climatic conditions and technology of milk production. One of the main problems is low indices of reproduction. This problem can be caused by different factors, but in our project we are trying to focus on the nutrition aspect. The experiment has been started in September 2011 in the farms of Krasnodar region of the Russian Federation. Special feature of this region is high temperature in the Summer time. One of the farm specializes on the cattle of the Holstein breed, the herd consists of 1 200 cows from Australia and Canada. The second farm specializes on the Ayrshire breed and has 2 600 cows. 500 cows were under the experiment. The individual data of the animals were processed after milk analysis. The results show that the Holstein breed animals imported from the foreign countries have lower level of the milk yield and lower milk fat content than the animals, which are breeding in the exporter countries. The Ayrshire cows are inferior in these indices to the animals from Finland and Canada. However, in spite of low milk yield at the level of 5-6 thousand kilos per 305 days of lactation, the open days in average is 150-180 days, and the calving percentage per 100 cows is 75-80%. For effective management in breeding of cattle with high genetic potential it is necessary to apply not only the state-of-art technologies of breeding and milking, but the evaluation of the animal's condition parameters at the earliest stages to detect the problem. The change of the approach to the herd management within the big milk farms will help to reduce the open days significantly, to reduce the index of insemination and calving interval which will have a positive impact on the milk production profitability increase

Keywords: nutrition controlling; dairy cattle; management

**ANALYSIS OF PRODUCTION AND SLAUGHTER TRAITS OF HARD LINE
HYBRID CHICKENS COBB 500**

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The study was conducted on a total of 4,300 broiler chickens of Cobb 500, both sexes. Tests were conducted in the poultry farms of individual producers surrounding East Sarajevo and nearby abattoir. Based on monitored broiler (productive) results broiler strains tested, at the age of 35 days, shows that the average initial mass of both sexes Cobb 500 broiler chickens was 44.54 g, and the final weight was 1682.00 g average daily gain of chicks of both sexes was 46.78 g / head. Average feed conversion was 1.79 kg. A number of dead animals in the first week of fattening (170 heads) Cobb 500, resulted in a higher percentage of mortality (6.41%) for a period of 35 broiler days. Based on the results of studies on yield of meat (slaughter yields), aged 35, of broiler chickens can be concluded: Yield of "standard treatment" of processed carcasses of both sexes was 82.93%. Yield value "ready to roast" was the average for both sexes was 76.14%, while the carcass yield "ready to grill" was 66.80%, for both sexes.

Keywords: Cobb 500; fattening traits; carcass traits; analysis

ANALIZA PROIZVODNIH I KLANIČNIH OSOBINA TEŠKOG LINIJSKOG HIBRIDA KOKOŠI COBB 500

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Eksperimentalno istraživanje je sprovedeno na ukupno 4.300 brojlerskih pilića genotipa Cobb 500, oba pola. Ispitivanja su sprovedena u okviru živinarske farme individualnog proizvođača u okolini Istočnog Sarajeva i najbližoj klanici. Na osnovu praćenih tovnih (proizvodnih) rezultata brojlerskih pilića ispitivane provenijence, u uzrastu od 35. dana, mogu se konstatovati da je prosječna početna masa oba pola brojlerskih pilića Cobb 500 iznosila je 44,54 g, a završna masa iznosila je 1682,00 g. Prosječan dnevni prirast oba pola pilića iznosio je 46,78 g/grlu. Prosječna konverzija hrane je bila 1,79 kg. Veći broj uginulih grla u prvoj nedelji tova (170 grla) hibrida Cobb 500, uslovio je i veći procenat smrtnosti (6,41%) za tovni period od 35 dana. Na osnovu rezultata istraživanja prinosa mesa (klaničnih randmana), u uzrastu od 35 dana, brojlerskih pilića može se zaključiti sledeće: Randman „standardna obrada“ obrađenih trupova oba pola iznosio je 82,93%. Vrijednost randmana „spremno za pečenje“ bila je u prosjeku za oba pola 76,14%, dok je klanični randman „spremno za roštilj“ bio 66,80%, za oba pola.

Ključne riječi: Cobb 500; tovne osobine; klanične osobine; analiza

**FLAXSEED (*LINUM USITATISSIMUM L.*) OIL AS A SUBSTITUTE FOR FISH
OILS IN FISH FEEDS**

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Fish meal (a source of protein) and fish oil (a source of polyunsaturated fatty acids) are dietary ingredients in fish feeds. The increased global consumption and aquaculture production of marketable fish (accounting for approximately 25% of global fish production) coupled with stagnating or declining catches from open ecosystems induce a reduction in fish meal and fish oil production. Consequently, partial or complete fish oil replacement by oils derived from certain plant sources, primarily flax, soybean and oilseed rape has come to the forefront. Flaxseed (*Linum usitatissimum L.*) is rich in oils (> 40%), containing extremely high levels of polyunsaturated fatty acids n-3 and n-6 (53.3% and 12.7%, respectively), which are higher than in other vegetable oils. A high favourable ratio of n-3 to n-6 fatty acids (3:1) has been found in muscles of salmonid fish fed feeds containing cold-pressed flaxseed oil as an alternative to fish oil. The levels of total n-3 fatty acids (beneficial to human health) do not show statistically significant differences compared to fish receiving fish oil through their diets. Flax thrives on different types of soils, and does not have any specific cultural requirements. Therefore, flax cultivation for fish feed production is opening up new horizons for agricultural intensification in the Central Balkan countries.

Keywords: flaxseed oil; fish nutrition; polyunsaturated fatty acids

**POTENTIAL USE OF ESSENTIAL OILS AND THEIR COMPONENTS IN
NOCARDIA MASTITIS TREATMENT**

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Like many mastitis pathogens, Nocardia can cause subclinical, clinical, or acute mastitis. Often it is associated with chronic mastitis as evidenced by fibrosed udders. As with any mastitis infection, milk production and quality is reduced by Nocardia infections. Nocardia are resistant to a number of antibiotics used to treat mastitis. Although some herds may experience an outbreak of Nocardia mastitis, usually it is restricted to only a few cows within a herd. Generally Nocardia is not a problem in herds which follow a good hygiene program. Essential oils (EOs) perform a wide range of biological activities. In recent years, EOs have emerged as a potential alternative to antibiotics in animal feed. However, EOs may also have potentials in the control of infective animal diseases. Interesting for us is the local use of EOs in the control of reproductive infection in animals. The aims of the present study were to determine the minimal inhibitory concentrations (MIC) of 3 various natural substances – EOs of selected plants (Aetheroleum Menthae piperitae, Aetheroleum Saturejae, Aetheroleum Thymii) and their major constituents (carvacrol, menthol, thymol) against Nocardia asteroides –NA. Therefore, it is assumed that some EOs can react against NA and it might be an active substance for pharmaceutical use in intramammary preparations for veterinary use. The EO of the plants, were extracted by hydrodistillation and analyzed by gas chromatography. Antibacterial sensitivity of isolate NA (field strain originating from cattle milk) were tested in vitro using an Agar Dilution Test (two fold dilutions of EO at concentrations ranging from 0.0122 to 25 µl ml-1) to determine the minimal inhibitory concentration (MIC). The results obtained have shown that selected EOs performed antimicrobial activity against NA in vitro assays. EOs from savory (Satureja montana), thyme (Thymus vulgaris), peppermint (Mentha piperita) and their constituents carvacrol, menthol, and thymol were effective against NA. MICs of these substances ranged from 0.2 to 0.78 µl ml-1. However, further investigation is necessary to confirm these results and assess the toxicity of selected substances in vitro and in vivo.

Keywords: essential oils; Nocardia mastitis; antimicrobial activity

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**CONDITION AND BODY SHAPE COEFFICIENTS OF RAINBOW TROUT
(ONCHORHYNCUS MYKISS WAL.) FROM DIFFERENT PARENT FLOCKS**

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Condition and body shape coefficients of fishes represent a way of monitoring environmental factor influence on fishes. The rainbow trout individuals that were used in the work originating from different parent flocks and different fish farms. Spawning was carried out on five selected fish farms. After that, the breeding eggs were delivered in Klasnik hatchery where were provided the same environmental conditions during embryonic development and cultivation of all five groups of individuals. As a conditioning factor in this work were analyzed Fulton's condition factor and coefficients of the heart, liver and spleen. In all individuals were determined next values: total length, standard length and body mass. In total, fifty individuals who were divided into five groups, were analyzed. The results show value differences of the coefficients between some of the analyzed groups.

Keywords: rainbow trout; different parent flocks; the coefficients

**KOEFICIJENTI ORGANA I KONDICIJE DUŽIČASTE PASTRMKE
(ONCHORHYNCUS MYKISS WAL.) IZ RAZLIČITIH MATIČNIH JATA**

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Koefficijenti organa i kondicije riba predstavljaju jedan od načina praćenja uticaja faktora spoljašnje sredine na rive. Jedinke dužičaste pastrmke koje su korišćene u radu porijeklom su od različitih matičnih jata, sa različitim ribogojilišta. Mrijest je obavljen na pet izabranih ribogojilišta, nakon čega je oplođena ikra dopremljena u mrestilište Klašnik gdje su obezbijedeni isti uslovi sredine tokom embrionalnog razvoja i gajenja za svih pet grupa jedinki. U radu je kao kondicioni faktor analiziran Fultonov koeficijent uhranjenosti, koeficijenti srca, jetre i slezene. Pored navedenog kod svih jedinki određene su vrijednosti: totalne dužine, standardne dužine i mase tijela. Ukupno je analizirano 50 jedinki koje su podijeljene u 5 grupa. Rezultati pokazuju postojanje razlika u vrijednostima praćenih koeficijenata između pojedinih analiziranih grupa.

Ključne riječi: Ključne riječi: dužičasta pastrmka; različita matična jata; koeficijenti

**CHANGES IN THE BODY DEVELOPMENT OF PIVSKA PRAMENKA OVER
THE LAST 40 YEARS**

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Pivska pramenka is the indigenous sheep breed with coarse wool that has been grown for centuries in the north-western part of Montenegro. It is well adapted to an extensive and a semi extensive way of rearing in the conditions of the cold mountain climate. Feeding of sheep is primarily based on pasture, while during wintertime hay is the main feed, supplemented by grain during lambing season. Investigation was conducted in the 2012 on three flocks from different locations; one from area of Plužine municipality and two from Žabljak municipality. In total, 141 animals were measured and 11 body measures were determined: height at withers - HW, height at rump - HR; bodylength - BL, chest depth -CD; chest width-CW; rump width- RW; chest circumference- CC; bone circumference- BC; ear length - EL, tail length-TL; and body weight -BW. As the result of data analysis, using the linear model with fixed herd effect, the following averages were determined: HW 71.7cm, HR 72.3; BL70.7cm, DC 32.2cm, CW 21.3cm; RW 18.2cm; CC 100.2cm, BC 9.0cm; EL 11.7cm; DR 39.3 cm and BW 71.6kg. Significant differences were found between flocks ($P<0.05$) for all measures except for chest circumference, ear length and tail length. Comparison of these results with the results of the same breed from late70's and early 90-ies of the last century, which were for height at wither 66.38 cm and 69.27cm, body length 66.60 and 69.31 cm, chest circumference 86.12 and 86.77cm and for body weight 53.67 and 56.75kg respectively, shows that body size has been increased and differences were statistically significant ($P<0.05$). Larger body measurements are probably the result of positive selection implemented in recent years, improved feeding conditions, and possible crossing with other breeds.

Keywords: Pivska pramenka, indigenous breed, breeding system, body development,

**PROMJENE U TJELESNOJ RAZVIJENOSTI PIVSKE PRAMENKE TOKOM
POSLJEDNJIH 40 GODINA**

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Pivska pramenka je autohtona rasa ovaca koja se vjekovima gaji u sjeverozapadnom dijelu Crne Gore. Karakteriše je dobra prilagođenost ekstensivnom i poluekstensivnom načinu gajenja u uslovima oštре planinske klime. Ishrana je tokom većeg dijela godine zasnovana na paši, a zimi se ovce hrane sijenom uz dodatak zrnastih hraniva tokom sezone jagnjenja. Tokom 2012. provedena su istraživanja na tri stada sa različitim lokaliteta, jedno sa područja Plužina i dva sa područja Žabljaka. Za ukupno 141 grlo utvrđeno je 11 tjelesnih mjeru: visina grebena – VG; visina krsta – VK; dužina trupa – DT; dubina grudi – DG; širina grudi – ŠG; širina karlice – ŠK; obim grudi – OG; obim cjevanice – OC; dužina ušne školjke - DU; dužina repa - DR i masa tijela – MT. Analizom podataka, primjenom linearnog modela sa fiksnim efektom stada, utvrđeni su sljedeći opšti prosjeci za navedene tjelesne mjeru: VG 71,7cm; VK 72,3 cm; DT 70,7 cm, DG 32,2 cm; ŠG 21,3 cm; ŠK 18,2 cm; OG 100,2cm; OC 9,0 cm; DU 11,7 cm; DR 39,3 cm i masa tijela 71,6 kg. Utvrđene su statistički značajne razlike između stada ($P<0,05$) za sve tjelesne mjeru osim za obim grudi, dužinu uva i dužinu repa. Poredenjem rezultata ovih istraživanja sa rezultatima istraživanja s kraja 70-ih i s početka 90-ih godina prošlog vijeka, koja su za visinu grebena iznosila 66,38 cm i 69,27 cm, dužinu trupa 66,60 cm i 69,31 cm, obima grudi 86,12 cm i 86,77 cm i tjelesnu masu 53,67 kg i 56,75 kg, zapaža se da je došlo do znatnog povećanja tjelesnih mjeru, a ispoljene razlike bile su statistički značajne ($P<0,05$). Veće tjelesne mjeru vjerojatno su rezultat pozitivne selekcije u proteklom periodu, poboljšanih uslova ishrane, kao i mogućeg ukrštanja sa drugim rasama.

