6TH INTERNATIONAL SYMPOSIUM ON AGRICULTURAL SCIENCES

AGRORES 2017

BOOK OF ABSTRACTS

February 27 - March 2, 2017
Banja Luka, Republic of Srpska, Bosnia and Herzegovina

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February 27 – March 2, 2017; Banja Luka, Bosnia and Herzegovina

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ORGANIZERS

University of Banja Luka
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SYMPOSIUM PROGRAM

	Monday, February 27th, 2017
	Academy of Sciences and Arts of Republic of Srpska

11:00 - 13:00	Registration of participants
12:45 - 13:45	Welcome Cocktail Press conference
13:45 - 14:30	Opening ceremony Welcome speeches of organizers and sponsors: Milan Mataruga, PhD, Rector, University of Banja Luka Nataša Poklar Ulrih, PhD, Biotechnical Faculty, University of Ljubljana Nedeljko Tica, PhD, Dean, Faculty of Agriculture, University of Novi Sad Mladen Todorović, PhD, Mediterranean Agronomic Institute of Bari Welcome speech of Mayor of Banja Luka, Igor Radojičić, MSc Welcome speechof Minister of Agriculture, Forestry andWater Management of Republic of Srpska, Stevo Mirjanić, PhD Welcome speechof Minister of Science and Technology of Republic of Srpska, Jasmin Komić, PhD
	Plenary Lectures Working Committee: Gordana Đurić, William Meyers, Vesna Gantner
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14:50 - 15:10 [P2]	Vesna Gantner; J.J. Strossmayer University of Osijek, Faculty of Agriculture, Osijek, Croatia *The future of cattle breeding in light of climate change*
15:10 - 15:30 [P3]	Mladen Todorović; IAM, Bari, Italy *Climate change, water and agriculture: challenges for the future*
15:30 - 15:50 [P4]	Gordana Đurić; University of Banja Luka, Institute for Genetic Resources, Banja Luka, Bosnia and Herzegovina *Genetic resources in the Republic of Srpska and BiH - current state and proposal for the regulation*
15:50 - 16:10 [P5]	Marina Mačukanović Jocić, Zora Dajić Stevanović, Mića Mladenović; University of Belgrade, Faculty of Agriculture, Belgrade, Serbia *Biotechnology achievements in quality assurance of honey in the Balkans*
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16:45 - 18:45	Round Table *Quality certified products – An effective tool for rural development and Sustainable Agriculture*, moderator: Eligio Malusa Introductory speeches:

	Carmelo Sigliuzzo; NSF, Italy *Voluntary certification to promote quality products for internal and international markets*	Eligio Malusa; CREA, Italy, InHort, Poland *Technical standards and marketing strategies for quality products – experiences from Italy and Poland*

	TUESDAY, February 28th, 2017
	Faculty of Agriculture

08:30 - 13:00	Registration of participants

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10:00 - 10:15 [HO5]	Z. Jovović, D. Baričevič, N. Pržulj, A. Govedarica Lučić, A.Velimirović EFFICIENCY OF NOWEL LIQUID ORGANIC FERTILIZER “CHAP LIQUID” IN IMMORTELLE (*Helichrysum italicum* L.) SEEDLINGS PRODUCTION	
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13:45- 15:00	Lunch	
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11:00 - 12:00	Discussion on Presentations and General Discussion
13:45 - 15:00	Lunch
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	WEDNESDAY, March 1st, 2017
	Faculty of Agriculture

08:30 - 13:00	Registration of participants

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09:30 - 09:45 [AERDO3]	B. Mutavdžić, Lj. Drinić, T. Novaković, Ž. Vaško, N. Novković THE COMPARATIVE ANALISYS OF GRAIN PRICES IN SERBIA AND THE REPUBLIC OF SRPSKA	
09:45 - 10:00 [AERDO4]	V. Zarić, A. Ostojić, B. Rajković, M. Urošević TRANSACTION COSTS OF FRESH APPLE TRADE BETWEEN REPUBLIC OF SERBIA AND BOSNIA AND HERZEGOVINA	
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13:30 - 15:00	Lunch	
15:00 - 18:00	22nd Conference of Agricultural Engineers of Republic of Srpska Room 39, 1st Floor	

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20:00	Social Dinner	Restaurant "*Slobodni um*"

	SECTION: SUSTAINABLE MANAGEMENT OF NATURAL RESOURCES	Room 39, 1st Floor
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11:30 - 11:45 [SMNRO7]	M. Brankov, M. Simić, V. Dragičević, B. Kresović HERBICIDE SELECTIVITY TO MAIZE INBRED LINES AND POSSIBILITY OF COMBINED APPLICATION OF HERBICIDE AND FOLIAR FERTILIZER IN MAIZE SEED CROP
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13:30 - 15:00	Lunch
15:00 - 18:00	22nd Conference of Agricultural Engineers of Republic of Srpska Room 39
18:00 - 19:00	General Discussion and Conclusions Closing of the Symposium Room 5, Ground Floor
20:00	Social Dinner Restaurant "Slobodni um"

	THURSDAY, March 2nd, 2017

09:00 - 17:30	**Technical Tour*** Banja Luka – Trebovljani – Jablanica – Klekovci – Gradiška – Banja Luka *more info on web-site: *http://www.agrores.org/?page_id=2210*

PLENARY LECTURES

P1

MEASURING THE SIZE OF THE DUTCH BIO-ECONOMY

Wim Heijman, Thijs Schepman

Wageningen University, Dept. of Social Sciences, Agricultural Economics and Policy Group

This paper estimates the size of the Dutch Bio-Economy, based on its value added. Using consolidated input-output tables, the size of the Dutch Bio-Economy is estimated for the period 2008-2015 and future predictions are made for the period 2016-2020. During the period 2008-2015, the Dutch Bio-Economy has grown from 5.5% of the total Dutch value added in 2008 up to 6.6% in 2015. For future prediction, five scenarios are analysed, with projected growth of the Bio-Economy ranging from 6.87% of total value added on the low end to 8.48% on the high end in 2020.

Keywords: bio-economy, input output table, scenario's.

P2

THE FUTURE OF CATTLE BREEDING IN LIGHT OF CLIMATE CHANGE

Vesna Gantner[1], Maja Gregić[1], Božo Važić[2]

[1]*University of J.J. Strossmayer in Osijek, Faculty of Agriculture, Osijek, Croatia*
[2]*University of Banja Luka, Faculty of Agriculture, Banja Luka, Bosnia and Herzegovina*

Forecasts indicate that the world population will increase from current 7.2 billion to 9.6 billion till 2050. The combination of population growth, growing incomes and urbanization imposed enormous challenges on food and agriculture systems. On the other hand, the natural resources necessary to support global food and non-food production and agricultural services provision will not grow. Agriculture plays an important role in global environmental issues, such as climate change, land degradation, water pollution and biodiversity loss, therefore the future growth in production must be accommodated within the growing insufficiency of natural resources, including land, water and nutrients. Also, waste and greenhouse gasses (GHG) emissions must be reduced. The global livestock sector, with total GHG emissions estimated at 7.1 giga tones of CO2-eq/year (year 2005) which represent 14.5% of all anthropogenic emissions, significantly affects the environment. In terms of species, cattle are the main contributor to the sector's emissions (65%), while in terms of commodity, beef is the main contributor with 2.9 giga tones of CO2-eq, or 41% of total sector emissions. The cattle sector, especially dairy cattle, although significantly contributing to the total GHG emissions, on the other hand, suffers significant losses due to induced climate change. Under heat stress conditions, lactating cows tend to decrease milk production as well as to increase prevalence of mastitis and fertility disorders. In many dairy-producing areas of the world heat stress conditions represent a significant financial burden (for instance $ 900 – $ 1,500 million/year in the USA). Since dairy cattle are the contributor and the victim of ongoing climate change, application of adequate mitigation techniques is necessary to ensure the future of dairy cattle farms. There are many methods to decrease the impact of heat stress on cattle, for example shading, cooling and nutrition. Furthermore, selection of heat stress resistance could be an effective, long-term method. The other problem is sector's GHG emission. The GHG emission intensities vary greatly among producers due to different agro-ecological conditions, farming practices and supply chain management. This variability gives opportunity to finding the adequate mitigation option. The reduction of the GHG emission could be achieved by: reducing production and consumption; lowering the emission intensity of production; or by combining the above mentioned. The adoption and application of mitigation techniques by majority of the world's producers can result in significant reductions of emissions in interval from 14 to 41% depending of the selected specie, production system and world's region. Since climate change is a global issue and livestock supply chains are increasingly internationally connected, effective mitigation actions could be achieved only by global approach. To conclude: the future of cattle breeding lies in a sustainable production system that provides an effective production of high quality meat and milk with animals selected to high heat tolerance as well as to low GHG emission per kg of product.

Keywords: cattle, climate change, GHG emission, heat stress, mitigation techniques.

P3

CLIMATE CHANGE, WATER AND AGRICULTURE: CHALLENGES FOR THE FUTURE

Mladen Todorović

CIHEAM – Mediterranean Agronomic Institute of Bari, Valenzano (BA), Italy

The impact of the climate change on water resources and agriculture is evident worldwide. Frequent droughts, flash floods, heat spells and spring frosts triggered the decline of agricultural production, further depletion of water resources, soil erosion, land abandonment and desertification, as well as the increased pressures on socio-economic development particularly in marginal rural zones. Spatial and temporal change of precipitation and air temperature will design new cultivation scenarios for the future together with modified land use and water availability. Hence, the shifting of agro-ecological zones northward and towards higher elevations is expected. On one side, higher air temperature will decrease the growing cycle of plant species, anticipate sowing/planting dates, increase respiration rates, reduce period of yield formation, lessen biomass production and yield and, very likely, decrease yield quality (i.e. lower protein level of grains). On the other, the increase of air temperature will extend the overall period suitable for cultivation and permit, in some areas, more than one cropping in the same year. Additional impact on agricultural production will be due to altered biological cycles of weeds and pests, and new weeds/pests and crop diseases. In the Euro-Mediterranean area, the crop water requirements are expected to decrease, for winter-spring and spring-summer crops, by 4 to 8% because of air temperature increase and the shortening of the growing season. Hence, the irrigation requirements would decrease or remain steady. Therefore, the air temperature increase could have a dominant role on the shortening of the growing season rather than on the increase of crop water needs. On the contrary, a slight increase of irrigation requirements could be expected for perennial and autumn-winter crops due to precipitation decrease. Similarly, most of rainfed cropping systems could be characterized by the increase of water deficit. Thus, irrigation could become necessary in order to stabilise agricultural production. However, the reduction of water availability for agriculture is expected in the future due to projected increase of water demand by other sectors. Therefore, climate change could trigger the water supply problems for agriculture that could be alleviated by the adoption of water saving practices and the use of innovative technological achievement.

Keywords: water balance, crop water requirements, irrigation, adaptation.

P3

THE PRESERVATION OF GENETIC RESOURCES IN THE REPUBLIC OF SRPSKA AND BIH – CURRENT SITUATION AND PROPOSAL FOR REGULATION

Gordana Đurić

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The preservation and sustainable use of genetic resources, as part of the overall biological diversity, makes an important part of the strategy of sustainability and development of any society. Genetic resources are not only important in terms of providing food, medicines and other products for human population, but they also represent a cultural and historical heritage of human race, as well as the intrinsic value of nature itself. The issue of preservation and sustainable use of genetic resources is regulated by numerous international agreements and other documents. The third objective of the Convention on Biological Diversity (CBD) is a fair and equitable division of profit from the sustainable use of genetic resources on the basis of bilateral agreements. Bosnia and Herzegovina acceded to the Convention in 2002. The FAO Commission on Genetic Resources for Food and Agriculture (CGRFA), as the main international forum for agro-biodiversity, gave rise to the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). A central component of this agreement is a multilateral system for access to genetic resources and sharing of the benefits from their use, taking into account the rights of small farmers and traditional knowledge and practices of local communities. Bosnia and Herzegovina has not yet signed this agreement. The issue of genetic resources in BiH is under the jurisdiction of the entities. The only official documents exist solely in the Republic of Srpska at the moment. In June 2008, the Plant Genetic Resources Preservation Programme was adopted in the Republic of Srpska, whereas the Forest Genetic Resources Preservation Programme was adopted in 2013. The issue of animal genetic resources in the Republic of Srpska has not yet been regulated. BiH and the Republic of Srpska have not yet tackled the issues of aquatic or genetic resources of microorganisms and invertebrates. Our country is rich in numerous indigenous and endemic species, thus the necessity for measures of their protection and preservation is inevitably imposed. In order to improve the framework for the preservation and sustainable use of genetic resources it is necessary to establish a coordination body for inter-entity and international cooperation. At the Republic of Srpska's level, it is necessary to adopt a uniform law on genetic resources, in accordance with the provisions of the Natural Protection Law, which will regulate the basic objectives and principles of preservation, sustainable use and access to genetic resources, law enforcement bodies, measures and procedures for the preservation and sustainable use, unified database as well as financing and supervision.

P4

BIOTECHNOLOGY ACHIEVEMENTS IN QUALITY ASSURANCE OF HONEY IN THE BALKANS

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The world's annual honey productionis about 1.2 million tons. In Serbia average honey production in the last 10 years has been 15-20 kg honey per hive, i.e. 5.500 tons/year in total, which is below the European average. Consumption of honey is higher in developed countries, where the annual domestic production does not cover the requirements of the market. The current shortage of natural honey has caused the market to be undercut by cheap and counterfeit honey, the use of which is restricted by imposing standards and import restrictions. The objective of this review is to present the advantages of some new methods for honey quality control and the authentication of geographical and botanical origin in the Balkan region by implementing modern biotechnological and research approaches. There are reliable methods for detection of adulteration by adding sugar cane and maize syrups (determination of 13C/12C ratio and specific sugars), feeding sucrose (measurement of sucrose, erlose and proline content), beet sugar (FTIR spectroscopy), as well as improper water removal and inadequate fermentation (yeast count, glycerol and ethanol) and overheating and storage defects (measurement of HMF, diastasic and invertasic activity). Presence of the high fructose corn syrup (HFCS) is currently determined by isolation of specific oligosaccharides using HPLC. In addition, GC, the micelle electro-kinetic chromatography, followed by 13C-NMR spectroscopy and Raman spectroscopy as a rapid method could be applied in order to test some aspects of honey quality. Besides classical melissopalynology, assessment of routine physico-chemical parameters (e.g. pH, acidity, enzyme activity, electrical conductivity, sugars, fructose/glucose ratio, optical rotation, etc.) and determination of some minor components (amino acids, trace elements) using chemometry, some promising new methods are applied for testing the authenticity of geographical (near-infrared spectroscopy) and botanical origin (determination of volatile compounds by dynamic head space or SPME, followed by GC-MS or electronical noses, determination of polyphenols by HPLC, front-face synchronous fluorescence spectroscopy, pollen DNA analysis) of honey. Although powerful methods to justify honey adulteration are applied, they need to be further enhanced, in order to authenticate and protect natural honey. Future approaches for assurance of honey quality in the Balkan region, should consider application of modern biotechnologies and implementation of international standards and regulations.

Keywords: honey quality, authenticity, biotechnology, modern methods.

ORAL PRESENTATIONS

Section: PLANT SCIENCE

Subsection: Horticulture

Oral Presentations

HO1

THE IMPACT OF OENOLOGICAL MEANS ON GLYCEROL CONTENT IN MONTENEGRIN WINES: VRANAC AND KRATOŠIJA

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The influence of three different commercial yeasts (BDX, BM4X4 and ICV D21) and two different lactic acid bacteria (LAB) on glycerol content in Montenegrin wines Vranac and Kratošija were studied during 2012 vintage. Beside glycerol content, the basic quality parameters of grape must (sugar content, total acidity, pH, tartaric and malic acid) and the wine quality parameters (alcohol content, total dry extract, glycerol, pH, total polyphenols and total anthocyanins) were determined after alcoholic and malolactic fermentation. After alcoholic and malolactic fermentation, within both wines, the highest content of glycerol was achieved when BDX yeast was used. There were no significant differences within glycerol content when different LAB was used. In Kratošija wine, glycerol content for BDX treatment varied between 9.02 – 9.09 g/L, while in Vranac wine, itvaried from 8.88 – 8.95 g/L. Slightly higher glycerol content for other two treatments was achieved also in Kratošija wine, but surprisingly Vranac wines were sensory better evaluated.

Keywords: wine, yeast, lactic acid bacteria, glycerol, wine quality.

HO2

GRAPE QUALITY OF PROBUS AND CABERNET SAUVIGNON (Vitis viniferaL.) AFFECTED BY TWO DIFFERENT SEASONS, WET AND DRY

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Weather, a key factor in winemaking is highly variable in Fruška Gora wine region. Some grapevine cultivars including Probus, autochtonous (*Vitis vinifera*) cultivar from this region, and Cabernet Sauvignon, have a long ripening period highly affected by weather conditions. The research was conducted in Sremski Karlovci at the experimental field of University of Novi Sad, Faculty of Agriculture, during 2014 and 2015. The meteorological conditions during the season and its effect on the grape quality of Probus and Cabernet Sauvignon were analysed. Season 2014 was very wet with 387 mm rainfall recorded between June 1 - September 31, twice as much than during the same period in the season 2015. In 2014, wet conditions resulted in a diminished yield due to a high incidence of *Botritys cinerea*. Average temperature in August 2015 was 5,4˚C higher than in August 2014, with some days characterized by extremely high temperatures. The productive results in dry season were not as good as it was expected. Total acidity and sugar contents in the musts of both cultivars were higher in wet 2014, compared to 2015. Probus accumulated more total anthocyanins in dry 2015, compared to wet 2014 and between these two seasons a statistically significant difference was found.

Keywords: Probus, Cabernet Sauvignon, meteorological conditions, grape quality.

HO3

INFLUENCE OF YEAST STRAIN ON "STANUSINA" WINE CHEMICAL COMPOSITION AND SENSORIAL ANALYSIS

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Every wine has its unique signature defined by its chemical composition. There are numerous factors in the wine making process that influence the chemical composition of wine. The more diversity there is in the chemical components in a wine, the more complex it will be. Numerous publications suggest that different yeast strains produce different chemical compounds, or the same ones in different quantity, giving wine its uniqueness. In this study we used three different commercial yeast strains (Enoferm BDX, Lalvin 71B and Lalvin ICV D254 all produced by Lallemand) in order to determine what influence they will have on the phenolic content and sensorial analysis of wine from the autochthonous grape vine variety Stanusina. We analyzed the content of total phenols according to Folin ciocalteu assay, total flavan 3ols were measured with 4-(dimethylamino) cinnamaldehyde reagent and total flavonoids with aluminum chloride colorimetric assay. The sensory evaluation of wine was conducted using the Davis 20-point scale system. The wine fermented with Lalvin 71B wine yeast had highest evaluation score of 18,5 points. The results obtained from this study show that the use of selected wine yeast strains improves the wine quality, contribute to more complex, more colored wines with higher extract and higher alcohol level. These wines are more harmonious and with nicer sensorial characteristics.

Keywords: "Stanusina", phenols, yeast strain.

HO4

THE ECONOMIC EFFECTS OF INVESTMENT IN HAZELNUT PLANTATION

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The aim of this paper is to describe all relevant internal and external elements of investing 0.5 ha planted hazelnut trees which are grafted on "Mečija" hazelnut and to review business opportunities and define ways in which business decision makers can take advantage of identified opportunities. Apart from investments in the plantation and the necessary equipment which are not currently available at the farm, there is an intention to install drop irrigation system as well as protective hail nets. Two hazelnut cultivars are planned to be used and both are Italian origin. The main cultivar is Tonda Gentile Romana, which matures in the second half of August. It is planned to plant about 250 plants of which 7% will be of pollinating cultivar. During the period of full fertility, yield is expected to be 6 kg of purified core of the tree. The realization of this investment requires 2,093.100 dinars, of which loan is 1,000.000 dinars. Net present value is positive (1,212.200 dinars) for a period of ten years. Internal rate of return is 16.97%. The deadline of the return of the investment is in the 8th year of operation of the investment, which is shorter than the period of loan return (10 years). The project can be evaluated as a cost-effective and accumulative one, because it achieves high levels of these indicators (economic is 6.36, the average accumulation is 56.83%). The project falls into the category of low risk because it has a lower high point of profitability during the period of exploitation (89.9%). The economic indicators of production (economics, profitability and risk breaking point) are very favorable, reflecting the high level of profitability of this production. However, the investment indicators (deadline of the return of the investment, net present value and internal rate of return) are also positive, but not so attractive as indicators of production. The main reason of this is a long period from the investment to reaching the first and maximal yield and economic results.

Keywords: investment, hazelnut, economic effects.

HO5

EFFICIENCY OF NOWEL LIQUID ORGANIC FERTILIZER "CHAP LIQUID" IN IMMORTELLE (Helichrysum italicum L.) SEEDLINGS PRODUCTION

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Increased global demands, secure marketing, satisfactory income, and extraordinary soil and weather conditions are the main reasons why immortelle is increasingly grown on plantations in our region. In recent decades demands for healthy and safe agricultural products, including medicinal substances produced according to the principles of organic production have significantly increased worldwide. With consideration to demands for raw organic material of immortelle, increasing significantly year after year, the aim of this research was to examine the efficacy of the novel liquid organic fertilizer - Chap liquid on the expression of some important morphological characteristics of seedlings. The experiments were conducted in a greenhouse in nursery "Ekoplant" from Podgorica. In all variants of the application, organic fertilizer Chap liquid has demonstrated significantly greater impact on increasing the average height of immortelle seedlings (36.7 cm), the average root weight (12.5 g), and the above-ground parts of plants (15.6 g) in comparison with a variant without application of fertilizers (31 cm, 7.7 g and 8.2 g, respectively). Differences in the studied traits of immortelle seedlings treated with liquid organic fertilizer Chap liquid and conventional fertilizers Sapro elixir (35.7 cm, 13.7 g and 15.2 g) did not have statistical significance. The results showed that novel liquid organic fertilizer Chap liquid is a reliable fertilizer that can be used in organic production of immortelle seedlings.

Keywords: immortelle, seedling, liquid organic fertilizer.