Ključne riječi: pivska pramenka, autohtona rasa, sistem gajenja, tjelesna razvijenost

VIRUSNE BOLESTI RESPIRATORNOG TRAKTA SVINJA

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Ispitivanja koja su obavljena u svetu ukazuju da su virusne infekcije respiratornog trakta svinja aktuelne bolesti koje nanose veoma velike ekonomske štete u proizvodnji tovljenika u mnogim zemljama. Cilj ovih istraživanja je bio da se utvrdi značaj prisustva virusnih infekcija (PRRS, Cirko virus, Influenca svinja) na pojavu bolesti respiratornog trakta svinja. Suočeni sa respiratornim sindromom u velikom delu populacije svinja u Vojvodini, pokušali smo odrediti prevalencu pojavljivanja PRRS i njegov značaj u patologiji svinja. Izvršili smo serološki pregled svinja na području Vojvodine i konstatovali da su gotovo sve farme u Vojvodini seropozitivne na PRRS. Od 770 uzoraka krvи pregledanih svinja, 276 je imalo specifična antitela za PRRS infekciju (35,84%). Virus PRRS smo izolovali u jednom slučaju. Pored toga smo diferencialno dijagnostički (iz pluća) izvršili i izolaciju drugih patogena. Kod svinja u Srbiji je virus influence H1N1 ustanovljen još 1982 u jednom zapatu u Vojvodini. Tokom 2006. i 2007. godine izvršeno je uzorkovanje i ispitivanje 1053 uzoraka krvи svinja dvorišnog načina držanja sa područja 34 naseljena mesta i 322 uzorka krvи svinja iz 5 zapata industrijskog načina držanja sa područja Vojvodine. Od 1053 uzoraka krvи svinja dvorišnog načina držanja pozitivan nalaz je utvrđen kod 53 ili 5,03% uzoraka sa područja 13 od 34 naseljenih mesta. Od 322 uzoraka krvи svinja industrijskog načina držanja pozitivan nalaz je utvrđen kod 50 ili 15,53% uzoraka iz tri od pet pregledanih zapata industrijskog načina držanja. Dobijeni rezultati ukazuju na prisustvo infekcije virusom influence podtipa H1N1 u obe populacije svinja. U 2010. godini je H1N1 ustanovljen na jednoj mini i na jednoj farmi industrijskog tipa. Novi „meksički tip“, H1N1 (2009) je izolovan u Srbiji 25.01.2010. god. Ispitivanja su izvršena na 20 farmi u Vojvodini i samo na jednoj farmi prisustvo Cirko virusa nije ustanovljeno. Na ukupno 12 farmi u kojima je ustanovljena infekcija svinja Cirko virusom, na 8 farmi je serološkim ispitivanjem utvrđeno prisustvo specifičnih antitela za virus PRRS. Ispitivanjem je bilo obuhvaćeno 16 opština, 36 naseljenih mesta i 79 dvorišta. Ispitano je ukupno 133 uzorka iz individualne proizvodnje, i cirko virus je ustanovljen u 112 uzoraka, dok u 21 uzoraku nije utvrđeno prisustvo cirko virusa.

Ključne reči: Cirkovirus; PRRS; respiratorne bolesti; svinja

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**THE USE OF DIFFERENT DIAGNOSTIC TECHNIQUES IN CATTLE
TUBERCULOSIS ERADICATION**

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Most of the member states of the European Union (EU) have achieved a bovine tuberculosis (BTB) free status, or are progressing towards bovine tuberculosis eradication. However, there are still countries and regions where BTB is endemic or despite once eradicated it is emerging again. Epizootiological investigations considering BTB in Serbia, reveal the low overall prevalence, but there are still tuberculous districts in South Backa region, with a relatively high incidence of BTB positive animals and herds. Thus, early and accurate diagnosis of BTB in living animals, and prompt removal of infected cattle, present a cornerstone in control and eradication campaign of this significant zoonosis. Infection of cattle with *Mycobacterium bovis* is usually chronic and can remain subclinical for a long period, and even if some of the clinical signs are present they are not pathognomonic. Importantly, infected cattle can shed the organism long before any obvious clinical signs are present, and spread the disease to other susceptible animals or humans. Tuberculosis can be spread to humans most oftenly by the inhalation of infectious droplet nuclei or by ingestion of raw milk and milk products, rarely by consumption of meat deriving from infected animals. Because BTB causes a significant economic losses to cattle farming operations and poses an public health hazard, control and eradication programs in domestic animals are mandatory in most countries. The early preclinical stages of BTB can be detected in live animals by the use of tests of cellular immunity. For routine BTB diagnosis in eradication campaign of most importance are tuberculin skin test, gamma interferon assay (γ -IFN) and of less importance fluorescens polarization assay and lymphocyte transformation tests. The strategic use of the γ -IFN assay in parallel with the tuberculin test provides early identification of infected cattle and reduces the number of false positive or inconclusive reactors, enabling early disposal of BTB positive animals. This paper reviews different techniques in bovine tuberculosis diagnosis that are currently available. Also our experiences in bovine tuberculosis diagnosis under local conditions in Serbia are discussed.

Keywords: tuberculosis; cattle; diagnosis

**PRIMENA SAVREMENIH METODA DIJAGNOSTIKE U SUZBIJANJU
TUBERKULOZE GOVEDA**

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U velikom broju država Evropske Unije tuberkuloza (TBC) goveda je iskorenjeno oboljenje, ili je na pragu da to postane. Međutim, postoje zemlje i regioni u kojima se ona endemski održava ili broj novoinficiranih zapata i jedinki raste. Epizootiološka analiza situacije u Srbiji ukazuje na nisku prevalenciju oboljenja, uz postojanje žarišta na teritoriji Južnobačkog okruga sa relativno visokom incidencijom tuberkuloznih jedinki i zapata. Stoga, pravovremena i precizna dijagnostika infekcije kod živih životinja, uz brzo uklanjanje inficiranih jedinki predstavlja temelj suzbijanja i eradicacije ove značajne zoonoze. Uzročnik tuberkuloze goveda *Mycobacterium bovis*, najčešće dovodi do hronične infekcije, koja nekad može i godinama ostati u subkliničkoj formi, a ako su i prisutni klinički znaci, oni nisu patognomonični. Značajno je da zaražene jedinke izlučuju uzročnika oboljenja mnogo pre pojave simptoma bolesti, te tako predstavljaju izvor infekcije za druge prijemčive životinje i ljudi. Do širenja uzročnika na ljudе najčešće dolazi inhalacijom inficiranih aerosola ili konzumiranjem sirovog mleka, retko mesnih prerađevina poreklom od tuberkuloznih grla. Budući da oboljenje nanosi velike ekonomske gubitke u govedarskoj proizvodnji i ima izražen zoonozni potencijal, u većini zemalja vrši se obavezno suzbijanje i iskorenjivanje tuberkuloze kod domaćih životinja. Rani preklinički stadijumi TBC goveda, mogu se otkriti na živim životnjama primenom testova koji registruju čelijski imunološki odgovor. Za rutinsku primenu u programu eradicacije tuberkuloze od najvećeg značaja su intradermalna tuberkulinizacija, gama interferon test (γ -IFN) i u manjoj meri metoda fluorescentne polarizacije i test transformacije limfocita. Strateška primena γ -IFN testa paralelno sa tuberkulinizacijom, omogućuje rano otkrivanje inficiranih grla, i smanjuje broj lažno negativnih i/ili nespecifičnih reakcija, te obezbeđuje brzo uklanjanje obolelih životinja iz zapata. U radu je dat pregled različitih metoda dijagnostike tuberkuloze goveda koje se danas primenjuju u svetu, kao i naša iskustva u njihovoј primeni u lokalnim uslovima.

Ključne reči: tuberkuloza; goveda; dijagnostika

UNAPREĐENJE PROIZVODNJE I KVALITETA SIROVOG MLJEKA

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Proizvodnja mlijeka je jedan od najsloženijih tehnoloških postupaka u stočarskoj proizvodnji i predstavlja jednu od najvažnijih poljoprivrednih djelatnosti u Bosni i Hercegovini. Primjenom evropskih standarda kvaliteta sirovog mlijeka, ova djelatnost u našoj zemlji može omogućiti radni angažman i znatan finansijski učinak velikog broja poljoprivrednih gazzinstava. U ovom radu prikazani su rezultati ocjene uslova primarne poljoprivredne proizvodnje mlijeka na uzorku od 30 gazzinstava sa 5-30 krava. Laboratorijske analize su urađene u akreditiranim laboratorijama JU „Veterinarski zavod“ Bihać, primjenom propisanih metoda (infra crvena spektrometrija, fluoro-opto-elektronska metoda, metoda protočne citometrije). Rezultati fizikalno- hemijskih analiza (MilkoScan FT 120) kao i analize ostalih parametara higijenskog kvaliteta (Fossomatic Minor, BactoScan FC) takođe se nalaze u obuhvatu ovog istraživanja. Na osnovu rezultata analiza i ocjene uslova proizvodnje dobijeni su podaci o uticaju uslova proizvodnje na definisane parametre kvaliteta mlijeka. Prosječna vrijednost mlječne masti za sve ispitane farme iznosi 3,89 % (ispod prosjeka EU) dok prosječna vrijednost sadržaja proteina se kreće u prihvatljivim granicama evropskih normativa (3,20 %). Prosječna vrijednost laktoze (4,62 %), se kreće u prihvaćenom intervalu vrijednosti (4,6% do 4,9%) za koju neki autori navode kao očekivanu. Vrijednost tačke mržnjenja prosječno se kretala -0,543°C što je neznatno niža od vrijednosti -0,533 °C koja je validna za kravljе mlijeko dobre kvalitete. Srednja vrijednost sadržaja SM iznosi 12,95% i u granicama je optimuma. Sadržaj bezmasne SM prosječno je iznosio 8,53 %, što udovoljava važećem Pravilniku. Broj bakterija kontaminanata se kretao od 35.000 do 1.550.000 ml/uzorka (nije postignuta široka higijenska stabilnost) a utvrđene vrijednosti somatskih ćelija su se kretale od 10.000 do 1.166 000 (širok dijapazon zdravlja vimenja). Higijena u cjelokupnom lancu proizvodnje mlijeka je zasigurno osnovni i najvažniji parametar koji ima uticaja na kvalitet i zdravstvenu sigurnost konačnog proizvoda. Unapređenje kvaliteta mlijeka postiže se neprekidnim poboljšanjima uslova proizvodnje, uz stalne korektivne i preventivne aktivnosti u cjelokupnom lancu. U zakonskoj regulativi higijenska kvaliteta sirovog mlijeka propisana je pravilnicima koji se odnose na higijenske propise u proizvodnji i prometu sirovog mlijeka, termički obrađenog mlijeka i mlječnih proizvoda.

Ključne riječi: proizvodnja mlijeka, zdravstveno-higijenski uslovi, kvalitet mlijeka

**UTICAJ SEZONE I NIVOA MLJEĆNOSTI KOD KRAVA NA REZULTATE
KONCEPCIJE NA PODRUČJU UNSKO- SANSKOG KANTONA**

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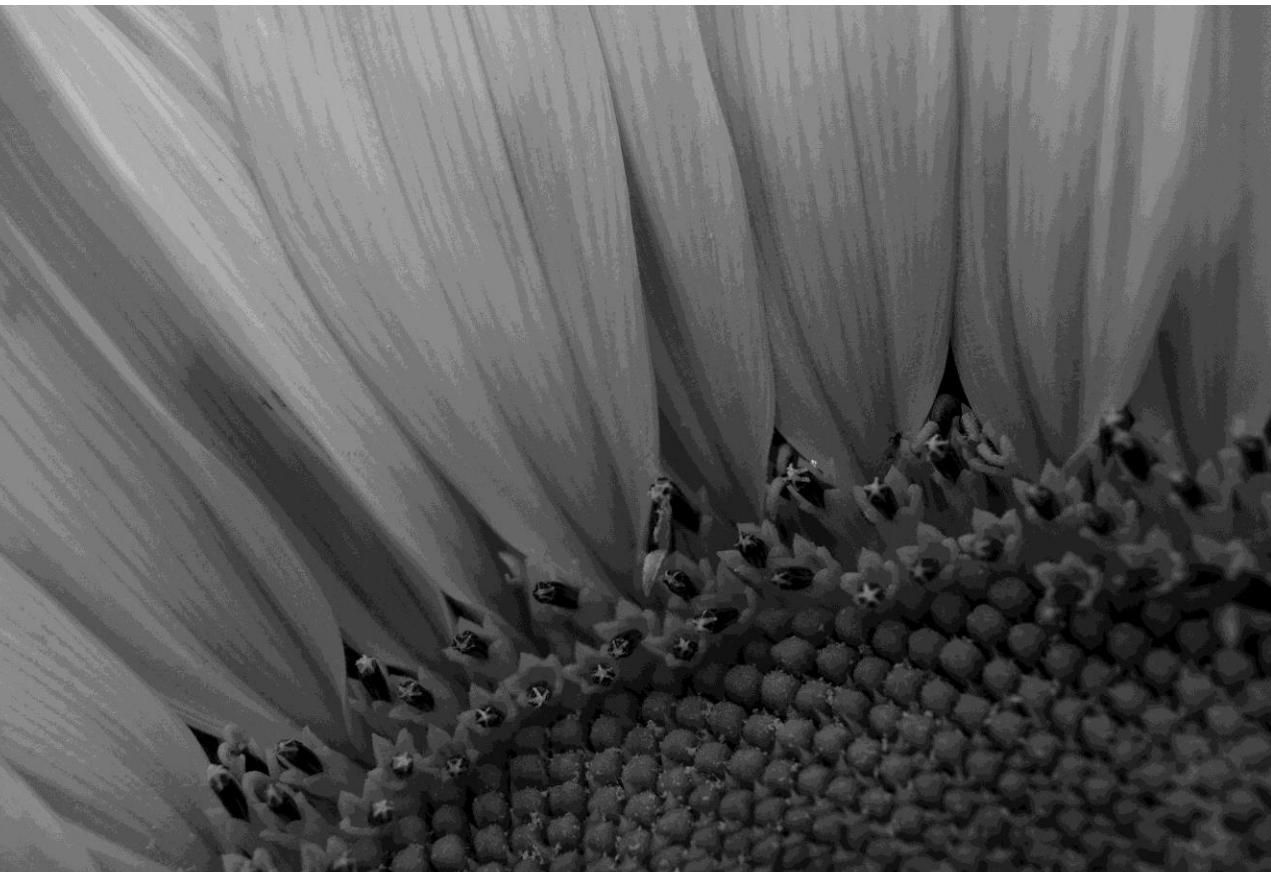
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Istraživanja uspješnosti primjene vještačkog osjemenjavanja, kao biotehnološke metode za povećanje reproduktivne efikasnosti goveda, temeljila su se na praktičnoj primjeni ove metode kod goveda na području Unsko-sanskog kantona. Praktični dio monitoringa obuhvatio je ukupno 1 200 krava, kod kojih je primjenjena metoda vještačkog osjemenjavanja, tokom dvije godišnje sezone: proljeće-ljeto (april-septembar), odnosno jesen-zima (oktobar-mart). Krave kod kojih su praćeni osnovni reproduktivni pokazatelji (vrijednost konцепције, indeks osjemenjavanja, dužina servis perioda) podijeljene su prema nivou mlječnosti u tri grupe (I< 3 500 L; II=3 501 - 4 500 L i III > 4 500 L). Prosječna vrijednost konцепцијe krava tokom sezone proljeće-ljeto iznosila je 74,38% a jesen-zima 80,33%. Prosječni indeks osjemenjavanja tokom sezone proljeće-ljeto iznosio je 1,59, a jesen-zima 1,60. Tokom sezone proljeće-ljeto prosječna dužina servis perioda iznosila je 72,75 dana dok je tokom sezone jesen-zima iznosila 72,03 dana. Vrijednost konцепцијe je u značajnoj mjeri zavisila od uticaja sezone kao i nivoa mlječnosti u prethodnoj laktaciji.