HO6

IMPACT OF PLANT GROWTH REGULATORS ON AFRICAN VIOLET(Saintpaulia ionantha H. Wendl.) PROPAGATION FROM LEAF CUTTINGS

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African violets (*Saintpaulia ionantha H.Wendl*) are highly decorative plants, mostly grown in indoor spaces. Because of their high market consumption, these plants have been mass produced worldwide. Although tissue culture is the technique that allows a production of healthy plants in a short period of time, African violets, considering the cost of in vitro propagation and due to their ability to produce roots easily are mostly propagated with the use of leaf cuttings. However, some of the phytohormones used *in vitro* for controlling the growth of the plant, *ex vitro* can also be used to improve plant growth. This experiment was conducted during 2016 in Novi Sad, as a continuation of a previous research which included a different cultivar of African violet. During this experiment, leaf cuttings of *Saintpaulia ionantha* H. Wendl *cv.* '*Flori*' were treated with two commercial plant growth regulators incit-1and incit-5, containing naphthalene acetic acid (NAA) as an active substance, in concentrations of 0,1% and 0,5 %, respectively. To examine the impact of these commercial PGRs on African violet rooting, three parameters were observed: number of rooted plants and the number and length of formed roots on each plant. Although the producer of these PGRs recommends the use of incit-1 for easy propagated plats, such as African violet, results of this research showed that the greater impact on rooting of African violets had incit-5. Research results showed that 25 days after the propagation, rooting of plants treated with incit-5 was 100%. In the same period of time, rooting percentage of plants treated with incit-1 was for 23.34 % higher than the rooting of non-treated African violets. The results of this research also showed that the length of formed roots of African violets treated with incit-5 was 45.5% higher than the length of the roots produced by non-treated African violets. Greater amount of formed secondary roots was observed on African violets that were treated with incit-1 and incit-5 than on non-treated plants. Also, the results of this research showed that non-treated African violets developed 70.9 % less secondary roots than plants treated with incit-5.

Keywords: *Saintpaulia ionantha*, NAA, PGR, fitohormones.

HO7

IMPACT OF SUMMER PRUNING OPERATIONS ON THE PARAMETERS OF POTENTIAL PRODUCTIVITY OF WINTER BUDS AT THE VINE VARIETY VRANEC GROWN IN THE REGION OF VELES, R. MACEDONIA

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This is a study of the influence of some summer pruning operations (defoliation, thinning grapes) on the parameters of potential productivity of winter buds on the vine variety Vranec grown near the town of Veles, during the years of 2013, 2014 and 2015. For this research we set four variants: control - without green pruning; defoliation - leaves removed from the base of the shoot to the node where the grape cluster is located, and two cluster reductions – 10 grape clusters per vine and 6 grape clusters per vine. From the obtained results it is found that there are no injuries in the main winter buds during the vegetation period and the potential fruitfulness is determined by higher coefficients - 1.38 which differ depending on the location along the cane. In the main buds mainly two inflorescences are formed. The yield at this cultivar will be formed mainly by clusters with sizes 350-550 μm, followed by those with the length of 550-750 μm. The application of defoliation and regulation of the yield with 6 and 10 clusters per vine has a beneficial effect on increasing the rate of potential fruitfulness of winter buds, the number of buds with 2 and 3 clusters, increases the inflorescences with a length of 350-550 μm and the appearance of new ones- longer than 750 μm.

Keywords: vranec, defoliation, thinning, potential fruitfulness, winter buds, yield.

HO8

MORPHOLOGICAL CHARACTERIZATION OF LEAF OF INDIGENOUS APPLE VARIETIES

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Determination of morphological characteristics of fruit trees from field collection in the *ex situ* conditions is the initial step in apple germplasm characterization. During 2016, morphological characteristics of aucthotonous apple accessions from the field collection of the Genetic Resources Institute of University of Banja Luka were studied. Measurements of leafs of 106 apple accessions have been done based on the following parameters: length and width of leaf blade and the length and width of leaf stalks. Also leaf blade area was measured by using the software Image J. The results showed that accession Vidovnjača (98,80 mm) had a maximum length of leaf blade while accession Staklara (58,81 mm) had the lowest leaf blade length. The maximum width of leaf blade was recorded at Slatka Zelenika accession (61,32 mm), while Šarunija accession had the smallest width of leaf (33,12 mm). Kanada Švabica accession had the largest length of the leaf stalk (44,01 mm) and Đulabija accession the lowest (16,57 mm). Staklara accession had the maximum width of the leaf stalk (2,78 mm), while Šarunija accession had the lowest width of the leaf stalk (1,19 mm). The largest leaf area was recorded at accessions Sadička (49,28 cm^2), while Staklara accession had the lowest leaf area (17,01cm^2). These results present a continued characterization of apple accesions from the fruit collection, and they gave more information about each accession in database. Based on this data, unique accession in the gene bank will be isolate.

Keywords: germplasm, conservation, field collection

HO9

THE EFFECT OF HYDROCOOLING TREATMENT OF SWEET CHERY (Prunus avium L.) ON SKIN COLOR OF FRUITS AFTER COLD STORAGE

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The fruits of sweet cherry are specific because of their short time of storage. For the purpose of longer time of storage, cooling of fruit was carried out in order to reduce the temperature before putting them in cold storage. During 2015 and 2016 sampled fruits of commercial cultivar of cherry Regina were studied in two locations, Gradiška (Turjak) and Trebinje (Popovo polje). The fruits were divided into three groups where the first group of fruits was analyzed after harvest, second group of fruits was treated with cooling treatment (hydrocooling) at a temperature of 0,9 °C in duration of 10 minutes and the third group of fruits was the control group. The fruits were placed in cold storage with the normal conditions (temperature 10 ºC and humidity 85-95%) for the period of 15 days. Fruit color was analyzed at the moment of harvest and after storage (treated group of fruits and the control group). Observing the intensity of red color in the color system, it can be concluded there was a higher value for fruits after harvest in 2016 than in 2015, indicating a higher intensity of sunlight of these fruits. Analysis showed that treated fruits and control fruits sampled in Gradiska had different skin color , which showed rapid maturation of untreated fruits during storage. Fruit sampled in Trebinje showed no significant difference in terms of skin color of treated fruits and the control group.

Keywords: *Prunus avium*, colorimetric method, skin color of fruit.

HO10

CHARACTERISTICS OF LOCAL POPULATIONS COLLARD SEED (Brassica oleracea L. var. Acephala) COLLECTED FROM EASTERN HERZEGOVINA, THE REPUBLIC OF SRPSKA

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Collard (*Brassica oleracea L. var. acephala*) is a plant from the family of *Brassicaceae.* There has not been any kind of research done in the Republic of Srpska on collard, although it is the dominant type of Brassica for the Eastern Herzegovina region. The aim of the study was to examine seed characteristics and seed quality of collard local populations from Eastern Herzegovina. Seed morphological characteristics of eight local collard population, collected in the framework of the Programme for Conservation of Genetic Resources of the Republic of Srpska, conducted by Genetic Resources Institute, University of Banja Luka were examined. IBPGR (1990.) and UPOV (2002.) descriptors for Brassica were used in seed characterization. Also, qualitative seed characteristics were examined according to standard methods for determining agricultural plants planting material quality, packaging, sealing and labeling. Considering the fact that these seeds are uncertified, collected a few years ago, and that brassicas seeds lose viability after 4-5 years, it was important to test their viability. Seed surface of studied populations was smooth, matte, and most of them had rounded seed. Color varied from gray-black to red brown. Collard seed belongs to the small seed category, with a length of seed ranging from 1.66 mm to 2.44 mm, and width from 1.28 mm to 2.5 mm. Seed purity ranged from 88.1% to 98.7%, while the minimum absolute collard seed weight was 2.64 g, and 4.08 g was maximum. Germinative energy was measured 3 days after the beginning of the germination test, and germination was measured 10 days after the test began. Germination varied from 33% to 96%, and the lowest recorded germination percentage was 50.5, while the highest was 98.5. Based on these results we can conclude that some collard local populations offer high-quality seeds, which are distinguished by good germination. This is very important from the point of production where quality seed gives quality seedlings, and thus the plants have good yield.

Keywords: collard, seed morphological characteristics, quality, germination.

Acknowledgment: Research was co-financed throughout Republic of Srpska Ministry of Science and Technology project Collecting, evaluation and regeneration of genetic resources of vegetables (no. 19/6-020/964-25/15)

Subsection: Crop Science

Oral Presentations

CSO1

FLOW GENE ALLELES OF GLIADIN IN WHEAT CULTIVARS OF SFRJ

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The gliadins are deposited in endosperm of wheat grain, which synthesis controlled by alleles at six *Gli* loci. Gliadin composition is specific for wheat cultivars and depends of crossing parents cultivars in breeding. In this work analyzed flow gene encoding gliadin proteins in wheat cultivars created in former Yugoslavia from foreign cultivars which used in breeding program. Flow gene alleles at three *Gli-1* and three *Gli-2* loci studied in 30 wheat cultivars of Yugoslavia and cultivars which mostly used as a parents in crossing originated from Italy -10, Hungary-10, France -10, Soviet Union-30, Romania-10, Great Britain-10, Mexico-10 cultivars. The origin of presence of *Gli-1* and *Gli -2* alleles in Yugoslav wheat cultivars analyzed on the base of identified alleles and their frequencies. For each *Gli-1* locus determined different number of alleles. In Yugoslav cultivars present 6 from identified 16 at *Gli-A1*, 6 from 13 at *Gli-B1*, 5 from 9 at *Gli-D1*, 6 from 20 at *Gli-A2*, 6 from 17 at *Gli-B2* and 6 from 18 at *Gli D2* in all cultivars in this study. Different number of *Gli*- alleles was in analyzed abroad wheat cultivars. According to presence of gliadin alleles, Yugoslav cultivars had more similarity with Soviet Union and Italian wheat cultivars. On the base of the most frequent alleles at each 6 *Gli*- loci in Yugoslav wheat cultivars in this study, can derived formula *b.l.b.b.b.a.* (40%, 43%, 53%, 30%, 36%, 46%) although that this composition of alleles did not present in studied cultivars. Alleles in Yugoslav cultivars with high frequency *Gli-A1b*registered in cultivars of Hungary, Soviet Union, Romania, British, Italy, *Gli-B1l* present in Soviet Union, Romania, Hungary cultivars, *Gli-D1b* identified in cultivars of all included Countries, *Gli-A2b* present in Hungarian, Romanian and Soviet Union cultivars, *Gli-B2b* registered in Hungarian, Soviet Union and Romanian, *Gli-D2a* preset in cultivars from each Country. Identified alleles in Yugoslav cultivars inherited from parent cultivars and their presence influenced by direction of wheat cultivar selection related to improving adaptability, quality and productivity.

Keywords: gliadin alleles, flow gene, wheat.

CSO2

GRAIN YIELD STABILITY OF MAIZE (*Zea mays* L.) HYBRIDS BELONGING TO DIFFERENT FAO MATURITY GROUPS

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Grain yield and yield stability of 15 maize hybrids belonging to FAO maturity groups 400-700 were analysed over a period of three years (2012-2014) in three different agroenvironments in Central Serbia. The hybrids were sown at the recommended plant densities ha^{-1}. Severe drought was recorded in 2012, with few rainy days and the total precipitation of about 40 *mm* for June, July and August i.e. during the flowering and fertilisation stages when the maize crop typically had the highest water requirement. The following year (2013) was characterised by more favourable conditions for maize growth, including moderate temperatures during the growing season, uniform distribution of rainfall and more rainy days, as opposed to adverse weather events i.e. extreme precipitation in 2014, most notably during sowing, germination, emergence and plant growth. Grain yields of all maize hybrids were higher in 2013 and 2014 than in 2012, mostly due to the higher amount and more favourable distribution of precipitation during the growing season. Grain yield across years was also dependent on FAO maturity group. The highest grain yield in 2012 was obtained by FAO 400 hybrids, whereas FAO 400-700 hybrids gave high yields in 2013 and 2014. Genotype x environment interactions were observed for all analysed traits. As regards stability parameters, late-maturity hybrids (FAO 600-700) generally exhibited unfavourable values i.e. specific responses and better adaptation to more favourable environmental conditions, higher average yields and higher values of the traits analysed, compared to early-maturity hybrids. Among medium-maturity hybrids (FAO 500), NS 5051 gave high yields at most of the experimental sites and in most years, demonstrating lower performance in terms of yield stability parameters compared to late-maturity hybrids.

Keywords: maize, hybrid, grain yield, stability.

CSO3

WINTER WHEAT (*Triticum aestivum* L.) OVERWINTERING UNDER DIFFERENT SOWING DENSITIES

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Wheat (*Triticum aestivum* L.) the main bread cereal is sown at around 40 000 hectares, or 7% of total arable land of Republic of Srpska. During the winter period wheat is exposed to the winter stresses, the more in absence of snow cover. Wheat overwintering ability affected the final number of plants that are able to continue their growth and development when the necessary conditions established. Research was conducted in two experimental years 2013/14 and 2014/15 in agroecological conditions of Banja Luka, and overwintering ability was studied in three wheat varieties (NS 40S, Prima andNova Bosanka). Standard agronomic practices for winter wheat were performed.Wheat varieties were sown manually at eightdifferent sowing densities with different seeds arrangement: 384, 424, 451, 504, 544, 584, 588, and 604 seeds m^{-2}. The experimental unit size was 1 m^2, with four replications. Sowing was carried out in the first decade of November in both years. Counting of wheat plants in both examined years was carried out in the second decade of February. Statistical analysis was performed using factorial analysis of variance 2×8×3, while significant differences between treatment were tested by Fisher's least significant difference test (LSD). The average of overwintering amount for all three examined wheat varieties was 50.14%. Two tendencies appeared at tested sowing densities, tendency of expressed decline of the average of overwintering plants percentage in 2014/15 in almost all the studied sowing densitiesand tendency to stability that have shown the sowing densities 384 and 424 seeds m^{-2}. However, sowing density 588 seeds m^{-2} stands out as the density with a tendency of the highest percentage of overwintering plants in both years.

Keywords: winter hardiness, sowing density, wheat.

CSO4

IMPACT OF TILLAGE AND FERTILIZATION ON NUTRITIONAL QUALITY OF MAIZE GRAIN

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Tillage has an influence on nutrient uptake from the soil, while fertilizers are important for obtaining high yield and appropriate nutritional quality of maize grain. The main goal of this study was to find which the combination of tillage (no-till, reduced and conventional tillage) and fertilization (zero fertilization ZF; 180 kg N ha^{-1}, 50 kg P ha^{-1}, 50 kg K ha^{-1} – F1; 240 kg N ha^{-1}, 50 kg P ha^{-1}, 50 kg K ha^{-1} – F2) will give the highest yield but also high contents of tocopherols (α-, β+γ-, δ-) and carotenoids (lutein, zeaxanthin and β- carotene) in maize kernel. Stressful 2015 year, with drought presence, has shown the higher averages values of concentrations of tested compounds and approximately twice lower maize yield comparing to the 2014 year. In both tested years, in reduced tillage system maize yield was higher compared to other tillage system s as well as a content of all analyzed compounds. Fertilization treatments revealed different effects on tocopherols and carotenoids content. Comparing to all tillage regimes, in both years, the highest content of δ-, β+γ- tocopherols and lutein were noticed in ZF, whilst the highest concentration of α- tocopherol was found in F2. From all tillage regimes, the highest values of zeaxanthin and β-carotene were obtained in F1. According to the obtained results, the highest impact on yield and nutritional quality of maize grain (*i.e.* α-, β+γ-, δ- tocopherols, lutein, zeaxanthin and β-carotene content) had the reduced tillage in combination with F2 treatment, in the 2015 year, a year with stressful agro - meteorological conditions.

Keywords: nutritional quality, vitamins, maize, yield.

CSO5

INFLUENCE OF SOME STIMULATORS ON THE GRAIN YIELD AND GRAIN QUALITY OF TWO DURUM WHEAT CULTIVARS

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The research was conducted during 2010 - 2012 on pellic vertisol soil type.Factor A – cultivars, include 2 Bulgarian durum wheat cultivars: Deyana and Zvezdica (*Triticum durum var. valenciae*). Factor B – stimulators, include 9 variants: untreated check and 5 growth stimulators – H - 40 in doses of 300 and 500 ml/ha, XH - 100 in doses of 1 and 1.2 l/ha, TH - 140 in doses of 2.5 and 2.8 l/ha, X – 80 in dose of 800 ml/ha and T – 100 in dose of 2.5 l/ha.All stimulators were treated during the tillering stage of durum wheat.It was found that the highest grain yield at durum wheat cultivars Deyana and Zvezdica is obtained by influence of growth stimulators XH - 100 and TH - 140. Increase the dose of stimulator H - 40 depresses durum wheat. The lowest yields are obtained by use of stimulators X - 80 and T - 100 at the both durum wheat cultivars. The grain yield increase by investigated stimulators is due to the increase in the grain number per spike and the grain weight spike in main tiller and second tiller. The 1000 grain weight, test weight, vitreousness, protein quantity, wet and dry gluten quantities are increased by influence of the investigated growth regulators. Physical and biochemical properties oh the grain are the highest by treatment with stimulators XH - 100 andTH - 140.The use of these two plant growth regulators is suggested as an element of the technology for growing of durum wheat.

Keywords: durum wheat, stimulators, grain yield, structural elements of the yield, grain quality.

Section: ANIMAL SCIENCE

Oral presentation

ASO1

PRODUCTION, PURCHASE AND PROCESSING OF MILK IN BOSNIA AND HERZEGOVINA

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This paper analyzes the production of milk as one of the most important branches of agriculture, which has been and should remain the backbone of its further development. The structure of agricultural production in Bosnia and Herzegovina is unfavorable. Share of livestock production in the value of total agricultural production is about 40%. The main problems that livestock and animal production face in Bosnia and Herzegovina are small production, excessive imports, unfavorable structure of production, low price of milk purchase and a very low standard of producers who are on the edge of existence. Milk production in B&H, unfortunately, is still underdeveloped, disorganized and often does not meet the needs of industrial dairy processing capacity. Milk processing (and the market) and the consumption of milk and dairy products is the consequence of an unfavorable economic situation, decreasing of living standards and purchasing of power, as well as of insufficient education of consumers about the importance of milk and milk products in a daily diet. Dominant production system is consisted of small farms (3-5 cows) dealing with mixed livestock production, with the primary goal of self-sufficiency, only 3.5% are farms that have more than 20 dairy cows. The data used in the paper were obtained from statistical agencies, as well as from the research in the 7 largest milk processors in B&H (purchasing and processing about 86.10% of total milk purchased in B&H). Number of dairy farmers of these 7 largest milk processors was 9,865 in 2015 (in 2012 it was 15,311 producers of raw milk), who owned a total of 49,865 dairy cows in 2015 (in 2012 it was 42,364 milking cows). Average per producers of raw milk was 5.05 cows in 2015 (in 2012 it was 2.77 cows per producer). Average milk production per dairy cow was 4,149 liter in 2015 (in 2012 production per cow was 4,026 liter). Milk quality in accordance with Milk Quality Decree is unsatisfactory. E-class quality of milk makes only 77% of deliverable milk and 68% of the number of samples.

Keywords: milk, purchase, production.

ASO2

ABIOTIC FACTORS AFFECTING PROPER GROWTH AND DEVELOPMENT OF FOALS

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Some of the most important characteristcs of horses, such as build, temper, size, muscularity, longevity, gait, energy of movement and swiftness, are conditioned by genetics. Every foal carries a certain amount of potential for exhibiting these traits inherited from its parents. Aside from these hereditary, genetic factors, there are also abiotic factors which are necessary for the proper growth and development of foals. The aim of this paper was to show how much the abiotic factors affect the proper growth of foals, and their subsequent value and capacity for use. Throughout the paper, by using a comparative method of specimen analysis, the authors have taken into account 19 foals of approximately the same age, held in different places in the Republic of Serbia and Bosnia and Herzegovina, in different climatic conditions and raised in different ways. By measuring the height of the withers with the measuring stick and binder twine, measuring the chest and cannon circumference, and the length of the barrel, as well as by taking notes of the foals' behaviour, the data was collected and subsequently analyzed according to zoohygienic stable conditions, the feeding and the quality of the food, socialization conditions, spatial conditions, and the management of the breeder. Enclosed with the complete documentation are corresponding photographs for those who are interested to get a clearer picture of the described research. By taking into account the analysis of the correlation between abiotic factors and the collected measurements of the foals, we get the results that indicate that the largest amount of factors that affect the growth and development of the foals are directly connected to abiotic factors provided by the breeder. The conclusion is that abiotic factors are in direct proportion with the development and growth of the foals.

Keywords: genetic, abiotic, factors, foals, capacity for use.

ASO3

ESTIMATION OF EFFECTIVE POPULATION SIZE OF DOMESTIC BUFFALOES IN THE REPUBLIC OF MACEDONIA

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The Republic of Macedonia has a long tradition of buffalo rearing. Nowadays the number of buffaloes has decreased to the risk level. Buffaloes are domestic animals which in the last 3-4 decades have been abundant, with paying no attention on their existence and development. Because of that, their number in our country declined to the critical number with a possibility of their disappearing. So, nowadays there are some aims to incorporate the domestic buffaloes in the national biodiversity programs for conservation of their genetic resources as transboundary and metapopulation breed. Five farms of buffaloes were subject of investigation. According to the rearing technology, there are different systems of buffalo production, mainly for meat production, and only one for milk and meat production. After thorough phenotypic characterization of buffaloes using FAO guidelines for phenotypic characterization and literature data merits, a total of 41 adult buffalo animals were recorded in the herd book for this breed in the year of 2016. Based on the population structure, estimated effective population size of domestic buffaloes in the Republic of Macedonia in 2016 was 25,76 and according to this figure and the total number of breeding males and females, this population could be classified as a very critical and disappearing population.

Keywords: domestic buffalo, autochthonous breed, effective population size.