Ključne riječi: krava, vještačko osjemenjavanje, sezona, mlječnost, konцепција.

Section 7. Crop Production



GMO - SAFETY AND RISKS

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Within research the man applied accumulated scientific knowledge for developing methods of creating cultivars and hybrids with improved productivity and low input requirements. Modern biotechnology methods contributed to efficiency of breeding and improving food resources, nutritional quality and developing genotypes with significant higher yield and quality in compare to genotypes created in conventional breeding. Modified plants, fruits and seeds as well as animals of which man had the greatest benefit in the same time their use has certain risks. However, by genetic modification is possible add, modify or delete a trait without interfering two complete genomes. This possibility cause numerous suspicions and doubts about the safety of GMO with new genetic constitution, the security of its use in the diet, as well as the security environment in which they breed. Many genetically modified plants are currently used in agriculture, which divided on the base of type of modification: insect resistance, herbicide resistance, diseases resistance etc. Their advantage is in expression of specific genes in plant genotype without introduction of undesirable traits. Genetic manipulation can contribute to increased productivity due to resistance to pests, herbicides, or environmental stress factors. The use of GMOs with inherit pest resistance can reduce the need for the application of pesticides. However, genetically modified plants could cross with wild relatives and pass transgenic material and lead to potential creation “super weeds” that would be resistant to herbicides or insects. Development of biotechnology opened a lot of question considering advantages and disadvantages of created organisms on the base of gene transfer from the genome of one organism into the genome of another organism. Also, the realization of several times higher yields is crucial in ensuring safe raw materials for food production and helping to solve world hunger. The process of transforming of plants with foreign DNA can disrupt the native DNA that could be harmful for the health of those that consume them. However, genetically modified crops can be used after estimation in terms of human health, food safety and the environment. The achieved changes of genotypes and phenotype could be significantly contribute to better adaptation to environment and climate changes.

Keywords: GMO, safety, risk, biotechnology, food

GMO- BEZBEDNOST I RIZICI

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U okviru istraživanja čovek primenio akumulirana naučna znanja za razvoj metoda za stvaranje sorti i hibrida sa poboljšanom produktivnošću i niskim imput zahtevima. Savremene metode biotehnologije doprine efikasnosti u oplemenjivanju i poboljšanju resursa hrane, nutritivnog kvaliteta i stvaranja genotipova sa značajno većim prinosom i kvalitetom u poređenju sa genotipovima kreiranim u konvencionalnom oplemenjivanju. Modifikovane biljke, voće i semena, kao i životinje od kojih je čovek imao najveću korist, istovremeno njihovo korišćenje donosi određene rizike. Međutim, genetskom modifikacijom je moguće dodati, izmeniti ili obrisati osobinu bez mešanja dva kompletна genoma. Ova mogućnost izaziva brojne sumnje i nedoumice o bezbednosti GMO sa novom genetsičkom konstitucijom, bezbednosti njihovog korišćenja u ishrani, kao i bezbednosti spoljašnje sredine u kojoj se oni gaje. Mnogo genetički modifikovanih biljaka se trenutno koristi u poljoprivredi, koje su podeljene na osnovu tipa modifikacije: otporne na insekte, otporne na herbicide, otporne na bolesti itd. Njihova prednost je u ispoljavanju specifičnih gena u genotipu biljke bez uvođenja nepoželjnih osobina. Genetička manipulacija može da doprinese povećanju produktivnosti usled otpornosti na štetočine, herbicide ili ekološke faktore stresa. Upotreba GMO sa naslednom otpornošću na štetočine može smanjiti potrebu za primenom pesticida. Međutim, genetički modifikovane biljke mogu se ukrštati sa sa divljim srodnicima i preneti transgeni materijal i dovesti do mogućeg nastanka „super korova“ koji mogu biti otporni na herbicide ili insekte. Razvoj biotehnologije je otvorio je mnogo pitanja, s obzirom prednosti i nedostatke stvorenih organizama na bazi transfera gena iz genoma jednog organizma u genom drugog organizma. Takođe, realizacija nekoliko puta većeg prinosa je od ključnog značaja za obezbeđivanje sigurnih sirovina za proizvodnju hrane i pomaže da se reši glad u svetu. Proces transformacije biljaka sa stranim DNK može da poremeti izvorni DNK koja može da bude štetna za zdravlje onih koji ih konzumiraju. Međutim, genetički modifikovani usevi mogu se koristiti posle procene u pogledu ljudskog zdravlja, bezbednosti hrane i životne sredine. Postignute promene na nivou genotipa i fenotipa mogu značajno da doprinesu boljem prilagođavanju sredine i klimatskim promenama.

Ključne riječi: GMO, bezbednost, rizik, biotehnologija, hrana

**EFFECTS OF AGROECOLOGICAL AND SOIL CONDITIONS ON TRAITS OF
HYBRID MAIZE SEED**

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The primary aim of maize production is providing high and stable yields, both quantitatively and qualitatively. Since there are different maize production regions, maize growing practices should be adapted to actual conditions of climate, soil and other environmental factors, in order to utilise potentials of habitat and genotype to the fullest extent. Maize hybrid seed of F1 generation (two single cross combinations) was the material used in the study. Shelling percentage was established and two seed commercial fractions (6,5-8,4 and 8,5- 11) were selected from the natural seed material. The participation of each fraction and their morphological and physiological traits were established on the drawn working samples. The most important traits (1000-seed weight, seed vigour and total seed germination) were determined in four replicates for each variant. The 1000-seed weight was established by weighing 10 x 100 seeds on the laboratory balance. Seed vigour and total seed germination were determined by seed germination at the temperature: t1=20/300C (16/8 h alternating) in four replicates according to the ISTA Rules and national methods regulated by the Regulation on Seed Testing Quality. Experimental data were processed to average values and total variability (x, Sx and C.V.) for all seed traits and for each experiment variant. The two-factorial analysis of variance (hybrid combination - location) was preformed for all observed seed traits. Agroecological conditions of maize growing regions and agro-chemical properties of soil were estimated according to results obtained by local hydrometeorological services and results on soil laboratory analyses. Conclusions on stability of trait expressions under effects of observed factors were drawn on the basis of the analysis of means and variance of traits of maize hybrid seed. The two-factorial analysis shows the extent of this impact. Variability of traits and the analysis of variance indicate that the hybrid combination is a crucial factor in seed trait expression. It sets boundaries to which a certain trait will vary. A great importance is given to environmental conditions, as a second observed factor, which affects the intensity in seed traits expression. Obtained results, on the whole, indicate that due to applied methods for the evaluation of the experimental results, the expected variations are complementary and point out to the significant effect of observed factors.

Keywords: maize; hybrid seed; agroecological conditions; traits; variability

UTICAJ AGROEKOLOŠKIH I ZEMLJIŠNIH USLOVA NA OSOBINE HIBRIDNOG SEMENA KUKURUZA

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Primarni cilj proizvodnje kukuruza je dobijanje visokih i stabilnih prinosa, kako kvantitativno tako i kvalitativno. S obzirom da postoje različita proizvodna područja gajenja kukuruza, tehnologiju proizvodnje treba prilagoditi konkretnim uslovima klime, zemljista i ostalim faktorima spoljne sredine kako bi potencijal staništa i genotipa bio iskorišćen u najvećoj meri. Materijal je hibridno seme kukuruza F1 generacije, dve single cros kombinacije. Posle određivanja procentualnog udela semena na klipu (randmana semena), na laboratorijskim uređajima za doradu semena, iz naturalnog semenskog materijala izdvojene su dve komercijalne frakcije semena (6,5-8,4 i 8,5-11). Iz dobijenih radnih uzoraka određeno je učešće svake frakcije i njegove morfološke i fiziološke osobine. Najvažnije osobine, apsolutna masa (masa 1000 semena), energija klijanja i ukupna klijavost semena, urađene su sa četiri ponavljanja za svaku varijantu. Apsolutna masa određena je merenjem 10 x 100 semena na laboratorijskoj vagi. Energija klijanja i ukupna klijavost određena je naklijavanjem semena pri temperaturi: t1=20/300C (naizmenično 16/8 časova) i u četiri ponavljanja po ISTA međunarodnim i domaćim metodama regulisanim Pravilnikom o kvalitetu semena. Eksperimentalni podaci obrađeni su na srednju vrednost i ukupnu varijabilnost (x, Sx i C.V.) za sve osobine semena i svaku varijantu istraživanja. Dvofaktorijalna analiza varijanse (hibridna kombinacija – lokalitet) urađena je za sve proučavane osobine semena. Za ocenu agroekoloških uslova na lokalitetima proizvodnje i agrohemskihs osobina zemljista, korišćeni su rezultati lokalnih hidrometeroloških službi, kao i rezultati laboratorijskih analiza zemljista. Analizom srednjih vrednosti i varijanse osobina hibridnog semena kukuruza doneti su zaključci o stabilnosti u ispoljavanju osobina pod uticajem posmatranih faktora. Koliki je taj uticaj, vidi se kroz dvofaktorijalnu analizu varijanse. Varijabilnost osobina i analiza varijanse ukazuju da je hibridna kombinacija presudni faktor u ispoljavanju osobina semena. Ona određuje granice do kojih će jedna osobina varirati. Veliki značaj pridaje se i uslovima spoljne sredine kao drugom posmatranom faktoru, koji utiče na intenzitet u ispoljavanju osobina semena. Rezultati istraživanja, u celini, pokazuju očekivana variranja koja se primenjenim metodama za ocenu eksperimentalnih rezultata međusobno dopunjaju i ukazuju na značajan uticaj proučavanih činilaca.

Ključne riječi: kukuruz; hibridno seme; agroekološki uslovi; osobine; varijabilnost

**INBRED LINES AS DONORS OF FAVOURABLE ALLELES FOR THE
IMPROVEMENT OF THE NUMBER OF KERNELS PER ROW OF THE F1
MAIZE HYBRID**

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The following maize inbred lines were used in the study: B14(C0), B37(C0), B73(C5) and B84(C7) (synthetic population BSSS) and B90(C7), B91(C8), B97(C9) and B99(C10) (synthetic population BSCB1). The objective of the present study was to estimate which of the observed inbred lines originating had the greatest relative values of favourable alleles for the improvement of the elite maize hybrid for the number of kernels per row. The greatest (28.8), i.e. lowest (16.1) numbers of kernels per row were recorded in the inbred B84(C7), i.e. B90(C7), respectively. The number of kernels per row was on the average 27.9 and 23.6 in parental components of the elite hybrid ZP580 (ZPL2 and ZPL1), respectively. The greatest number of favourable alleles for the improvement of the number of kernels per row was detected in the donor inbreds B73(C5), B97(C9), B99(C10), B37(C0) and B84(C7) that also had greater genetic relatedness with the parent ZPL1. The inbred B37(C0) was more related to the parent ZPL2. Furthermore, the inbred B73(C5) had a significant and positive difference of the parameters $G^* - (D^* \text{ or } F^*)$, and therefore the backcross of the F1 generation of the elite hybrid to the donor inbred is the best way to derive an initial population with the aim to develop new inbreds that will have a higher average number of kernels per row than the number in the inbred ZPL1. The value of the parameter D^* did not statistically differ from the value of the parameter G^* in the inbreds B14(C0) and B91(C8). This points out to the fact that the best way to derive an initial population is self-pollination of the F1 generation of the elite hybrid. Inbreds B84(C7), B97(C9) and B99(C10) had great values of the parameter G^* for the number of kernels per row, but the differences $G^* - (D^* \text{ or } F^*)$ were not significantly greater than 0. This points out that in the process of selection it is possible to perform direct self-pollination and selection of the inbreds derived from the crosses: B84 x ZPL1, B97 x ZPL1 and B99 x ZPL1, since both donor inbreds were related to the parental inbred ZPL1.