ASO4

ANALYSIS OF THE DEGREE COVERING OF YOUNG BULL CARCASS WITH FAT TISSUE ACCORDING TO EU STANDARD

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The Domestic Simmental cattle are the cattle breed which is mostly represented in the area of the Republic of Serbia. The quality of the carcasses has been the subject of interest for both primary production and the meat industry. The aim of this research was to analyze the degree of covering of carcass with fat tissue on young bulls slaughtered in a slaughterhouse in Raška district, according to the standard applied in the EU countries (Council Regulation (EC) N° 1234/2007, Commission Regulation (EC) N° 1249/2008; Commission European, Directorate-General for Agriculture and Rural Development). The rules defining the quality of meat are partially applied in Serbia (The Rulebook Official Paper SFRJ 34/74, 26/75, 13/78). The study was conducted on 123 young bull carcasses. The quality assessment and the fat tissue degree check were done immediately after the veterinary examination and measurement of carcasses. The correctness of the butchery procedure done in the given premises was valued as acceptable. As far as the degree of the coverage is concerned, there were three categories stated (2, 3, 4). Only one carcass was category 2. The 3rd category was found in 107 carcasses, which is significantly more ($p<0,01$) than in category 2 and in category 4 (15 trunks). The given results show that it is necessary to intensify the primary production upgrading in order to achieve better meat quality.

Keywords: domestic Simmental breed, carcasses, fat tissue.

ASO5

DEVIANT BEHAVIOUR OF HORSES AS A RESULT OF INADEQUACIES IN THE TRAINING PROCESS

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It is impossible to establish a uniform training for all types of horses, and that is why it is crucial for everyone to come to understand the psychology of horses. Just like any other human being, a horse has its own personality, character, and requires to be treated accordingly. Therefore, it is necessary to assess the temperament and intelligence of a horse before the training starts. Much of what is asked from a horse is in contrast with its natural – usual instincts. Overburdening the horse with demands can lead to its deviant behavior and even aggression. The teachings have shown that far better results are achieved when using a positive incentive rather than a punishment. If the horse is not trained with love, but with a system of punishment and reward, the horse will approach the training mechanically without a chance to think for itself. The resulting principle is the obedience principle, and not the principle of a willing suppleness which is a characteristic of partnership. When relieved of the psychological pressure, the animal is interested in solving tasks which it encounters during training. It neither resists nor works mechanically, but uses its intelligence, thus developing one of its greatest talents – the ability of understanding and accepting signals. The greatest specificity of the equestrian training is how to establish the unique connection between the rider and the horse both in the training process and in the competitive one. The emotional and psychological unity, i.e. the closeness of the rider and the horse, as well as the physical compatibility of the rider and the horse, are paramount. In order to ensure the mental and emotional understanding and bonding through time, stay and training, it is necessary to know and understand the development, growth and behavior of horses in different stages of life, i.e., growing up. The relationship between the mare and the foal in the earliest period of life, the ‘adolescence’ period (the period of reaching sexual maturity), the behavior of horses in a game, mutual communication, reaction of young horses to the teaching (education), etc.

Keywords: horse, horse psychology, deviant behavior.

ASO6

ANALISYS OF TROPHY VALUE OF ROE DEER (Capreolus capreolusL.) CULLED IN THE PLAINS AND IN THE HILLS

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In this study, we analyzed the aesthetical value of roe deer (Capreolus capreolus L.) trophies from two hunting grounds, one in the lowland plains (LU "Gaj", Županja, Croatia) and one in the mountainous (LU "Jovan Šerbanović", Žagubica, Serbia). The aerial distance between these two hunting grounds is roughly 250 km so the observed red deer populations were completely separated. The levation of Županja, the center of the lowlands hunting ground is 80 m above sea level, with almost no variation. Unlike that, Žagubica lies at 499 m above sea level, with significant variations in elevation, so some parts of the hunting ground are at over 1000 m above sea level.The obtained results indicate that the minimal lengths of both right and the left antlers are smaller in roe deer from LU "Jovan Šerbanović" than of those from LU "Gaj". Maximal length of both, the left and the right antler is greater in roe deer from LU "Gaj". Also, parameters of all antlers of roe deer culled in LU "Gaj" show much smaller coefficient of variation than those in roe deer culled in LU "Jovan Šerbanović". This indicates that the population in LU "Jovan Šerbanović" is not homogenous and that selection measures should be taken. Analyzed data indicate that the deer are being culled too young and that maximum development of antlers is thus prevented. As deer become more mature, the antlers become more developed. The elevation on which the said population lives does not affect that.

Keywords: roe deer, trophy value, antlers, elevation.

ASO7

BASIC PRINCIPLES OF ORGANIC GOAT FARMING

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Organic farming, as an ecologically acceptable production method, based on natural processes and the use of organic and natural materials, is becoming increasingly popular in Serbia. Beside the term “organic”, commonly used terms for this type of production are also “ecological” and “biological”. Despite the common, classical means of goat farming, in the recent years there has been an increase in the interest for change of usual farming methods and introduction of “Bio” systems, i.e. biologically clean farming method. Such production method results in products free of chemicals which are common in numerous substances used in common production methods. Wellbeing of animals is always a high priority in organic production. Primarily, animals should be provided with conditions for growth and development that are in compliance with their genetic potential. That implies paying respect to their physiological and ecological needs and the creation of conditions to express their natural functions and behavior.

Keywords: organic production, goats, breeding.

ASO8

CAN TANNIN-RICH EXTRACT (FARMATAN) HAVE POSITIVE INFLUENCE ON GROWTH AND CARCASSES PERFORMANCE OF MALE PIGS?

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Tannins are water soluble polyphenols with varying molecular weights. They are chemically classified in two classes: hydrolysable and condensed tannins, and both are considered to have adverse and beneficial effects, depending on their concentration and nature in animal feed. In many animal species adding tannins in the diet had negative effects including hepatotoxicity, toxic nephrosis, feed intake depression and growth reduction as they reduce digestibility of proteins, lower the activity of digestive enzymes, cause damage to intestinal mucosa or exert systemic toxic effects. Furthermore, tannins have positive health effects (enhancing properties), such as antibacterial, anti-parasitic, antioxidant, antidiarrheal and anticancerogenic in animals. Potential effects of tannins were also reported from Mediterranean countries where they have extensive pork productions with a pig diet rich in tannins, where acorns (Quercus) represent the main energy source. The effect of tannin supplementation on growth and carcasses performance of entire male pigs was studied. The experiment was performed on 51 male pigs (boars), which were divided in four groups: control group (BEK-2, 12.9 MJ ME/kg, 15 % proteins with no tannin supplement, T0, n=12), 1 % of tannin Farmatan® supplementation (Tanin Sevnica d.d., Sevnica, Slovenia) (T1, n=13), 2 % of tannin Farmatan® supplementation (T2, n=13) and 3 % of tannin Farmatan® supplementation (T3, n=13). The experiment started when boars reached approx. 60 kg of live weight, entered the fattening stage and received experimental diets. Animals were housed in group pens and the study was carried out respecting the Slovenian law on animal protection. Addition of tannin supplementation increased body weight ($P < 0.002$) and daily gain ($P < 0.000$), likewise carcass weight ($P < 0.005$). Data were analyzed using GLM procedures of the statistical software SAS (SAS Inc. Cary, USA). Results from the experiment suggest that hydrolysable tannins might exert positive effects on growth and carcasses performance of male pigs.

Keywords: tannins, growth performance, carcass traits.

Section: AGRICULTURAL ECONOMICS AND RURAL DEVELOPMENT

Oral Presentations

AERDO1

THE EURASIAN ECONOMIC UNION: A REVIEW OF PROGRESS AND PROSPECTS

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Both trade and domestic policies of major market players have been changing. Aside from still floundering or dormant WTO negotiations, and trade sanctions and counter-sanctions in Europe, efforts are ongoing in Russia and Central Asia to expand the Eurasian Economic Union (EAEU) to increase trade and policy harmonization within member countries.The paper will explore the basic elements of regional trade agreements and how such arrangements are expected to improve trade and economic development of participating countries. Reducing trade barriers is usually expected to improve market performance and increase trade, but regional trade agreements are also known to create trade diversion, so the results are not always clear. Some effects on these prospects will derive from the potential of this region to increase grain exports in the years ahead. Overlapping with EAEU developments there are ongoing WTO accession negotiations in the same region. For example, Kazakhstan joined WTO in November 2015 but issues on commitments in WTO vs EAEU membership are still to be sorted out. Those countries that are WTO members must observe rules and maximum commitment levels in agriculture, which differ greatly among these countries and their neighbors and are also likely to differ from actual or potential EAEU commitments. There could also be “within region” tensions, such as when EAEU members are not consulted on policies that can also have impacts on other EAEU members. The current status of EAEU, its ambitions and growing pains will be explored based on recent research on developments. Future challenges for Russia and other EAEU members will be assessed in view of current market conditions.

Keywords: Eurasia, trade agreement, economic union, WTO.

AERDO2

INFLUENCE OF SELECTED MARKET COMUNICATION ACTIVITIES ON FARMERS BUYING DECISION FOR CROP SEEDS

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In the research we analyzed how different ways of market communication between seed companies and consumers of crop seeds influence farmer purchasing decisions. Slovenian farmers react similarly to the European ones and recognize seed as a complicated purchasing problem. Buying process of crop seed is a five-phase process similar to every other complicated purchasing. Post-purchasing evaluation of seed takes part with delay after crop harvest. We confirmed, when buying seeds, farmers first search solutions within the known seed brands. Stable buying behavior is most common for consumers of crop seeds. Personal information given by vendor's seed adviser is essential for farmer buying decisions. Non-personal information only keeps a farmer informed about seed brand, but doesn't directly influence the purchasing. When satisfaction and trust with seed brand are developed, that forms a repeating buying behavior in farmers. Fair relationship between seed vendor and farmer and true loyalty based on mutual trust are crucial for farmers repeating buying behavior and long-term success of seed company.

Keywords: buying behaviour of farmers, crop seeds, buying proces, seedbrands, personal information, vendors trust, repeating buying behaviour.

AERDO3

THE COMPARATIVE ANALISYS OF GRAIN PRICES IN SERBIA AND THEREPUBLIC OF SRPSKA

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The grain market operates under the influence of great offers and excessive supplies. This general statement is a result ofwork of productive stock markets and it can be applied to the world market as well as to the market of the Republic of Srpska and ours. The price level of these grains is to a significant extent determined by the movement on wheat and corn markets. Market movements in Serbia lead to the conclusion that wheat market is very passive, while a drop in corn prices is huge and under the influence of the most significant demand segment on the Serbian market which is the exporters. The aim of this work is to analyze the fluctuations in the prices of wheat and corn over a year in Serbia and the Republic of Srpska. This work analyzes quarterly price movements of wheat and corn in Serbia and the Republic of Srpska in the period from 2010 to 2015. Selling prices are analyzed (the prices at which agricultural enterprises and cooperatives sell grains). Seasonal (quarterly) price fluctuations are statistically processed in the observed period. A method of relations to the general quarterly average is applied for the establishment of the seasonal indexes. The average wheat price in Serbia in the analyzed period was 167,67 euro/t, while the average of wheat prices in the Republic of Srpska in the same period was 195,99 euro/t. The average corn price in the analyzed period in Serbia was 151,25 euro/t, and in the Republic of Srpska 187,36 euro/t. The average wheat and corn prices in the Republic of Srpska are at a higher level than the average prices in Serbia, but they are characterized by greater stability in the observed period. The established values of the quarterly indexes show a seasonal character of wheat and corn prices. The highest average wheat price in Serbia and the Republic of Srpska is realized in the first quarter and it is 5% higher than the average price. The lowest level of average wheat price in Serbia and the Republic of Srpska is recorded in the third quarter.The highest level of corn prices in Serbia is recorded in the third quarter, while in the Republic of Srpska it is in the second quarter. The lowest level of corn prices in Serbia and the Republic of Srpska is recorded in the fourth quarter.