Keywords: inbred lines; maize; donors; hybrid; alleles

**INBRED LINIJE DONORI POŽELJNIH ALELA ZA POPRAVKU OSOBINE BROJ
ZRNA U REDU F1 HIBRIDA KUKURUZA**

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Ispitivane su inbred linije kukuruza: B14(C0), B37(C0), B73(C5) i B84(C7) (sintetička populacija BSSS) i B90(C7), B91(C8), B97(C9) i B99(C10) (sintetička populacija BSCB1). Cilj rada bio je da se oceni koja od ispitivanih inbred linija iz BSSS i BSCB1 sintetika ima najveće relativne vrednosti poželjnih alela za popravku elitnog hibrida kukuruza za osobinu broj zrna u redu. Linija B84(C7) imala je najveći broj zrna u redu 28,8 a najmanji broj zrna u redu 16,1 imala je B90(C7). Roditeljske komponente elitnog hibrida ZP580 imale su u proseku 27,9 (ZPL2) i 23,6 (ZPL1) broj zrna u redu. Najviše poželjnih alela za popravku osobine broj zrna u redu kod elitnog hibrida imale su linije donori B73(C5), B97(C9), B99(C10), B37(C0) i B84(C7) koje su pokazale veću genetičku srodnost sa roditeljem ZPL1. Linija B37(C0) je bila srodnija sa roditeljem ZPL2. Linija B73(C5) je imala značajnu i pozitivnu razliku parametara G^{*}-(D^{*} ili F^{*}) te je najbolji način za zasnivanje početne populacije povratno ukrštanje F1 generacije elitnog hibrida sa linijom donorom u cilju dobijanja novih linija koje će imati veći prosek broja zrna u redu od linije ZPL1. Kod linija B14(C0) i B91(C8) vrednost parametra D^{*} se nije statistički razlikovala od parametra G^{*}. To ukazuje da je najbolji način za zasnivanje početne populacije samooplodnja F1 generacije elitnog hibrida. Linije B84(C7), B97(C9), B99(C10) imale su visoke vrednosti parametra G^{*} za broj zrna u redu, a nisu imale vrednosti razlike G^{*}-(D^{*} ili F^{*}) signifikantno veće od nule. To ukazuje da se u procesu selekcije može vršiti direktna samooplodnja i selekcija linija iz ukrštanja B84 x ZPL1, B97 x ZPL1 i B99 x ZPL1 s obzirom da su obe linije donori pokazale srodstvo sa linijom roditeljem ZPL1.

Ključne riječi: inbred linije; kukuruz; donori; hibrid; aleli

**CORRELATION ANALYSIS FOR YIELD AND YIELD PARAMETERS OF MAIZE
(ZEA MAYS L.) HYBRIDS**

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Understanding of correlation between grain yield of maize (*Zea mays* L.) and its parameters improves the efficiency of plant production and breeding program as well. The objective of this paper is to determine the strength of correlation connection among yield (Y) of maize grain and following parameters: ear weight (EW), ear length (EL), grain weight (GW)/ear, grain number (GN)/ear and number of rows (RN) per ear. Highly significant (**= p<0.01) differences and moderate positive correlations in year 2006 were found among yield of maize grain and grain weight (0.38**) and strong positive correlation among yield and ear weight (0.62**). Highly significant (** = p<0.01) differences and strong positive correlations in year 2007 were found among yield of maize grain and grain weight (0.46**) and ear weight (0.42**) as well. Significant (*=p<0.05) and strong positive correlations among yield and number of grains per ear were found in years 2006 (0.64*) and 2007 (0.55*). Highly significant differences and weak positive correlations were found between yield of maize grain and ear length (0.25**), and strong and positive correlation among yield and ear weight (0.44**) and grain weight (0.47**) as well, in year 2008. Opposite to results obtained in year 2008, correlation between yield and ear length in 2009 was not significant. Also, the weaker correlation connection in compare to previous vegetation was established between yield and ear weight (0.29**), and yield and grain weight as well (0.28**).

Keywords: Maize; hybrids; grain yield; yield parameters; correlation

**ANALIZA KORELACIJSKE VEZE IZMEĐU URODA I PARAMETARA URODA
HIBRIDA KUKURUZA (ZEA MAYS L.)**

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Razumijevanje koreacijske veze između uroda zrna i parametara kukuruza (*Zea mays L.*) može povećati učinkovitost proizvodnje, a pored toga biti od koristi u oplemenjivačkom procesu. Cilj istraživanja je odrediti značajnost i jačinu koreacijske veze između uroda zrna kukuruza i sljedećih parametara: težine klipa, dužine klipa, težine zrna/klipu, broja zrna/klipu i broja redova zrna/klipu. Vrlo značajne razlike ($**=p<0.01$) i umjereno jaka korelacija u vegetaciji 2006. god. utvrđena je između uroda i mase zrna/klipu ($r=0.38**$) te jaka pozitivna korelacija ($0.62**$) između uroda i mase klipa. Vrlo značajne razlike i jaka pozitivna korelacija u 2007. god. utvrđena je između uroda i mase zrna ($r=0.46**$) te uroda i mase klipa ($0.42**$). Značajne razlike ($*=p<0.05$) i jaka pozitivna korelacija utvrđena je između uroda i broja zrna po klipu ($r=0.64*$ (2006) i $r=0.55*$ (2007). Vrlo značajne razlike i slaba pozitivna korelacija u vegetaciji 2008. god. utvrđene su između uroda zrna kukuruza i dužine klipa ($r=0.25**$), te jaka pozitivna korelacija između uroda, težine klipa ($0.44**$) i težine zrna ($0.47**$). Nasuprot rezultatima istraživanja u vegetaciji 2008. koreacijska veza između uroda zrna i dužine klipa kukuruza nije bila statistička značajna. Također, u odnosu na prethodnu vegetaciju u 2009. godini utvrđena je slabija koreacijska veza između uroda zrna i težine klipa ($0.29**$) te između uroda zrna i težine zrna ($0.28**$).

Ključne riječi: Kukuruz; hibridi; urod zrna; parametri uroda; korelacija

**WEATHER CHARACTERISTICS IN THE 2012 GROWING SEASON WITH
ASPECT OF MAIZE GROWING IN CROATIA**

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Maize is main field crop on the arable lands in Croatia and neighboring countries. In the 2006 -2010 period maize was average grown on 1149410 ha (Hungary), 1216786 ha (Serbia), 298697 ha (Croatia) and 189613 ha (Bosnia and Herzegovina) or total on about 30% of arable lands. In this period, considerable variation of annual maize yields were found as follows: from 3.6 to 7.5 t ha⁻¹ (Hungary), from 3.2 to 5.9 t ha⁻¹ (Serbia), from 4.9 to 8.0 t ha⁻¹ (Croatia), and from 3.2 to 5.1 t ha⁻¹ (Bosnia and Herzegovina), respectively. Aim of this study was testing weather characteristics for the 2012 maize growing season in Croatia. Water reserves in soil for sowing period were low because precipitation in January-March were about 50% of average and maize was mainly sown in dry soil. Precipitation in six towns of Pannonian region for April – September period were average 367 mm or for 21% lower from the long-term mean (LTM) 1961-1990, and they were accompanied with mean air-temperature 19.6 °C or the higher for 2.7 °C. With that regard, precipitation status in the eastern part of the region (Osijek, Slav. Brod and Bjelovar) was less favorable than in their western part (Sisak, Zagreb and Varaždin). Drought was especially affected on maize in August because of low precipitation from 4 mm (Osijek) to 15 mm (Varazdin) accompanied with mean air-temrptaures 23.8 °C or for 4.2 °C over average. Drought in Bjelovar had 80-day continuity from third 10-day of June to end of 10-days September (31 mm). Something better status was in Osijek as affected by 47 mm precipitation in third 10-day part of July. However, precipitation in Varazdin for this 80-day period were 112 mm. The most warm was third 10-day part of August because absolute air-temperature maximum 40.3 °C (Osijek), 38.5 °C (Bjelovar), and 37.5 °C (Varaždin) were recorded. Estimated (rude projection) yields of maize in 2012 for Croatia 4.2 t ha⁻¹, Hungary, 4.05 t ha⁻¹, Romania 2.40 t ha⁻¹, and Serbia 3.12 t ha⁻¹, are lower in comparison with the yields in the favorable 2010 growing season for 40%, 37%, 38%, and 44%.

Keywords: maize; precipitation; air-temperature; yield; Croatia

VREMENSKE PRILIKE U 2012. SA STAJALIŠTA UZGOJA KUKURUZA U HRVATSKOJ

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Kukuruz je glavna ratarska kultura na oranicama Hrvatske i susjednih zemalja. U razdoblju 2006.-2010. kukuruz je uzgajan u Mađarskoj prosječno na 1149410 ha, Srbiji 1216786 ha Hrvatskoj 298697 ha, a u Bosni i Hercegovini (BiH) na 189613 ha. Na ovim prostorima se kukuruz prosječno uzgaja na oko 30% oranica. U tom razdoblju evidentna su značajna variranja prinosa kukuruza po godinama: od 3,6 do 7,5 t ha⁻¹ (Mađarska), od 3,2 do 5,9 t ha⁻¹ (Srbija), od 4,9 do 8,0 t ha⁻¹ (Hrvatska), odnosno od 3,2 do 5,1 t ha⁻¹ (BiH). Cilj ovoga rada je analiza vremenskih prilika tijekom vegetacije kukuruza 2012. u Hrvatskoj. Zalihe vode u tlu u vrijeme sjetve bile su skromne i kukuruz je posijan uglavnom u suho tlo. Oborine u razdoblju siječanj-ožujak bile su za oko 50% manje od višegodišnjeg prosjeka. Količina oborina u šest mjesta Panonske regije u razdoblju travanj – rujan iznosila je prosječno 367 mm, što je za 21% manje od višegodišnjeg prosjeka 1961.-1990., a srednje temperature zraka 19,6 °C ili veće za 2,7 °C. S tim u vezi, stanje oborina u istočnom dijelu regije (Osijek, Slav. Brod i Bjelovar) bilo je nepovoljnije nego u zapadnom dijelu (Sisak, Zagreb i Varaždin). Suša i visoke temperature bile su osobito izražene u kolovozu, jer je prosječna količina oborina bila od 4 mm (Osijek) do 15 mm (Sisak), uz temperature 23,8 °C ili za 4,2 °C iznad prosjeka. Sušno razdoblje na području Bjelovara trajalo je neprekidno od početka treće dekade lipnja do kraja prve dekade rujna. U navedenih 80 dana palo je 31 mm oborina. Nešto bolje bilo je u Osijeku (63 mm), jer je u trećoj dekadi srpnja palo 47 mm kiše. U Varaždinu je u promatranih 80 dana palo 112 mm oborina. Treća dekada kolovoza bio je najtoplji dio godine kada su zabilježeni absolutni maksimumi 40,3 °C (Osijek), 38,5 °C (Bjelovar), odnosno 37,5 °C (Varaždin). Gruba procjena očekivanog prinosa kukuruza 2012. u Hrvatskoj (4,2 t ha⁻¹), Mađarskoj (4,05 t ha⁻¹), Rumunjskoj (2,40 t ha⁻¹) i Srbiji (3,12 t ha⁻¹) ukazuje na 40%, 37%, 38%, odnosno 44% manji prinos od onoga ostvarenog u povoljnjoj 2010. godini.

Ključne riječi: kukuruz; oborine; temperature zraka; prinos zrna; Hrvatska

EFFECTS OF FOLIAR FERTILIZATION ON CORN GRAIN QUALITY

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The presented data were collected within the experiments carried out in Skopje region, R. of Macedonia at the experimental fields of the Institute of Agriculture. The experiment with corn plant was conducted to study the effect of foliar fertilizer Megagreen in different concentrations on the macro and micro elements in corn grain during 2008 and 2009. The experimental design was a randomized complete block, with four variants and three replications. Foliar treatments consisted of three levels of Megagreen with a 0.3, 0.6 and 0.9 percent concentration and control (without fertilization). The experiment was carried out on two different experimental sites on alluvial soils. Soil reaction on both experimental sites was moderately alkaline ($\text{pH}_{\text{H}_2\text{O}}=8$), with low concentration of humus (1.37-1.89%), while the content of easy available P_2O_5 and K_2O was significantly different, and vary in the ranges of P_2O_5 19.88, K_2O 15.72 and P_2O_5 41.52 and K_2O 42.46 mg/100g. soil for each site, respectively. The foliar fertilizer was applied four times during the growing period, starting from the stage of 7-8 leaf (V7), in a intervals of 10-15 days. In order to determine the impact of different concentrations of fertilizer on grain quality, besides measuring of grain yield, additional samples were taken for chemical analysis. The soil and plant analysis were made carried out according officially adopted international methods. The study results showed that the highest concentration of N and Cu was observed in the control variant, while the content of these two elements was lower, when Megagreen was applied. The statistical analyses showed significant positive effect of foliar applications of Megagreen in concentration of 0.9 % on the content of K, Mn and Zn in corn grain. The concentration of this elements in grain samples for the 2 growing seasons was as follows: K- 0.27 and 0.29%; Mn – 5 and 6 mg/kg and Zn – 22 and 26.33 mg/kg. The findings showed that effects of Megagreen on the P, Ca, Mg and Fe concentration in the grain were insignificant.

Keywords: corn; grain; foliar; fertilizer; macro; micro; elements; alluvial soil

THE INFLUENCE OF VARIOUS TYPES OF CYTOPLASM ON GRAIN YIELD OF MAIZE INBREDS

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The aim of this study was to determine the influence of various types of cytoplasm (cms-C, cms-S and fertile), and environment factors on yield of twelve inbred lines of maize. It was presumed to have studied different inbred lines of maize genetic base and to respond differently to environmental factors that affect the returns of grain. The experiment with inbred lines set at two locations in 2008 and 2009. The four factorial analysis of variance (genotype-cytoplasm-year-location) and cluster analysis for each source CMS (Rohlf, 2000). Based on the analysis of variance showed that there were significant differences between inbred lines of grain yield and interaction with the inbred lines tested factors (type of CMS, age and location). The inbred line L1 achieved the highest (3.3 t ha⁻¹), and the inbred line L10 (1.5 t ha⁻¹) the lowest grain yield. A cytoplasmic type significantly affects the studied properties of the inbred lines. Depending of the cytoplasmic type (cms-C, cms-S and fertile), fluctuation in grain yield of inbred lines was very significant in the inbred lines L2, L5, L7, L10 and L12. The average grain yield fluctuated very significantly ($P \leq 1\%$) depending of the year and the localities. In 2008, the yield (2.9 t ha⁻¹) was higher than in 2009 (2.12 t ha⁻¹). The first locality had higher yield (2.72 t ha⁻¹) than the second one (2.31 t ha⁻¹). A cluster analysis carried out based on the obtained dendograms showed some differences in the origin, i.e. genetic distance among the same inbred lines with different cytoplasmic source. The fertile lines and the C-sterile lines (L1, L2 and L3) therefore showed certain similarity in clustering and divergence, unlike the S-sterile lines. The fertile line L12 has a unique origin and represents a single cluster, and when it comes to divergence, it attains a big genetic distance from the other lines, regardless of their cytoplasmic source.

Keywords: cytoplasmic male sterility; maize; inbred lines; yield; cluster analysis

UTICAJ RAZLIČITOG TIPOA CITOPLAZME NA PRINOS ZRNA INBRED LINIJA KUKURUZA

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Cilj istraživanja bio je da se odredi uticaj različitog tipa citoplazme (cms-C, cms-S i fertilna), i faktora spolašnje sredine na prinos zrna dvanaest inbred linija kukuruza. Pošlo se od pretpostavke da su proučavane inbred linije kukuruza različite genetičke osnove i da različito reaguju na faktore spolašnje sredine što utiče na različit prinos zrna. Ogled sa inbred linijama postavljen je na dve lokacije tokom 2008 i 2009 godine. Urađena je četvorofaktorijsalna analiza varijanse (genotip-citoplazma-godina-lokacija) i klaster analiza za svaki izvor citoplazme (Rohlf, 2000). Na osnovu analize varijanse utvrđeno je da postoje veoma značajne razlike između inbred linija u prinosu zrna kao i interakcije inbred linija sa ispitivanim faktorima (tip citoplazme, godina i lokacija). Najveći prinos zrna ostvarila je inbred linija L1 (3,3 t ha-1), a najmanji L10 (1,5 t ha-1). Tip citoplazme veoma značajno utiče na proučavane osobine inbred linija. Variranje prinosa zrna inbred linija u zavisnosti od tipa citoplazme (cms-C, cms-S i fertilna) bilo je veoma značajno kod inbred linija L2, L5, L7, L10 i L12. Prosečan prinos zrna inbred linija je veoma značajno ($P \leq 1\%$) varirao u zavisnosti od ispitivanih godina i lokacija. Veći prinos (2,9 t ha-1) ostvaren 2008. godine u odnosu na 2009. godinu (2,12 t ha-1). Na prvoj lokaciji ostvaren je veći prinos (2,72 t ha-1) u odnosu na drugu lokaciju (2,31 t ha-1). Urađena klaster analiza na osnovu dobijenih dendrograma pokazala je razlike u pripadnosti odnosno genetičkoj distanci između istih inbred linija ali sa različitim izvorom citoplazme. Tako su fertilne linije i linije sa C izvorom sterilnosti (L1, L2 i L3) pokazale izvesnu sličnost u pogledu grupisanja i divergentnosti za razliku od linija sa S izvorom sterilnosti. Fertilna linija L12 po svojoj pripadnosti je jedinstvena i zastupa samo jedan klaster, a u pogledu divergentnosti nalazi se na velokoj genetičkoj distanci u odnosu na ostale linije bez obzira na izvor citoplazme.

Ključne riječi: citoplazmatska muška sterilnost; kukuruz; inbred linije; prinos; klaster analiza

**FOLIAR APPLICATION OF LIQUID ORGANIC FERTILIZER ON THE FORAGE
PRODUCTION OF RED CLOVER (TRIFOLIUM PRATENSE L.)**

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Adequate mineral nutrition of red clover is one of the preconditions for the realization of maximum yield potential, especially on acid soils. The field experiment with two cultivars of red clover (K-39 - diploid and Amos - tetraploid) was established on the soil in type of cambisol, using a randomized block design with three replications. The crop was grown in dense planting conditions (20 cm row). The objective of this study was to evaluate the effect of foliar treatment with liquid organic fertilizer (Bioplant flora, Plant DOO, Russia) on forage yield, hay yield, yield components (plant height, number of stem m⁻²) and the share of water in green forage at the time of harvest. Foliar fertilization was carried once at the phase beginning of intensive growth and the second time, two weeks after, in a concentration of 0.4% and amount of 600 l ha⁻¹ of water. Irrespective of foliar fertilization, variety K-39 had a significantly higher number of stem m⁻² and significantly higher yields of forage and hay in relation to tetraploid variety Amos. This is a consequence of the greater tolerance of the variety K-39 on the extreme drought conditions in the period June-October. Foliar application of liquid organic fertilizer affected on a significant increase in plant height cv K-39, which resulted in higher yields of forage and hay (12.1 and 14.7% respectively). It can be connected with the positive effect of biostimulators of the fertilizer on growth and stem elongation. The positive impact of foliar application of organic fertilizer in the conditions of extreme drought at the major part of the vegetation period indicates that this research should be continued or to check the effect of fertilizer under normal production conditions.

Keywords: red clover; foliar fertilization; Bioplant flora

**FOLIJARNA PRIMENA TEČNOG ORGANSKOG ĐUBRIVA U PROIZVODNJI
KRME CRVENE DETELINE (TRIFOLIUM PRATENSE L.)**

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Pravilna mineralna ishrana crvene deteline, naročito na kiselim zemljištima jedan je od preduslova za maksimalnu realizaciju potencijala za prinos. Poljski ogled je sa dve sorte crvene deteline (K-39 – diploidna i Amos – tetraploidna) postavljen na zemljištu tipa gajnjače po potpuno slučajnom blok sistemu u tri ponavljanja. Cilj rada je bio da se u uslovima guste setve (20 cm međuredno) analizira uticaj folijarne prihrane tečnim organskim đubrivom (Bioplant flora, Plant DOO, Rusija) na prinos krme, sena, komponente prinosa (visina biljke, broj izdanaka po m⁻²) i ideo vode u zelenoj krmi u vreme košenja. Folijarna primena đubriva izvršena je jednom na početku intenzivnog porasta i drugi put nakon dve nedelje u koncentraciji 0.4% i količini vode 600 l ha⁻¹. Nezavisno od folijarne prihrane, sorta K-39 imala je značajno veći broj izdanaka m⁻² kao i značajno veći prinos krme i sena u odnosu na tetraploidnu sortu Amos. Ovo je posledica veće tolerantnosti sorte K-39 na uslove ekstremne suše u periodu Jun-Oktobar. Folijarna prihrana tečnim organskim đubrivom uticala je na značajno povećanje visine biljake kod sorte K-39, što je uslovilo veći prinos zelene krme i sena (12.1 i 14.7% po redosledu). To se može povezati sa pozitivnim delovanjem biostimulatora koje đubrivo sadrži na porast i izduživanje stabla. Pozitivan uticaj folijarno primjenjenog organskog đubriva u ekstremno sušnim uslovima u većem delu vegetacionog perioda ukazuje da bi ova istraživanja trebalo nastaviti odnosno proveriti njegovo delovanje u normalnim uslovima proizvodnje.

Ključne riječi: crvena detelina; folijarno đubrenje; Bioplant flora

THE INFLUENCE OF AGE AND WAYS TO KEEP THE SEED GERMINATION
NIGEL SATIVA L.

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Germination of seeds of plant species Nigel sativa was examined. The seed was produced in 2007 at the experimental field of the Institute of Medicinal Plant in Pancevo. After harvesting the seeds dried to 9% moisture content, and then cleared of impurities. The dried seeds are divided into five types of packaging: paper bags, glass jars, canvas bags, metal and wooden boxes. After a month, a sample is placed on the germination of four replicates of 100 seeds from all five types of packaging. Next five years, samples were taken from each package type 4 times per 100 seeds and placed on germination. Germination was carried out in a hot bed in petri dishes on filter paper at a constant temperature of 200C with lighting 12/12 hours respectively. Reading the total germination was carried out after 21 days. Based on the analysis of variance were highly significant ($p \leq 1\%$) differences seed germination Nigel depending on the package type, length of seed storage and interaction of these two factors. The highest average total germination (78.4%) had a seed kept in paper bags, and the lowest (63.1%) seed kept in a metal box. Between the seeds kept in a cloth bag of seeds kept in a wooden box, no statistically significant difference between the total germination percentage (75.5% and 74.5%). Germination of seeds kept in a glass container (69.2%) and a wooden box (74.5%) was significantly higher than the very seed germination kept in a metal box (63.1%) and a significantly smaller than seed germination kept in a paper bag (78.4%) and a cloth sack (75.2%). Highest average total seed germination Nigel had in the first (92.6%) and second year (89.9%) of storage. What is the period of seed storage was longer germination was lower. From the third to fifth year, total germination was: 79.7%, 56.1% and 32.6%. Germination of seeds, which is a month after the harvest was examined 82.2%. Highest total germination had one year old seed stored in a paper bag (97.5%) and the lowest seed from five years old kept in a metal box.

Keywords: Nigel; seed germination; packaging; seed age

UTICAJ STAROSTI I NAČINA ČUVANJA NA KLIJANJE SEMENA NIGELA SATIVA L.

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Ispitivana je klijavost semena biljne vrste Nigela sativa. Seme je proizvedeno 2007 godine na oglednom polju instituta za proučavanje lekovitog bilja u Pančevu. Nakon žetve seme je dosušeno do sadržaja vlage 9%, a zatim je očišćeno od primesa. Osušeno seme raspoređeno je u pet vrsta pakovanja: papirna kesa, staklena posuda, platnena vreća, metalna i drvena kutija. Nakon mesec dana jedan uzorak stavljen je na klijanje u četiri ponavljanja po 100 semena iz svih pet vrsta pakovanja. Narednih pet godina uzimani su uzorci iz svake vrste pakovanja 4 puta po 100 semena i stavljeni na naklijavanje. Naklijavanje je vršeno u klijalištu u petri posudama na filter papiru na konstantnoj temperaturi od 200 C uz osvetljenje 12/12 časova naizmenično. Očitavanje ukupne klijavosti vršeno je nakon 21 dan. Na osnovu analize varijanse utvrđene su veoma značajne ($p \leq 1\%$) razlike ukupne klijavosti semena Nigele u zavisnosti od vrste pakovanja, dužine čuvanja semena i interakcije ova dva faktora. Najveću prosečnu ukupnu klijavost (78.4%) imalo je seme čuvano u papirnim kesama, a najmanju (63.1%) seme čuvano u metalnoj kutiji. Između semena čuvanog u platnenoj vreći semena čuvanog u drvenoj kutiji nije bilo statistički značajnih razlika ukupne klijavosti (75.5% i 74.5%). Ukupna klijavost semena čuvanog u staklenoj posudi (69.2%) i drvenoj kutiji (74.5%) bila je veoma značajno veća od ukupne klijavosti semena čuvanog u metalnoj kutiji (63.1%) i veoma značajno manja od ukupne klijavosti semena čuvanog u papirnoj kesi (78.4%) i platnenoj vreći (75.2%). Najveću prosečnu vrednost ukupne klijavosti seme Nigele imalo je u prvoj (92.6%) i drugoj godini (89.9%) čuvanja. Što je period čuvanja semena bio duži ukupna klijavost je bila manja. Od treće do pete godine ukupna klijavost semena bila je: 79.7%, 56.1% i 32.6%. Ukupna klijavost semena koje je mesec dana nakon žetve ispitivano bila je 82.2%. Najveću ukupnu klijavost imalo je seme staro jednu godinu čuvano u papirnoj kesi (97.5%), a najmanju seme iz staro pet godina čuvano u metalnoj kutiji.

Ključne riječi: nigela; seme; ukupna klijavost; pakovanje; starost semena.

**EFFECT OF CROP ROTATION AND FERTILISATION ON MAIZE YIELD AND
YIELD STABILITY IN A LONG-TERM EXPERIMENT**

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The objective of this study was to access cropping technology adaptation of the maize growing in a long-term experiment located at the experimental field of the Institute of Field and Vegetable Crops in Novi Sad. The study treatments involved different cropping systems with different share of maize in rotation for 1991–2010 period. To evaluate interaction year by treatment two-way analyses was applied. For comparing selected cropping systems versus agro-ecological conditions stability and relative stability analyses were performed. To estimate an environmental contribution in a yield formation 3 periods were considered: hydrological year (X–IX), vegetative period (IV–IX) and critical period (VI–VII) by using rainfall and temperature data. Two-way analyses of variance for maize grain yield resulted in differences between treatments, while significantly higher yield was observed at the 3-year crop rotation (6854 kg ha⁻¹) and lower at the unfertilized 2-year rotation (2267 kg ha⁻¹). Stability analyses ($p < 0.05$) showed significant response when linear regression was applied with 2-year ($r = 0.94^{**}$) and 3-year ($r = 0.92^{**}$) maize rotation. Relative stability showed that higher yield response to favorable agro-ecological conditions would be with maize monoculture ($r = 0.76^{**}$) and 2-year rotation (0.53^{**}). Maize monoculture significant affected by climatic variation over the investigated period and 2-year rotation showed positive maize reaction to preceding winter wheat. The maize rotation without fertilization had lower and relatively unstable yield. The results demonstrated that climatic conditions could play a major role in effectiveness of maize cropping systems, yield formation and sustainability of maize growing in the future.

Keywords: maize; crop rotation; fertilisation; yield; yield stability.