Keywords: wheat price, corn price, quarterly seasonal indexes.

AERDO4

TRANSACTION COSTS OF FRESH APPLE TRADE BETWEEN THE REPUBLIC OF SERBIA AND BOSNIA AND HERZEGOVINA

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Fresh apples are one of the most important export products of the Republic of Serbia. Given the international demand, a key driver for increasing production and supply, it is not surprising that fresh apples export has been growing in the last period. Companies have an incentive to export fresh apples because of the relatively favorable prices. Considering foreign trade data it is to expect that, the FOB (free on board) prices of export country and CIF (cost, insurance and freight) prices of import country for specific commodity, in this case fresh apples, correspond over time. These differences are considered transaction costs. In case the differences do not represent transaction costs, we have a situation where some participant in the marketing chain and trade gain more and vice versa. For this research we analyzed export and import data for fresh apples for the Republic of Serbia and the Republic of Bosnia and Herzegovina. Sources for this data were foreign trade statistics and we analyzed a period between 2005 and 2015. The research results show that differences between FOB and CIF prices do not represent transaction costs. Moreover, a difference varies from one year to another. Obviously, there are participants in the marketing chain who gain more from trade and others who gain less.

Keywords: apple, trade, prices, transaction costs.

AERDO5

THE ROLE OF FINANCING THE FUTURE CROP SYSTEM IN SERBIA

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The aim of this paper is to determine the importance of system of financing the agricultural production based on future crop as collateral. The system of future crop financing is consistedin confirming the existence of crop production on farmers demand by the government institution.Financing agricultural production based on future crop as collateral is not a new system in Serbia, as it has been in practice for many decades (forward contracts or so called *Green contracts*). The novelty is that the new system has additional instruments for securing the contract fulfillment i.e. the system of out-of-court enforced collection, central recording of all contracts so that double financing is avoided, in the case of default in paying the debt, a farmer cannot use government subsidies for a certain period etc.System of financing the agricultural production based on future crop as collateral was first established with great success in Brazil. Serbia is the first country in Europe that introduced the system of financing agricultural production based on future crop as collateral in June 2015. Law on financing the agricultural production and securing the financing has been enacted. The European Bank for Reconstruction and Development has supported the project.The analysis shows that the Serbian system is functioning without obstacles. The comparative analysis between Serbian and Brazilian systems showed a significant difference. The main conclusion is that the Brazilian Confirmation on future crop is more standardized than the Serbian one. Higher standardization is allowing secondary trade and securitization of debt instruments. As a consequence, financiers are much more reluctant to use these debt instruments because they can be sold.In Serbia those instruments are not standardized and depend on negotiations between farmers and financier secondary trade and securitization are not in place in Serbia. A recommendation could be that a standardization of Confirmation on future crop should be introduced which will lead to the secondary trade with these debt instruments and a further development of the system of financing agricultural production based on future crop as collateral in Serbia.

Keywords: financing of agricultural production, forwards, pre-harvest financing.

JEL: E61, Q13

AERDO6

SPECIALIZED AGROBANK – PRO AND CON ARGUMENTS

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The subject of the research is the controversy as to whether universal commercial banks can successfully operate loans for agriculture or whether it is necessary to have specialized agrobanks. The objective of the research is to identify the needs and requirements for the establishment of a specialized agrobank in Bosnia and Herzegovina. The subject of the research was, from the standpoint of world experience, to explore the combination of historical and desk research methods. Furthermore, the situation in Bosnia and Herzegovina, based on available facts and personal experience and observations, was researched by a combination of methods of analysis, scenarios and comparisons, and conclusions are derived by inductive-deductive methods. The results of the research are presented in detail in the paper, and this abstract covers only a reference to two researched hypotheses. The first research hypothesis, which was rejected, was that a specialized agrobank can provide cheaper loans to agriculture compared to other (commercial) banks and at the same time be a long-term sustainable financial institution. The second and the accepted hypothesis was that a specialized agrobank may be more sensitive to the needs and problems of agriculture than other non-specialized commercial banks.

Keywords: agriculture, credit, bank.

AERDO7

EDUCATIONAL POLICY AS A FUNCTION OF RURAL DEVELOPMENT

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Basic point of this paper is a need for creation of educational policy as a function of vision of rural development throughout strategic documents in Serbia, respectively the necessity of rural development based on knowledge. One of the priorities in the field of Agricultural and Rural Development Strategy of Serbia for the period from 2014-2024 ('Official Gazette of the RS', No.85/2014) is a systematic advancement in transferring knowledge and development of human potential in rural environment by increasing the number of educational and training programs. Existing model of agricultural advisory service, which is proved to be efficient, should systematically arrange in demands of constant professional improvement of employees through life-long learning. Using the method of documentation analysis, in Strategy of Education Development in Serbia up to 2020 ('Official Gazette of the RS' No.72/2012.) it has been recognized that there are possibilities of higher education institutions in securing quality conditions for realizing non-formal education in life-long learning. Activity planned for this purpose is that higher education institutions develop special part-time programs for adults, short courses up to 30 ESPB, professional masters and masters for employers' needs. Development and implementation of other models for transferring knowledge can be accomplished through various forms of non-formal and informal education of adults. Considering that the Strategy of Adult Education Development in Serbia ('Official Gazette of the RS', No.1/2007) highlights the fact that education of adults is the main instrument in socio-economic transformation and social development, and that it should be a basic support for sustainable socio-economic development of the country and its integration in global, especially European economy, it is very important to perceive possibilities of creating a new educational policy through the system of education of adults which would be in the function of rural development.

Keywords: educational policy, rural development, education.

AERDO8

'DOLINA BARYCZY POLECA' AS A POLISH EXAMPLE OF A SYSTEM FOR REGIONAL PRODUCTS PROMOTION

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Regional products belong to the group of products directly related to a given geographical area. Most often they have the character of food products, but they can also be non-food products and various services. The presence of these products indicates the activity of the population from a region and is a manifestation of cultural heritage, which has a positive effect on local development. This is especially important in rural areas that do not have such economic opportunities as large urban agglomerations, which is why every element conducive to generating extra income and creating new jobs is very desirable. The development activities related to the production of regional products are therefore very welcome and help strengthen the potential of remote areas of large cities. In the study we described the example of systemic support market development of regional products at a micro level. This system is called 'Barycz Valley Recommended' (Polish description 'Dolina Baryczy Poleca') and is managed by the social organization - Local Action Group 'Partnership for the Barycz Valley', which operates in southern Poland in the area of several adjacent counties through which the river Barycz flows. Despite the small size of this river, it is a valuable natural area due to the habitat of birds and fish living in the wild and held in a number of fishing ponds. High Nature Value restricts the possibility for the development of intensive agriculture or industry, and therefore it has developed a system that will promote sustainable development of these areas and will use local human and natural potential. The study used secondary and primary data. To collect secondary data used documentary method, which made it possible to describe the system, conditions of the trade mark using and identify product groups distinguished in the system. Primary data was collected through unstructured direct interviews during study visits in the two entities that participate in this system.

Keywords: regional product, traditional food, promotion.

AERDO9

SPECIFICS OF POLISH WINE MARKET

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For many people outside Poland, it may seem strange that there is a dynamically developed wine production. This is due to a variable climate and the occurrence of severe frost, as well as the lack of a strong tradition in this type of activities that have been lost in the period of socialist economy. For these reasons, Poland ceased to be treated as a wine country. However, the observed climate warming, changes in the trends of alcohol consumption, as well as the rediscovery of the fact that in Poland there were a lot of vineyards, made the production of Polish wine begin to recover. The study used secondary data to provide a global wine market situation in Poland (size and type of production, the share of wine in the structure of alcohol consumption, formal requirements to such activity), as well as the primary data coming from the direct interview to describe the sample of Polish vineyard. The research indicated a strong potential for growth of wine market in Poland, and also showed that in spite of the specific climatic and economic conditions it is possible to conduct a successful wine business in this country.

Keywords: wine, vineyard, alcohol consumption.

AERDO10

TRADITIONAL AND REGIONAL FOOD PRODUCTS IN POLAND

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Observing the food market in Europe can be seen that consumers are increasingly looking for products related to a specific region or conventional or organic method of production. Such products are usually more expensive than mass-produced industrial food, but they have a number of advantages that attract buyers to them. Among these advantages can replace the high value of taste and nutrition, unique character associated with the specifics of the region or the mode of production without the use of artificial preservatives and enhancers, as well as greater certainty as to the origin of the product and its manufacturer. In Poland, the market development of the traditional and regional foods accelerated after the accession to European Union. This is due to the increase in awareness of the potential of such foods and the emergence of EU and national support (legal, institutional environment and financial) for high quality food, as well as the growth of real income of consumers. The paper presents the state of the Polish market of traditional and regional foods. Describes the support systems of this type of products on the national and EU level (including the List of Traditional Products, System Quality & Tradition, Protected Designation of Origin, Protected Geographical Indication, Traditional Speciality Guaranteed). To collect data in the studies have been used method of documentary and study of literature. Data sources were secondary and came mainly from the materials of the Ministry of Agriculture and Rural Development and the institutions involved in the organization and promotion of regional and traditional products in Poland. The results have been prepared in descriptive and graphic form.

Keywords: regional product, traditional product, food.

AERDO11

CONSUMER ASSESSMENT OF RASPBERRY TEA

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Recognizing the consumer preferences allows defining factors that determine the choice of the product. Knowing consumer preferences helps build a market offer and sometimes it is also used to manipulate the decisions of buyers by marketing signals. The focus of this paper is the analysis of fruit tea. The aim of this article was to determine consumer preferences towards tea and organoleptic assessment of three kinds of raspberry tea differing in composition and content of raspberries. Questionnaire surveys were conducted among 70 students of the University of Environmental and Life Sciences in Wrocław. The questions from the first part of the survey pertained to the frequency of drinking tea, the most popular types and forms of drinking tea (leaved, granulated, express), place of purchase, label reading and the characteristics that determine the choice of tea. In the second part the respondents were asked to do organoleptic assessment of raspberry teas (1 Tea: 11% raspberries, 2 Tea: 100% raspberries, 3 Tea: 0,6% raspberries). Firstly, the powdery teas were assessed in terms of smell, color and consistency, then the infusions were evaluated taking into account the smell, color and taste. Subsequently, the respondents answered whether the flavor of raspberries is perceptible and if the flavor different than that of the raspberries is sensible. People who drink tea 1-2 times a day prevailed in this study (this group accounted for 36%). The most enjoyable tea among the respondents was black tea (26%). The respondents declared that while buying tea they pay attention to taste, price, composition of label, healthproperties and also to the confidence and familiarization with the seller. Nearly 79% of respondents recognized the consistency of Tea 2 (powdery form) as very desirable. Taste of Tea 1 was identified as the most raspberry and Tea 2 was characterized as having the weakest flavor of raspberry. It was considered that the Tea 3 is to the greatest extent characterized by taste other than raspberry (identifying chemical additives, lemon and hibiscus).