**PRODUCTION TRAITS OF FABA BEAN VARIETIES (*VICIA FABA L.*) IN THE
BANJA LUKA REGION**

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Faba bean has a significant place among the annual legumes grown in the world. It is used for the production of silage, green fodder and seed. Cultivation of faba bean as animal feed in Republic of Srpska is negligible, while faba bean for human consumption can be found sporadically mostly in eastern Herzegovina. In the four-year experiment, 13 varieties of faba bean were analyzed in the Banja Luka region. The aim of the experiment was to investigate the faba bean yield and adaptability of the cultivars in this region. Phenological phases of faba bean cultivars in agroecological conditions of Banja Luka region are monitored. From morphological characteristics were measured plant height, number of plants per unit area and the number of pods per plant. Grain yield ranged from 1 t ha^{-1} to 8.4 t ha^{-1} , depending on the variety. Observed faba bean cultivars showed different adaptability to agro-ecological conditions in the Banja Luka region. The results indicate that faba bean is important annual forage legume under-represented in the sowing structure. Due to a number of favorable characteristics, greater representation of faba bean on our arable land is recommended.

Keywords: faba bean, grain yield, agroecological conditions

**PROIZVODNE OSOBINE SORATA KRMNOG BOBA (VICIA FABA L.) U
BANJALUČKOJ REGIJI**

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Krmni bob zauzima značajno mjesto među gajenim jednogodišnjim leguminozama u svijetu. Koristi se za proizvodnju silaže, zelenu krmu i kao koncentrovano hraniwo. Krmni bob se vrlo malo gaji u Republici Srpskoj, dok se baštenski bob može sporadično naći većinom u području Istočne Hercegovine. U četvorogodišnjem ogledu ispitivan je prinos 13 sorata krmnog boba u banjalučkoj regiji. Cilj ogleda bio je da se ispita prinos zrna krmnog boba kao i adaptibilnost ispitivanih sorata u ovoj regiji. Praćene su fenološke faze sorata krmnog boba u agroekološkim uslovima banjalučke regije. Od morfoloških osobina mjerene su visine biljaka, broj biljaka po jedinici površine i broj mahuna po biljci. Prinos zrna se kretao od 1 t ha⁻¹ do 8,4 t ha⁻¹ u zavisnosti od sorte. Posmatrane sorte krmnog boba pokazivale su različitu adaptibilnost na agroekološke uslove u Banjalučkoj regiji. Rezultati ispitivanja ukazuju da je krmni bob značajna jednogodišnja krmna leguminoza malo zastupljena u sjetvenoj strukturi. S obzirom na niz povoljnih karakteristika, preporučuje se veća zastupljenost krmnog boba na našim oraničnim površinama.

Ključne riječi: krmni bob, prinos zrna, agroekološki uslovi

**FORAGE YIELD AND QUALITY OF THE NOVI SAD CULTIVARS OF PEA
(PISUM SATIVUM) AND VETCHES (VICIA SPP.)**

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Since its establishment in 1938, the Institute of Field and Vegetable Crops has carried out a programme of breeding annual forage legumes, with pea (*Pisum sativum* L.) and vetches (*Vicia* spp.) as the most important. So far, from 1977 to 2012, in Novi Sad, there has been developed and registered eleven forage pea cultivars in Serbia, namely (autumn-sown) NS Dunav, NS Pionir, Pionir, Kosmaj, Cer, Pešter and NS Krmni and (spring-sown) NS Lim, NS Junior, Trezor and Jantar. Also, from 1967 to 2012, in Novi Sad, there has been developed and registered eleven common vetch cultivars in Serbia, namely (autumn-sown) Novosadska 624, NS Sirmium, Neoplanta, Tara, Morava and NS Tisa and (spring-sown) Novosadska 5590, Beograd, Novi Beograd, Perla and NS Zlatozrna. In addition, there are two Hungarian vetch (*Vicia pannonica* Crantz) cultivars, NS Panonika and Panonka, two hairy vetch (*Vicia villosa* Roth) cultivars, NS Violeta and NS Viloza, and one bitter vetch (*Vicia ervilia* (L.) Willd.) cultivar, Perper. Both autumn-sown and spring-sown cultivars of forage pea and vetches play an important role in many contemporary cropping systems. They easily fit into various cropping rotations, produce a considerable amount of aboveground biomass and enrich the soil for the succeeding crop. Pionir is currently the most widely commercialised Novi Sad forage pea cultivar, with a potential for up to 50 t ha⁻¹ of fresh forage, 10 t ha⁻¹ of forage dry matter and about 20% of crude protein content in forage dry matter. Neoplanta is the most popular among common vetch cultivars, with a potential for up to 45 t ha⁻¹ of fresh forage, 9 t ha⁻¹ of forage dry matter and about 22% of crude protein content in forage dry matter. Hungarian, hairy and bitter vetches may be more significant for cultivating in less favourable environments where often show a better agronomic performance than pea and common vetch.

**AIR TEMPERATURE IN VERTICAL PROFILE OF WINTER WHEAT CANOPY
DURING THREE DIFFERENT YEARS**

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Air temperature was monitored in wheat canopy in Žabčice (Czech Republic) during the main growth season in 2010, 2011 and 2012 years. Automatic sensors were positioned at three levels (on the ground, at the effective height and at 2 meters above the ground). According to crop developmental stage period was divided to three parts. Air temperature in vertical profile of canopy differed significantly in dependence on year, wheat developmental stage and time of day. The differences in vertical stratification of air temperature were pronounced especially during the light part of the day. In this time the temperature in ground part of canopy was significantly lower in the 2010 and 2011. The maximum difference (-6°C) was found in the stage of stem elongation to end of flowering in the year 2011, the minimum difference (-2°C) were measured in the stage of tillering to beginning of stem elongation in the same year. The course of temperatures in vertical profile of winter wheat canopy differed in year 2012, significantly. This year was very dry and the growth of winter wheat was very poor, plants were short and the canopy spare. The temperatures in ground part were higher (+3°C) both in tillering to beginning of stem elongation and ripening stages. These results can be used in growing models and in making more accurate prediction models of pathogens and pest occurrence on winter wheat.

Keywords: microclimate; air temperature; winter wheat; canopy

**CONTRIBUTION OF ASS. LOLIO-PLANTAGINETUM MAJORIS BERGER,
1930. TO MELLIFEROUS POTENTIAL OF ALFALFA CROP (MEDICAGO
SATIVA L.)**

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The floristic-phytocoenological investigation of the alfalfa crop was conducted to determine melliferous species and to assess their importance in improving alfalfa bee pasture. The study of apiflora included the analysis of the abundance, degree of constancy, intensity of pollen and nectar production and the percentage of melliferous species. Based on the floristic-phytocoenological study, 84 plant species were identified in the association *Lolio-Plantaginetum majoris Berger, 1930*. Of the total number of identified species, 65 were melliferous ones, making 77.4%. The most plants are members of the family Asteraceae (16). Plant species, contributing the most to melliferous potential of this community, and which are characterized by a great abundance, high degree of constancy and high intensity pollen and/or nectar production are: *Cirsium arvense*, *Taraxacum officinale* and *Trifolium repens*. However, it is considerably larger number of species whose contribution to the bee pasture was negligible, whether due to the low pollen and nectar production (*Verbena officinalis*, *Veronica persica*, *Crepis setosa*, *Pastinaca sativa*) or because of the low abundance and low degree of constancy (*Trifolium pratense*, *Lythrum salicaria*, *Lotus corniculatus*, *Helianthus tuberosus*, *Carduus acanthoides*, *Tussilago farfara*, *Stachys annua*). Furthermore, 15 anemophilous nectarless species of the family Poaceae, Cyperaceae, Chenopodiaceae, Plantaginaceae, Amaranthaceae and some Polygonaceae are present in the investigated community. These plants, that do not produce nectar, are either completely unattractive or may in certain circumstances be a good source of pollen for honey bees (*Rumex crispus*, *R. obtusifolius*, *Plantago major* i *P. lanceolata*). Apiflora of the ass. *Lolio-Plantaginetum majoris* has no great contribution to the overall melliferous potential of the alfalfa crop because of the relatively small abundance of cenobionts that are insufficiently attractive to honey bees during mass flowering of alfalfa.

Keywords: apiflora; melliferous potential; nectar production; pollen production; alfalfa crop

**DOPRINOS ZAJEDNICE LOLIO-PLANTAGINETUM MAJORIS BERGER, 1930.
MEDONOSNOM POTENCIJALU USEVA LUCERKE (MEDICAGO SATIVA L.)**

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Istraživanje je obuhvatilo florističko-fitocenološku analizu useva lucerke (*Medicago sativa L.*), da bi se izdvojile medonosne biljke i procenio njihov značaj u poboljšanju lucerišta kao pčelinje paše. Proučavanje apiflore obuhvatilo je analizu brojnosti, stepena prisutnosti, intenziteta polenske i nektarske produkcije i procenta medonosnih biljaka. Florističko-fitocenološkom analizom useva lucerke izdvojena je zajednica *Lolio-Plantaginetum majoris Berger, 1930.*, u kojoj su zabeležene 84 vrste od kojih su 65 (77.4%) medonosne. Medonosnim vrstama najbogatija je familija Asteraceae (16). Medonosnosti ove zajednice najviše doprinose vrste koje se odlikuju istovremeno velikom brojnošću, visokim stepenom prisutnosti i visokim intenzitetom polenske i nektarske produkcije: *Cirsium arvense*, *Taraxacum officinale* i *Trifolium repens*. Međutim, znatno je veći broj vrsta čiji je doprinos u pčelinjoj paši neznatan, bilo zbog slabe polenske i nektarske produkcije (*Verbena officinalis*, *Veronica persica*, *Crepis setosa*, *Pastinaca sativa*) ili zato što se odlikuju niskom brojnošću i niskim stepenom prisutnosti (*Trifolium pratense*, *Lythrum salicaria*, *Lotus corniculatus*, *Helianthus tuberosus*, *Carduus acanthoides*, *Tussilago farfara* i *Stachys annua*). U ispitivanoj zajednici prisutno je i 15 anemofilnih vrsta iz familija Poaceae i Cyperaceae, Chenopodiaceae, Plantaginaceae, Amaranthaceae i neke Polygonaceae, koje ne proizvode nectar. Ove vrste su ili u potpunosti neutraktivne ili pojedine mogu u izvesnim okolnostima da budu dobar izvor polena za medonosnu pčelu (*Rumex crispus*, *R. obtusifolius*, *Plantago major* i *P. lanceolata*). Apflora zajednice *Lolio-Plantaginetum majoris* nema veliki doprinos u ukupnom medonosnom potencijala lucerišta zbog relativno male brojnosti cenobionata i njihove nedovoljne atraktivnosti za pčelu u vreme masovnog cvetanja lucerke.

Ključne reči: apiflora; medonosni potencijal; nektarska produkcija; polenska produkcija; usev lucerke

EFFECT OF LIMING ON GRAIN YIELD OF FIELD PEA

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Growing field pea for grain and forage is an integral part of livestock development strategy, due to the importance of field pea as a good source of protein in improving milk and meat production. This specifically relates to livestock farmers in Central Serbia who experience problems in alfalfa production. Moreover, field pea as a legume plays an important role in the crop rotation system, where it is used as an excellent preceding crop. The frequent occurrence of drought in arid years and, hence, dryland farming, necessitate alternation of crops, along with the use of other cultural practices, in an effort to reduce the effect of water deficiency during the growing season. Under non-irrigated conditions, grain yield of spring pea cvs. NS-Junior and Javor was evaluated in 2011 and 2012 on acid soil subjected to amendments. A field trial was established in Čačak ($43^{\circ}54'39.06''$ N, $20^{\circ}19'10.21''$ E, 246m a.s.l.) on alluvial soil acid in reaction (pH_{H2O} 4.8), having 3.18% organic matter, 0% CaCO₃, 22.08 mg P₂O₅, and 30.0 mg K₂O 100 g⁻¹ soil. The experimental field was fertilized with 300 kg ha⁻¹ N15P15K15. The treatments applied included the control and liming at rates of 3t ha⁻¹ and 6t ha⁻¹. The experiment was laid out in a randomized complete block design with four replications and a plot size of 5m² (1x5m). In 2011, cvs. NS-Junior and Javor produced an average yield of 2.54 t ha⁻¹ and 2.78 t ha⁻¹, respectively. No statistically significant differences were observed between the control and liming treatment. In the rainfall-deficient year 2012, cv. Javor (1.93 t ha⁻¹) statistically significantly outyielded cv. NS-Junior (1.19 t ha⁻¹). In the second year of this research, both liming rates were found to have a highly significant effect on grain yield in cv. NS-Junior, as compared to the control. In both years, the grain yield obtained was significantly below the genetic potential of the cultivars tested, mostly due to deficient rainfall and severe soil and air drought.

Keywords: pea, grain, lime, yield

**UTICAJ AGREKOLOŠKIH USLOVA I ĐUBRENJA KREČOM NA PRINOS ZRNA
STOČNOG GRAŠKA**

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Gajenje stočnog graška u cilju dobijanja zrna i krme je deo strategije razvoja stočarske proizvodnje, jer kao dobar izvor proteina povećava produkciju mleka i mesa. Osim toga, kao leguminozna biljka, krmni grašak ima i važno mesto u plodoredu njivskih biljaka, kao odličan predusev. U uslovima suvog ratarenja na zemljištu kisele reakcije, uz mere popravke, analiziran je prinos zrna i neki morfološki pokazatelji jarih sorti graška NS-Junior i Javor u 2011. i 2012. godini. Pre setve je izvršeno i đubrenje sa 3t/ha i 6t/ha kreča, sa ciljem podizanja pH vrednosti zemljišta. U 2011. godini prosečan prinos sorte NS-Junior je bio 2,54 t/ha, a sorte Javor 2,78 t/ha. Razlike između kontrolne varijante i useva gde je primenjen kreč, nisu bile statistički značajne. U 2012. godini, praćenoj velikim nedostatkom padavina, sorta Javor (1,93 t/ha) bila je statistički značajno prinosnija u odnosu na sortu NS-Junior (1,19 t/ha). U drugoj godini proučavanja utvrđen je i visoko značajan uticaj obe doze kreča na povećanje prinosa kod sorte Junior. U obe godine ostvareni prinos zrna, bio je značajno ispod genetskog potencijala gajenih sorti, što je najvećim delom posledica manjka padavina i izrazite zemljišne i vazdušne suše.