Section: SUSTAINABLE MANAGEMENT OF NATURAL RESOURCES

Oral Presentations

SMNRO1

I KNOW YOU ARE THERE: PLANT-PLANT COMMUNICATION BY A BRIEF TOUCH

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In nature plants live together in communities constantly exposed to mutual mechanical contact. Such stimuli may reveal presence of competitors and induce adaption response in touched plants. The effect of plant response to brief mechano stimuli on growth pattern and their interaction with insects is still poorly understood. Contact between neighboring plants was simulated by a soft face brush. The terminal leaves of potato *Solanum tuberosum* L. were touched one minute per day. Non-glandular trichomes were counted on images made by light microscope while glandular trichomes and pavement cells were counted on images made by scanning electronic microscope. Volatiles released by touched and control plants were identified and quantified using coupled gas chromatography–mass spectrometry (GC-MS). Potato adaption to brief touching affected changes in pattern of biomass distribution, reduction in stem mass fraction and increase in branch and leaf mass fraction. The frequency of glandular trichomes and pavement cells was significantly higher on primary leaves from touched plants. Treatment didn't affect the size, weight and number of tubers. Touched plants significantly changed their volatile profile and released consistently greater quantities of (E)-β cariophylene, germacrene D-4-ol and (E)-nerolidol and lower quantities of the terpenes (E)-ocimene and linalool. Volatiles released from headspace of touched plants were significantly less preferred by *Macrosiphum euphorbia* (Thomas) and *Myzus persica* (Sulzer) then volatiles released by control plants. This study shows that brief contact may be an important cue for the detection of neighboring plants and may affect plant-insect interactions.

Keywords: adaption, *Solanum tuberosum* L., touching, plant interactions, biomass distribution, *Macrosiphum euphorbiae* (Thomas), *Myzus persicae* (Sulzer), trichomes, volatiles.

SMNRO2

IMPROVED WATER PRODUCTIVITY BY DEFICIT IRRIGATION: IMPLICATIONS FOR WATER SAVING IN ORANGE, OLIVE AND VINEYARD ORCHARDS IN ARID CONDITIONS OF TUNISIA

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Field experiments on deficit irrigation (DI) were performed in Médenine, Tunisia on drip-irrigated olive, orange and grapevine orchards during 2013 and 2014. Four irrigation treatments were compared: full irrigation (FI), which was irrigated at 100% of ETc for the whole season; two deficit irrigation (DI) strategies -DI75 and DI50- which received, respectively, 25 and 50% less water than FI; and traditional farming management (FM) - with water input much less than actually needed. The traditional farming (FM) applied 11, 18, 30 and 33% less water than the FI treatment, respectively, in orange, grapevine and table and oil olive orchards, indicating that farmers' practices represent a form of unintended deficit irrigation. Yield was reduced when deficit irrigation was applied and there were significant differences between DI75, DI50 and FM treatments. Significant differences were not observed between DI50 and FM treatments even though numerically smaller yield was observed in the former (DI50) as compared to the latter (FM). The irrigation water productivity (IWP) was significantly affected by irrigation treatments. The smallest IWP was recorded under the FI treatment, while the largest IWP was obtained under the deficit irrigation treatment (DI50). The DI50 and FM treatments reduced the economic return compared to the full treatment (FI), while the DI75 treatment resulted in a better economic return in respect to DI50 and FM. Full irrigation (FI) could be recommended for olive, orange and grapevine irrigation under the arid climate of Tunisia. Nevertheless, the treatment DI75 can be applied as a strategy under water scarcity conditions in commercial olive, orange and grapevine orchards allowing water savings up to 25% but with some reduction in yield and net return. The results would be helpful in adopting deficit irrigation in ways that enhance net financial returns.

Keywords: water productivity, deficit irrigation, drip irrigation, orchards.

SMNRO3

ANTIBACTERIAL ACTIVITY OF DIFFERENT EXTRACTS OF Helianthus tuberosus*L.*

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Helianthus tuberosus L. is a plant originating from North America, which is original cultivated for human consumption. In many studies researchers pointed to the fact that the extracts obtained with polar solvents have a greater microbial activity. In accordance with this, the aim of our study was to compare antibacterial activities of extracts of Helianthus tuberosus L. obtained in polar (methanol) and non-polar (petrol-ether) solvents. The strongest antibacterial activity was expressed by Helianthus tuberosus L. methanol extract on bacteria Salmonella Typhimurium ATCC 14028 and Escherichia coli ATCC 25922 while petrol-ether extract expressed strongest antibacterial activity on Salmonella Typhimurium ATCC 14028 (7,8125 µg/mL). The lowest antibacterial activity was expressed by petrol-ether extract on Listeria monocytogenes ATCC 19112 (500 µg/mL).
Results indicate that extracts obtained using a polar solvent have stronger antibacterial activity .

Keywords: *Helianthus tuberosus L.*, antibacterial activity, polar solvent, non-polar solvent.

Acknowledgment: Research was financed by the Ministry of Education, Science and Technological Development, Republic of Serbia, projects TR 31057.

SMNRO4

WATER FACILITIES IN FUNCTION OF SUSTAINABLE DEVELOPMENT OF THE SPECIAL NATURE RESERVE "ZASAVICA" IN VOJVODINA PROVINCE

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Construction of water management facilities as well as land reclamation have an impact on the sustainable development of protected natural areas. Justification of construction of the water gate on the Modran channel should meet the requirements of users with opposing aims. In the focus of the research in this paper are objectives of "Zasavica" special nature reserve as well as users of agricultural land (12,000 ha) which gravitates to this channel. For the assessment of justification, multiple methods were used such as investment and differential calculation, calculating rent value of land, real rent value of land, capitalised value, etc. Necessary investment for the water gate construction is about € 155,000.00. During the use period of this facility, annual operating costs would reach the amount of about 3,000 €/year. The main benefit of building this object is the reduction of damage from flooding by inland waters. Also, requests of special nature reserve that is needed to keep the Modran channel full of water would be met (biodiversity). For most common crops in this area (wheat, corn), several economic indicators were calculated: income and production costs (€/ha), profit (€/ha), calculating the actual land rent (€/ha), capitalized value (€/ha). These values could be expected after the construction of the water gate. Expected values are at the level of the area to which they belong (Srem). Expected effects after the construction of this building in terms of a special nature reserve are: the development of rural tourism, hospitality and recreation and better employment of the local population. Researches have shown that even after the construction of this building there is a risk of flooding (in wet years) in this area. Three scenarios of risk management that could be applied in order to redress the owners of agricultural land have been proposed. Ecological effects after the construction of this building were assessed in relation to microclimate, the quality of surface and ground water, air, noise, soil quality, visual pollution and safety. After all these parameters, the construction of this facility does not threaten the ecological and aesthetic value of the area.

Keywords: economic effects, Modran channel, water gate, natural reserve.

SMNRO5

VERIFICATION OF EXTRACTION METHODS OF POTATO CYST NEMATODES BY SEINHORST ELUTRIATOR

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Process of analysis of official samples in phytosanitary laboratories according to national and international standards shall be verified or validated based on the scope of methods and equipment used within each laboratory. This process is essential since it is a proof that the laboratory performs analysis according to widely accepted international standards. Potato cyst nematodes (PCN) *Globodera pallida* and *Globodera rostochiensis* are among the most damaging pests of potato, placed on quarantine lists of the most countries in the world. They are specific among nematodes since they form cysts, cuticular structures of female dead body. The cyst protects several hundred eggs within it from different type of damage. The capacity of juveniles inside eggs to survive for more than 20 years makes this group of plant-parasitic nematodes extremely tough for control. The European Commission adopted a directive which proposes that it is obligatory for each member state to sample at list 0.5 % of wear potato area and each hectare of seed potato production. This directive has been fully implemented in Bosnia and Herzegovina. Verification of extraction procedures of soil samples by Seinhorst elutriator covered the following criteria: analytical sensitivity, selectivity, repeatability and reproducibility. Analytical sensitivity was verified by a number of cysts extracted from 32 samples. Selectivity criteria included two soil types: sandy and clay soils and dry and wet soil. Repeatability covered each criteria from selectivity test 4 times for two densities of cysts 5 and 10. Reproducibility was verified for two different operators on different days. Accepted extraction efficiency is 60% or more and this study revealed that the laboratory performs extraction of PCN in a range of 80-90 % depending on soil type, soil condition, number of cysts in a sample, operator and time. Verification procedure showed that the laboratory can properly carry out Seinhorst extractor techniques in routine analysis.

Keywords: official samples, *Globodera pallida*, *Globodera rostochiensis*, equipment, laboratory.

SMNRO6

DETECTION OF THE BEAN COMMON BLIGHT BACTERIA, Xanthomonas axonopodis pv. phaseoli (Xap) IN BEAN SEEDS

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This research describes the detection of Xanthomonas axonopodis pv. phaseoli (Xap) bacteria in bean seeds using isolation method on semi-selective medium Milk Tween Agar (MT). Using the MT medium, Xap formes yellow, shiny, convex colonies with two zones of hydrolysis, a larger clear zone and a smaller, milky one. As a positive control Xap reference material was used (producer CIRM, France). Grown colonies of the tested samples were compared for shape, size, color and consistency with the positive control colonies. Xap is a Gram negative, catalase-positive, rod-shaped bacteria, therefore Gram staining and catalase tests have been performed on the colonies suspected to be Xap, to determine the presence of this bacteria. Above mentioned pathogen is the causative agent of bean common blight, causing great damage to the crops and can be spread by seeds over long distances. Bacteria could be present on seeds with and without visible symptoms, therefore its detection in seeds is very important, especially in lots intended for commercial sowing.

Keywords: seeds, beans, bacteria, detection, Xanthomonas.

Acknowledgment: Research was co-financed throughout the Republic of Srpska's Ministry of Science and Technology project of bilateral cooperation with the Republic of Slovenia "Genetic Resources of Leguminous Plants for Human Consumption and their Role in Sustainable Agriculture" (no.19/6-020/964-10/16)

SMNRO7

HERBICIDE SELECTIVITY TO MAIZE INBRED LINES AND POSSIBILITY OF COMBINED APPLICATION OF HERBICIDE AND FOLIAR FERTILIZER IN MAIZE SEED CROP

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Maize breeding is one of most profitable practices in agriculture. According to FAO, maize is the third crop grown worldwide after rice and wheat, and the first according to seeded area in Serbia (about 1,2 million ha). One of the most important challenges in this production is weed control. Maize line crossing brings maize hybrids. However, maize inbred lines are homozygous and they have slowlier growth, germination and smaller habit comparing to maize hybrids, where weeds have a lot of free space for germination and development. Also, maize lines are generally more sensitive to herbicides than hybrids and their application is not registered for use in seed crop. According to numerous studies, herbicides especially post-em, can negatively affect maize plants, with a decrease of yield or its loss. Optimal plant nutrition elevates plant response to stress factors (abiotic and biotic), including herbicide stress. Foliar application of nutrients – foliar fertilising could help plants avoid herbicides stress and decrease possible negative impact on plants. A three-year field experiment (2010-2012) was set up to test selectivity of applied herbicides in five maize inbred lines. Herbicides (mesotrione, topramezone, rimsulfuron and foramsulfuron) were applied in 5-6 leaf stages in recommended and double dose for hybrid maize. For diminishing herbicide stress, foliar fertilizer was applied with herbicides (formulation 12:4:6+ME+AA). Visual damage estimation, as well as leaf area, plant height and fresh mass were measured in the period of 2-3 weeks after treatments and in flowering stage. Maize grain yield was estimated in harvest. Obtained data were statistically processed by ANOVA and differences between means were tested by LSD test.Applied herbicides showed different selectivity: triketones did not cause significant injuries and had minor effects on measured parameters and grain yield. Sulfonylurea herbicides caused significant visual injuries in most lines. Two lines, early maturity group, had the highest injuries and a decrease in all measured parameters and they were characterised as sensitive. Two lines were medium sensitive and one was tolerant. In the tolerant line, the slight visual injuries were observed with minor impact on measured parameters andno influence on grain yield. Applied foliar fertilizer showed a positive effect on maize lines, with significant increase of measured parameters and grain yield, especially in sensitive lines.