Ključne reči: grašak, zrno, prinos

**EFFECT OF DROUGHT ON QUINOA GRAIN YIELD (CHENOPODIUM QUINOA
WILLD.)**

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Application of alternative cereals in nutrition requires introduction of new plant species in agricultural production, such as quinoa, amaranthus, etc. Quinoa (*Chenopodium quinoa* Willd.) is cultivated for its grain, which has similar nutrition value like cereal grain, but it's gluten free. In 2010, 2011. and in 2012. we performed experiments with introduced species of quinoa. Experiments were conducted on location in Nova Pazova on the calcareous chernozem using two genotypes (KVL 52 and KVL 37). Sowing was done in April and harvest in August. The average air temperature during the growing season (April-September) rose from the first to the third year of experiments, and rainfall were significantly decreased. In 2010. the yield was 1360 kg/ha, and in 2011. it amounted 1467 kg/ha. During 2012. very high temperatures (31 to 38,4 °C) lasted 70 days and drought occurred in the period June-September. This resulted in a very significant reduction in grain yield, which averaged 382 kg/ha. Variety KVL 52 had higher yield compared to the KVL 37.

Keywords: quinoa, precipitation, grain yield, drought, temperature.

UTICAJ SUŠE NA PRINOS ZRNA KVINOJE (CHENOPODIUM QUINOA WILLD.)

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Korišćenje alternativnih žita u ishrani zahteva uvođenje novih biljnih vrsta u proizvodnju kao što su kvinoja, amaranthus i druge. Kvinoja (*Chenopodium quinoa* Wild.) se gaji radi zrna, koje je po nutritivnoj vrednosti slično zrnu žita, ali ne sadrži protein gluten. Tokom 2010., 2011. i 2012. godine izvođeni su ogledi sa introdukovanim vrstom kvinoja (*Chenopodium quinoa* Willd.). Ogledi su izvedeni u Novoj Pazovi na zemljištu tipa karbonatni černozem sa dva genotipa (KVL 52 i KVL 37). Setva je obavljena u aprilu i žetva u avgustu. Prosečne temperature vazduha u periodu vegetacije (aprili-septembar) su rasle od prve prema trećoj godini izvođenja ogleda, a količine padavina su značajno opadale. U 2010. ostvaren je prinos od 1360 kg/ha, a u 2011. godini 1467 kg/ha. U 2012. godini nastupile su veoma visoke temepeperature (31-38,4°C) u trajanju od 70 dana i suša u periodu juni-septembar. Ovo je uticalo na veoma značajno smanjenje prinosa zrna, koji je u proseku iznosio 382 kg/ha. Sorta KVL 52 je bila prinosnija u odnosu na KVL 37.

Ključne reči: kvinoja, padavine, prinos zrna, suša, temperature.

**AGRONOMIC CHARACTERISTICS OF THE LATEST GENERATION OF THE
NOVI SAD CULTIVARS OF PROTEIN PEA (PISUM SATIVUM L.)**

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Although pea (*Pisum sativum* L.) is one of the most ancient crops throughout Balkan countries, in Serbia it has been used exclusively as a vegetable crop and for human consumption. Since early eighties of the last century, a programme of breeding protein pea, also known as dry pea, has been launched at the Institute of Field and Vegetable Crops. So far, from 1992 to 2011, in Novi Sad, there has been developed and registered eleven protein pea cultivars in Serbia, namely (autumn-sown) Cer and NS Mraz and (spring-sown) NS Junior, Jantar, Moravac, Jezero, Javor, Partner, Kristal, Dukat and NS Koral. All these cultivars represent an excellent supplement for soybean meal in feeding both ruminants and non-ruminants and even may replace it completely in the years with severe drought during soybean growing season. The essential progress in developing protein pea cultivars represents the introduction of several traits, such as increased proportion of mechanical tissue in the lower parts of stems, short internodes, determinate stem growth, large stipules, afila leaf type without leaflets and only with tendrils, earliness, grouped pods in the upper half of a plant, uniform maturity and smaller seeds. All this leads to a less expensive sowing, easier mechanical harvesting and significantly decreased seed losses. The latest generation of the Novi Sad protein pea cultivars, such as Partner, Kristal, Dukat and NS Koral, are characterised by improved earliness, grain yields of about 5 t ha⁻¹, a crude protein content of about 25% and a very low content of anti-nutritional factors. The Novi Sad protein breeding programme is currently aiming at a wide-scale production of the autumn-sown cultivar NS Mraz, with an extremely prominent earliness providing a mechanical harvest at least one week before autumn-sown barley, grain yield of up to 5 t ha⁻¹, a crude protein content of about 27% and also a very low content of anti-nutritional factors.

Keywords: protein pea; grain yield; Novi Sad cultivars; grain quality

**INTERCROPPING LEGUMES WITH CEREALS, BRASSICAS AND OTHER
LEGUMES FORAGE PRODUCTION**

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Intercropping is commonly regarded as a simultaneous growing of several species at one place is considered one of the most ancient cropping systems. The most traditional way of intercropping legumes is one with cereals. Throughout the Balkan countries, pea (*Pisum sativum L.*) and common vetch (*Vicia sativa L.*) are intercropped with oat (*Avena sativa*), barley (*Hordeum vulgare L.*), wheat (*Triticum aestivum L.* subsp. *aestivum*) and triticale (\times *Triticosecale spp.*). In most cases, the best quality of such mixtures when grown for forage is in the intercrops of legumes with oat, while barley is usually the most aggressive and leading to a very low crude protein content in forage dry matter. Less widely distributed way of intercropping legumes is with brassicas, such as autumn-sown fodder kale *Brassica oleracea L.* var. *viridis L.* or spring-sown white mustard (*Sinapis alba L.*). Such mixtures may produce more than 8 t ha⁻¹ of forage dry matter. The least known way of intercropping legumes is the one where they are intercropped with each other. The first form is where pea or some other annual legume is used in establishing a perennial forage legume, such as lucerne (*Medicago sativa L.*), red clover (*Trifolium pratense L.*) or sainfoin (*Onobrychis viciifolia Scop.*), where the former plays the role of a bioherbicide and contributes by yield and quality to the first cut of the latter. The second form of mutual legume intercropping is where one annual legume with good standing ability, such as faba bean (*Vicia faba L.*) or white lupin (*Lupinus albus L.*), are supporting crops, while those with prominent lodging susceptibility, such as pea, common vetch or grass pea (*Lathyrus sativus L.*), are supported crops, resulting in a better utilisation of natural resources, efficient weed control and high, quality and stable forage yield.

Keywords: intercropping; legumes; cereals; brassicas; forage

**SOME QUANTITATIVE PROPERTIES OF RYE (SECALE CEREALE L.) GROWN
IN DEPOSOL**

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This paperwork reflects the three-year research results on impacts of different agricultural practices to growth and development of rye (*Secale cereale L.*). This research has been performed within the framework of biological reclamation phase of deposol in the mine Stanari. The significance of growing rye is reflected in the production of grain and total biomass. The aim of the overall research is to determine the impacts of different doses of fertilizers and agromeliorative measures to yield, seed quality and other quantitative properties of rye. A three-year research (2010, 2011 and 2012) has been performed on deposol in the process of reclamation. Deposol to be researched is located on the internal dump site for overburden from the open pit Raškovac - Stanari. Field two-factor experiment was set up according to the randomized block design with four replications. The first factor (A) represents agromeliorative measures applied before and during the sowing (liming and NPK fertilizers). The second factor involves tracking the impact of different doses of nitrogen top dressing in vegetation. Measurement and statistically analysis of plant height, seed yield and 1000 grain weight has been performed. The achieved results indicate the existence of a statistical differences occurring especially between the applied treatment with nitrogen top-dressing. The maximum measured height of rye plants was 153,67 cm and average height was 128,31 cm. Maximum seed yield was 5,53 t/ha, with the average 2,60 t/ha. The average value of 1000 seeds is 37,28 g, the maximum value of 61,92 g and 12,11 g minimum. The minimum value of plant height was 86,53 cm, and grain yield was 0,35 t/ha. The highest medium plant value and grain yield were achieved in the treatments with the highest nitrogen top dressing (N54). Medium maximum value of 1000 seeds was achieved in the treatments with a dose of 27 kg/ha N. The applied treatments, along with the environmental conditions affecting the habitat of different traits measured results. The achieved results prove that rye can be grown successfully in the process of biological reclamation of deposol, and later in potential production in the permanent conversion of land.

Keywords: reclamation; plant height; seed yield; seed quality; Stanari

**NEKE KVANTITATIVNE OSOBINE RAŽI (SECALE CEREALE L.) GAJENE NA
DEPOSOLU**

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U radu su iznijeti trogodišnji rezultati istraživanja uticaja različitih agrotehničkih mjera na rast i razvoj raži (Secale cereale L.). Ova istraživanja su provedena u okviru biološke faze rekultivacije deposola u rudniku Stanari. Značaj gajenja raži se ogleda u proizvodnji zrna i ukupne biomase. Cilj ukupnog istraživanja je utvrđivanje uticaja različitih doza mineralnih đubriva i drugih agromeliorativnih mjera na prinos, kvalitet sjemena i druge kvantitativne osobine raži. Trogodišnja istraživanja (2010, 2011 i 2012) su provedena na deposolu u postupku rekultivacije. Deposol za istraživanje je smješten na unutrašnjem odlagalištu otkrivke sa površinskog kopa Raškovac – Stanari. Poljski dvofaktorijski ogled postavljen je po metodi slučajnog blok sistema u četiri ponavljanja. Prvi faktor (A) predstavlja agromeliorativne mjere primjenjene prije sjetve i u samoj sjetvi (kalcifikacija i NPK đubriva). Drugi faktor obuhvata praćenje uticaja različitih doza prihrane azotom u vegetaciji. Izvršeno je mjerjenje i statistički obrađena visina biljaka, prinos sjemena i masa 1000 zrna. Dobijeni rezultati ispitivanja ukazuju na postojanje statističkih razlika naročito između primjenjenih tretmana prihrane azotom. Maksimalna izmjerena visina biljaka raži je 153,67 cm, a prosječna 128,31 cm. Maksimalni prinos sjemena iznosi 5,53 t/ha, a prosjek 2,60 t/ha. Prosječna vrijednost mase 1000 zrna je 37,28 g, maksimalna vrijednost 61,92 g, a minimalna 12,11 g. Minimalna vrijednost visine biljaka je 86,53 cm, a prinsa zrna iznosi 0,35 t/ha. Najveće srednje vrijednosti visine biljaka i prinsa zrna ostvareni su na tretmanima sa najvećom dozom azota u prihrani (N54). Srednja maksimalna vrijednost mase 1000 zrna je na tretmanima sa dozom azota 27 kg/ha. Primjenjeni tretmani, zajedno sa agroekološkim uslovima staništa su uticali na različite rezultate mjerenih osobina. Ostvareni rezultati dokazuju da se raž uspješno može gajiti u postupku biološke rekultivacije stanarskih deposola, a i kasnije pri mogućoj proizvodnji u trajnoj prenamjeni površina.

Ključne riječi: rekultivacija; visina biljaka; prinos sjemena; kvalitet sjemena; Stanari

**EFFECT OF PLANT DENSITIES AND PLANTING TIME ON GRAIN YIELD AND
PROTEIN CONTENT OF DURUM WHEAT**

Foto Kashta , Pellumb Harizaj, Agim Canko, Nikollaq Bardhi

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Planting time and density are the major factors affecting phenological development, grain yield and wheat yield quality. The aim of this study was to evaluate the effects of planting date and plant densities on yield and yield quality of durum wheat. The experiment was laid out according to randomized complete block design with split plot arrangements and four replications. Two genotypes of durum wheat (Creso and Line 5/11-1) were planted on 5 dates from 15 October to 15 December, with 15 days intervals at 4 densities (300, 400, 500 and 600 plant / m²). The results showed that planting dates and population densities significantly affected grain yield ha-1, protein content, wet gluten, and vitreous of kernel. It was observed that wheat yields and other characters for both cultivars responded differently to planting dates and plant densities. Highest yields for 5/11-1 were recorded under 15th November and 1th December planting time, whereas for Creso the highest yields were achieved under 1th and 15th November. The optimum seeding rate was different for the two genotypes. For line L-5/11=1 the highest and lowest grain yields were obtained at densities of 500 and 300 plant/m² respectively, and for Creso at 400 and 300 plant/m² respectively. Planting time and density did not show significant effect on protein content, wet gluten and vitreous of kernel. However, highest values of these traits were obtained from lowest and highest densities when yields were the lowest, showing that these differences are influenced by those yield values.

Keywords: durum wheat, density, planting time, yield, protein, wet gluten, vitreous

**SOME MORPHOLOGICAL AND PRODUCTIVE CHARACTERISTICS OF
TRITICALE DEPENDING ON AGROCLIMATIC CONDITIONS IN THE
LOCALITY**

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Triticale is a plant species with high genetic potential for yield and favorable nutritional values, so it is considered as promising. For achieving high and stable yields, it's necessary to have favorable agroclimatic conditions of the locality, variety and advanced agricultural techniques, with a special turn to fertilizing. In this paper is given a review how agroclimatic conditions of the locality and variety influence on some morphological and productive characteristics of triticale. The experiment included two localities with different agroclimatic conditions, as well as two varieties of triticale (KG-20 and Tango). The experiment was set up as block system with three repetitions. Applied cultural operations during the triticale growing were standard, with using of NPK 80:80:60 fertilizer. Investigations were carried out in Centre for Agricultural and Technological Investigations in Zajecar and in Agricultural School in Kraljevo, during 2008/09 and 2009/10. Results of the investigation showed significant influence of the locality on plant's height, spike's length, number of grains in spike, grain's mass per spike and yield of grains in triticale. All these characteristics had higher values in locality of Zajecar than in locality of Kraljevo. Variety Tango, in both locality, had significantly higher values of the investigated parametres than variety KG-20. So, the differences in average yield, for both varieties, between the localities were 1.24 t ha⁻¹. Variety Tango, in locality of Zajecar, had about 0.9 t ha⁻¹ higher yield than variety KG-20, while in locality of Kraljevo that difference was only 1.05 t ha⁻¹ in favor of variety Tango. These differences are result of favorable climatic and soil conditions in locality of Zajecar in regard to locality of Kraljevo. These results are evidence for importance and role of agroclimatic factors and variety in expression of productive characteristics of triticale.

Keywords: triticale; morphological characteristics; productive characteristics; locality; agroclimatic conditions

**NEKE MORFOLOŠKE I PRODUKTIVNE OSOBINE TRITIKALEA U
ZAVISNOSTI OD AGROKLIMATSKIH USLOVA LOKALITETA**

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Tritikale je biljna vrsta sa visokim genetskim potencijalom za prinos i povoljnim nutritivnim vrednostima pa se smatra perspektivnom biljnom vrstom. Za postizanje visokih i stabilnih prinosa neophodni su povoljni agroklimatski uslovi područja, sortiment i agrotehnika sa posebnim osvrtom na đubrenje. U radu je dat prikaz uticaja agroklimatskih uslova lokaliteta i sorte na neke morfološke i produktivne osobine tritikalea. Ogled je obuhvatao dva lokaliteta, koja su se razlikovala po agroklimatskim osobinama, i dve sorte tritikalea (KG-20 i Tango). Ogled je postavljen po blok sistemu u tri ponavljanja. Primenjena agrotehnika u proizvodnji tritikalea je bila standardna, sa primenom NPK đubriva kombinacije 80:80:60. Ispitivanja su izvedena u Centru za poljoprivredna i tehnološka istraživanja u Zaječaru i na imanju Poljoprivredne škole u Kraljevu, tokom 2008/09 i 2009/10 godine. Rezultati ispitivanja su pokazali značajan uticaj lokaliteta na visinu biljaka, dužinu klasa, broj zrna u klasu, masu zrna po klasu i prinos zrna tritikalea. Sve navedene osobine su bile veće na lokalitetu Zaječara nego na lokalitetu Kraljeva. Sorta Tango je, na obe lokalitete, imala sve značajno veće ispitivane parametre nego sorta Kg-20. Tako su razlike u prosečnom prinosu za obe sorte, između lokaliteta, iznosile 1.24 t ha-1. Sorta Tango je na lokalitetu Zaječar imala za 0.9 t ha-1 veći prinos nego sorta KG-20, dok je na lokalitetu Kraljeva ta razlika iznosila 1.05 t ha-1 u korist sorte Tango. Ove razlike su rezultat povoljnijih klimatskih i zemljišnih uslova na lokalitetu Zaječara u odnosu na lokalitet Kraljeva. Ovi rezultati su dokaz značaja i uloge agroklimatskih faktora i sorte u ispoljavanju produktivnih osobina tritikalea.

Ključne riječi: tritikale; morfološke osobine; produktivne osobine; lokalitet; agroklimatski uslovi.

PRESENCE AND ABUNDANCE OF INSECTS IN WHEAT CROP

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In the wheat crop that was grown using standard agricultural practices, were collected samples of insects in order to identify their presence and abundance. The research was conducted at two sites Banja Luka region (Trapisti and Aleksandrovac). Towards the end of stem elongation of wheat insects were collected using a insect sweep net and after wheat heading was used method shaking down of insects from spikes. The samples were collected every 10 days, and from each site were taken 4 samples. During the research were monitored meteorological parameters (rainfall and mean daily temperature). Identification showed the presence of the 14 categories of insects: *Lema melanopus* L., *Holotrips tritici* Kurd, *Aphididae*, *Tetigonidae*, *Oscinella frit* L., *Eurygaster* spp., *Aelia* spp., *Tipulidae*, *Cephus pygmaeus* L, *Nitidulidae*, *Formicidae*, *Acrididae*, *Tetrigidae*, *Coccinellidae*. From the previously mentioned insects at the site Trapisti not found *Tetigonidae* family, and at the site Aleksandrovac was not found the presence of the family *Formicidae*. The other insects have appeared on both sites. According to the total number of specimens collected during research on the site Trapisti leading *Aphididae* (total of 278 specimens collected), *Holotrips tritici* (34) and *Lemma melanophus* (23), and at the site Aleksandrovac were most numerous *Aphididae* (205), *Lemma melanophus* (50) and *Aelia* spp. (20). The abundance of other insects ranged from 1 to 19 specimens. During the research period precipitation and mean monthly temperatures were well above multiannual average. However applied standard agro-technical measures were sufficient to maintain the average abundance of all the identified insects below economic threshold during the entire research period.

Keywords: presence and abundance of insects, wheat, stem elongation, heading

PRAĆENJE PRISUSTVA I BROJNOSTI INSEKATA U USJEVU PŠENICE

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U usjevu pšenice gajene uz primjenu standardnih agrotehničkih mjera, izvršeno je prikupljanje uzoraka insekata u cilju utvrđivanja njihovog prisustva, identifikacije i brojnosti. Istraživanje je vršeno na dva lokaliteta banjalučke regije (Trapisti i Aleksandrovac). U fenofazama kraj vlatanja i početak klasanja primjenjena je metoda entomološke mreže (kečera), a u fenofazama nakon klasanja metoda otresanja sa klasova. Uzorkovanje je vršeno svakih 10 dana, pri čemu su sa svakog lokaliteta uzimana 4 uzorka. Tokom istraživanja praćeni su meteorološki parametri (količina padavina i srednje dnevne temperature). Nakon identifikacije ustanovljeno je prisustvo 14 kategorija insekata: *Lema melanopus* L., *Holotrips tritici* Kurd, *Aphididae*, *Tetigonidae*, *Oscinella frit* L., *Eurygaster spp.*, *Aelia spp.*, *Tipulidae*, *Cephus pygmaeus* L, *Nitidulidae*, *Formicidae*, *Acrididae*, *Tetrigidae*, *Coccinellidae*. Od navedenih insekata na lokalitetu Trapisti nije ustanovljeno prisustvo familije *Tetigonidae*, a na lokalitetu Aleksandrovac nije ustanovljeno prisustvo familije *Formicidae*, a ostali insekti pojavljivali su se na oba lokaliteta. Prema ukupnoj brojnosti svih jedinki prikupljenih tokom istraživanja na lokalitetu Trapisti prednjače *Aphididae* (prikupljeno ukupno 278 jedinki), *Holotrips tritici* (34) i *Lema melanophus* (23), a na lokalitetu Aleksandrovac najbrojniji su *Aphididae* (205), *Lema melanophus* (50) i *Aelia spp.* (20). Brojnost ostalih insekata kretala se od 1 do 19 jedinki. Tokom perioda istraživanja količine padavina i srednje mjesečne temperature su bile daleko iznad višegodišnjeg prosjeka za ispitivano područje. Ipak primjenjene standardne agrotehničke mjere su bile dovoljne da, tokom cijelokupnog perioda ispitivanja, zadrže prosječnu brojnost svih identifikovanih insekata ispod ekonomskog praga štetnosti.

Ključne riječi: prisustvo i brojnost insekata, pšenica, vlatanje, klasanje

**THE EFFECTS OF MICROBIOLOGICAL FERTILIZERS AND SOIL
CONDITIONERS ON GRAIN YIELD SPELT (TRITICUM AESTIVUM SSP
SPELTA)**

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The paper examined the impact of organic farming technology on grain yield spelt (*Triticum aestivum* spp. *spelta*) at locations in the mountains Zlatar. In mountainous conditions at over 1000 m above sea level research conducted microbiological effects of different fertilizers (Uniker and Slavol) and soil conditioners (hydrogel and zeolite) to yield of spelt in organic farming systems. Organic farming technologies included conventional tillage, microbiological fertilization without chemical crop protection. Soil conditioners and fertilizers Uniker microbiological, and combinations thereof are applied by treating the soil just before sowing of spelt (cultivar Nirvana). Microbiological fertilizer (Slavol) was applied in top-dressing. Applying soil conditioners alone or in combination with microbiological fertilizers, both in primary applications, as well as top dressing obtained higher yields of grain spelt. The highest yield of grain was achieved with included soil conditioners (zeolit - 5,39 t ha⁻¹), and the lowest in control (3.23 t ha⁻¹). The best combination of microbiological fertilizers and soil conditioners in organic farming system was uniker + zeolite and slavol in top-dressing, which is spelt, the yield of grain (5.76 t ha⁻¹).

Keywords: spelt, organic farming, fertilizer, grain yield.

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THE RESULTS OF TESTING THE HARVESTING DEVICE WORK QUALITY OF THE COMBINES IN HARVESTING OF RYE AND TRITICALE

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One of the main characteristics of combine harvesters is to harvest out crops in one pass, while collecting grains from the field and separating from impurities and straw (material other than grain - MOG), which are being taken back to the field, while the quality of the work varies. The content of impurities, a plain and broken kernels, is not desirable in seed neither in the mercantile grains using in further processing, because it significantly complicates cleaning and storing of grains, and significantly reducing the quality of the product and its market value. Harvesting device of combines with the traditional scheme of threshing TTO (drum cross-transversal, grain mass flow goes tangentially and straw-shakers oscillatory separate grains), is limiting factor in the combines work, with increasing speed increases the flow of grain mass, increasing losses and impurities in the mass after harvest. The quality of the work is influenced by numerous factors: moisture content, grain-straw ratio, yield levels, compliance of the peripheral speed of underdrum-drum and its spacing, setting sieves, fan speed, mode of working speed. In cases where these parameters are not properly aligned, performance is significantly distorted, so that a high content of impurities in harvested mass. This paper presents the results of exploitation research of the working quality of harvesting devices of combines ZMAJ 133 and CLAAS D48 in harvesting of rye and triticale in agroecological conditions of Kosovo and Metohia. The objective of our study was to determine the quality of the separation devices of the combines, the contents of the whole healthy, broken, a plain grains and other impurities. Quality threshed mass was determined by taking samples of threshed mass from the combine's bunker, and percentage of healthy, full, broken kernels and impurities have been determined later in the laboratory. It has been applied standard methodology, which refers to the field and laboratory testing, as well as exploitation testing of the combines. Based on these results, it was concluded higher quality work of the threshing device CLAAS D48 in relation to the harvester ZMAJ 133. In the harvested mass at the combine CLAAS D48, it has been measured the highest content of the whole grains and the average was 95.27%, the lowest has been measured in the combine ZMAJ 133 to 93.44%. The contents of broken grains varied in the range of 2.67% (CLAAS) to 3.84% (ZMAJ 133).

Keywords: Combine; quality; threshing device; cleaning; rye; triticale.

**REZULTATI ISPITIVANJA KVALITETA RADA VRŠEĆIH UREĐAJA
KOMB AJNA ŽETVI RAŽI I TRITIKALEA**

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Jedna od osnovnih karakteristika žitnih kombajna je da žetu žitarica obavljaju u jednom prohodu, pri čemu sakupljaju žitarice sa polja i odvajaju od slame i primesa (materijal other than grain – MOG), koje se istresaju natrag na parcelu, pri čemu je kvalitet rada različit. Sadržaj primesa, polomljenog i štrog zrna, nije poželjan kako u semenskom tako i u merkantilnom zrnu za preradu, imajući u vidu da značajno otežava čišćenje i čuvanje zrna, uz značajno smanjenje kvaliteta dobijenog proizvoda i tržišne vrednosti. Vršeći uređaj kombajna sa tradicionalnom šemom vršidbe TTO (bubanj poprečno-transferzalno, protok žitne mase ide tangencijalno, a slamotresi oscilacijama izdvajaju zrno), predstavljaju limitirajući faktor u radu kombajna jer se sa povećanjem brzine kretanja povećava protok žitne mase, povećavaju se gubici i sadržaj nečistoća u ovršenoj masi kombajna. Na kvalitet rada utiče veliki broj faktora: vlažnost zrna, odnos zrno-slama, visina prinosa, usklađenost periferne brzine bubenja sa razmakom podbubanj-bubanj, podešenost sita, broj obrtaja ventilatora, režim radne brzine. U slučajevima kada navedeni parametri nisu pravilno usklađeno, kvalitet rada se u značajnoj meri narušava, tako da se dobija visok sadržaj primesa u ovršenoj masi. U radu su prikazani rezultati eksplotacionih ispitivanja kvaliteta rada vršećeg uređaja dva različita kombajna (ZMAJ 133 i CLAAS D48) pri žetvi raži i tritikale u agroekološkim uslovima severnog Kosova i Metohije. Cilj naših istraživanja je bio da se utvrdi kvalitet rada separacionih organa kombajna kroz sadržaj celog zdravog, polomljenog, štrog zrna i ostalih primesa. Kvalitet ovrštene mase je određivan uzimanjem uzorka ovrštene mase iz bunkera kombajna, a procentualni sadržaj zdravog-celog, polomljenog zrna i primesa utvrđen je kasnije u laboratorijskim uslovima. Primena metodika je standardna, a odnosi se na poljsko-laboratorijska i eksplotaciona ispitivanja kombajna za ubiranje zrna. Na osnovu dobijenih rezultata zaključeno je da je vršeći uređaj kombajna CLAAS D48 kvalitetnije radio u odnosu na kombajn ZMAJ 133. U ovršenoj masi kombajna CLAAS D48 izmeren je najveći sadržaj celog zrna i iznosio je prosečno 95,27%, a najmanji kod kombajna ZMAJ 133- 93,44%. Sadržaj polomljenog zrna je varirao u rasponu od 2,67% (kombajn CLAAS) pa do 3,84% (kombajn ZMAJ 133).

Ključne riječi: Kombajn; kvalitet; vršeći uređaj; čišćenje; raž; tritikale

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