Keywords: corn, triketons, sulfonylurea, fertilizing.

SMNRO8

THE IMPACT OF ARTIFICIAL INFESTATION OF WESTERN CORN ROOTWORM ON MAIZE ROOTS IN VOJVODINA PROVINCE, SERBIA

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The Western corn rootworm (WCR), *Diabrotica virgifera* sp. *virgifera* LeConte (Coleoptera: Chrysomelidae), is an economically important maize pest in Europe. It is native in America, but present worlwide. This pest was first detected in Serbia in 1992, near the Belgrade airport. Field experiments were carried out from 2014 to 2016 in Bečej, Vojvodina province (Serbia), with Serbian cultivar NS-640, with maize in monoculture. In the experimental field, 96 plants were selected, marked and arranged in 48 pairs. Each pair consisted of two plants. The first was artificially infested with WCR egg suspension (4mL) in the root zone (D plant) and the second, the control plant (C plant), injected with the same amount of distillated water in the root zone. During all tree years, the experimental field was inspected regularly, on weekly bases. Root damage was evaluated during the last field inspection (September or October), according to a scale established by Ostlie and Notzel (1987). Comparing the root damages on C and D plants in 2014 and 2015, more severe root damages were recorded on D plants. In 2016, level of root damages caused by larval attack, on C and D plants did not differ significantly. The number of C plants with healthy root system rapidly declined from one year to another (46 in 2014, 25 in 2015 and 3 in 2016). The results of the three-year study indicate that in 2014 the majority (46 out of 48) of the C plants were with healthy roots (rate 1), while in 2016 the highest number of C plants (10 out of 48) was with a completely destroyed root system (rate 6). The highest number of D plants, with high levels of root system damages (rate 6) was registered in 2015 (18 out of 48), while the highest number of D plants with healthy root system (rate 1) was in 2014 (6 out of 48). Given indicates that there is no specific pattern in the movement of WCR larvae in the soil, but also the effect of different weather conditions should be considered (temperature and soil moisture).

Keywords: WCR, artificial infestation, maize, root inspection, damages.

SMNRO9

MORPHOLOGICAL AND MOLECULAR IDENTIFICATION OF *Frankliniella occidentalis* (Pergande) IN THE REPUBLIC OF SRPSKA

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The western flower thrips, *Frankliniella occidentalis* (Pergande) (Thysanoptera: Thripidae) is the most economically important pest among thysanopterans, due to its extremely wide host range and geographical distribution. It is also a quarantine pest at the EPPO A2 quarantine list: No. 177. This polyphagous species causes direct damages such as flower and bud deformation, shape distorsion of fruits and leaf spots mainly on fruit trees, vegetables and cultivated flower plants both in greenhouse and in open filed and indirectly by transsmiting phytopathogenic fungi, bacteria and viruses (5 of the 17 recognized Tospovirus species). During the survey for sanitary status of nurseries in 2016 in one greenhouse in Nova Topola (Republic of Srpska, Bosnia and Herzegovina) the presence of high population of thrips was foundon *chrysanthemums flowers*. Flowers were picked and each blossom was examined using stereomicroscope for species identification. *F. occidentalis* was confirmed by morphological characters of adults, following EPPO diagnostic protocol PM 7/11(1). In addition, thrips identification was performed by amplification of internal transcribed spacer 2 (ITS2) regions. The obtained ITS2 sequences from two specimens subjected to comparison with the publicly available sequence data in the NCBI database showed 99-100% identity with *F. occidentalis* specimens from Taiwan, USA and China. Confirmation of the presence of *F. occidentalis* in the country is of economic importance representing a significant finding for further management and control of the pests and tospoviruses on vegetable and ornamental crops.

Keywords: western flower thrips, nurseries, chrysanthemums flowers, morphological characters, ITS2.

SMNRO10

OCCURENCE OF GRAPEVINE PINOT GRIS VIRUS IN BOSNIA AND HERZEGOVINA

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Grapevine Pinot gris virus (GPGV) belongs to the genus *Trichovirus*, family *Betaflexiviridae*. It was first identified in 2003 in grapevine cultivars Pinot Gris and Traminer, grown in the Northern Italy (Trentino area). The virus was subsequently recorded in other Italian regions and in other countries such as: Slovenia, the Czech Republic, Slovakia, Greece, France, China, Turkey, Republic of Georgia and South Korea, Canada and the USA. Regarding Bosnia and Herzegovina (BiH) there is a report of the virus detection in one sample of cv. Blatina that was sent for virus analyses in Italy in 2010. Etiology of the disease is still not completely clear. The most common symptoms that were observed on infected plants are chlorotic mottling, puckering and deformation of the leaves, reduced yield, and low quality of the berries. However, the virus occurs also in asymptomatic grapevines. Preliminary results obtained from transmission trials suggest that the *Colomerus vitis* mite can acquire GPGV and transfer it to healthy grapevines, making the mite a potential candidate vector for natural GPGV transmission. Because of a severe outbreak of the disease in Italy and Slovenia, we conducted a screening for the presence of GPGV in the vineyards of Northen (Prnjavor, Derventa) and Southern (Grude) parts of BiH. In vineyards from Prnjavor and Derventa leaves from plants with virus-like symptoms were collected at the end of May 2016 while from Grude locality at the end of June 2016. At these localities presence of eriophyd mites was observed. Total RNA was extracted using the RNeasy Plant Mini Kit (Qiagen) following MacKenzie et al. (1997). The presence of GPGV was tested by RT-PCR using specific primer pairs DetF / DetR. An amplified product of 588 bp, obtained from one sample (Derventa locality, cv. Traminer) out of 13 tested was subsequently custom-sequenced (Macrogen Europe, The Netherlands). BLAST comparison of the obtained sequence (GenBank accession No. KY320458) with comparable GPGV sequences retrieved from GenBank, disclosed that the highest identity at the nuclotide level (99%) was with the isolate GPGV ZA505-8N from Trentino (GenBank accession No. LN606732.1).This survey was performed on small number of samples but the obtained result constitutes an alarming finding for a viticultural area and in the future detailed study should be performed on GPGV etiology and epydemiology in BiH.

Keywords: vinyards, GPGV, BiH, RT-PCR, sequencing.

POSTER PRESENTATIONS

Section: PLANT SCIENCE

Subsection: Horticulture

HP1

ESSENTIAL OIL COMPOSITION AND BIOACTIVITIES OF POST-DISTILLATION EXTRACTS OF THREE MACEDONIAN SALVIA SPECIES

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Many Salvia species are strongly aromatic plants possessing a range of biological activities. The aim of this study was to examine essential oil composition of Salvia amplexicaulis, S. jurisicii and S. ringens from Macedonia, total phenolic and flavonoid contents as well as antioxidative and antineurodegenerative activities of post-distillation extracts. Essential oils were isolated using hydrodistillation and their compositions were analyzed by GC-FID and GC-MS. Post-distillation plant material was extracted using 70% methanol, 70% ethanol and hot water. Total phenolic and flavonoid contents were measured spectrophotometrically. Antioxidant activity of extracts was examined using DPPH assay, while antineurodegenerative activity was evaluated in terms of inhibition of acetylcholinesterase and tyrosinase. Essential oils of S. amplexicaulis and S. jurisicii were mainly composed of oxigenated sesquiterpenes with spathulenol (12.3%) and caryophyllene oxide (11.3%) as dominant components, respectively. The main components of S. ringens oil were oxigenated monoterpenes, mainly 1.8-cineole (31.99%). The highest total phenolic contents was obtained for S. ringens methanol extract (146.49 mg GAE/g), followed by aqueous and methanol extract of S. amplexicaulis. Ethanol extract of S. amplexicaulis and methanol extract of S. ringens contained the highest amount of flavonoids (67.51 mg QE/g and 56.14 mg QE/g, respectively). Methanol and aqueous extract of S. amplexicaulis and alcoholic extracts of S. ringens showed the strongest antioxidant activity, neutralizing more than 80% of DPPH radical. The extracts of analyzed species inhibited tested enzymes in range of 20-40% for acetylcholinesterase and 20-60% f or tyrosinase, with the strongest antineurodegenerative activity obtained for methanol and aqueous extracts of S. amplexicaulis. The results showed that analyzed species produce mono- and sesquiterpenes rich essential oils. Polar fractions of post-distillation plant material of these species, especially of S. amplexicaulis and S. ringens, contained high level of phenolics and flavonoids and showed antioxidant and enzyme-inhibiting activities. This result leads to a conclusion that post-distillation waste could be exploited as raw material for extraction of plant phenolics possessing potential biological effects.

Keywords: Salvia spp., extracts, bioactivities, phenolics.

HP2

EFFECT OF DIFFERENT AGE OF PEPPER SEEDS ON THE VEGETATIVE BEHAVIORS AND PHYSIOLOGICAL STATUS OF SEEDLINGS

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The main aim of the present study was to evaluate the influence of the different age of pepper seed on the changes of vegetative development and physiological status of the grown seedlings. Experiments were carried out with seeds from two typical Bulgarian pepper cultivars Kurtovska kapia 1619 and Bulgarski rotund. The seeds were stored from 12 to 120 months in ambient conditions in paper pouches. During the period of 12 mounts the sowing quality – germination energy (first count), germination (final count) and percentage of normal developed sprouts were established. The vegetative experiments were conducted in vegetative growth box. The length and weight of root, length and weight of stem, number and weight of leaves and leaf area were measured. The intensity of respiration and guaiacol peroxidase enzyme activity in seeds were analyzed. The leaf gas-exchange parameter as intensity of photosynthesis and transpiration and stomata conductivity were accounted. Pepper seeds preserve normal sowing quality to 4 years. The length of root and stem decrease with an increase of storage period . The intensity of photosynthesis and transpiration were inhibited for seedlings of aged seeds. The same process occurred in terms of intensity of respiration and the guaiacol peroxidase enzyme activity in the seeds.

Keywords: sowing quality, germination, leaf gas-exchange, photosynthesis, transpiration.

HP3

VEGETATIVE BEHAVIORS OF LINDEN SEEDLINGS (Tilia ssp.)

Valentin Panchev, Valeria Ivanova

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The main goal of this study was to establish the morphological development of the seedlings of Tilia ssp. The experiments were carried out with seeds from three species of Tilia - Tilia grandfolia, Tilia cordata and Tilia tomentosa. The seeds were harvested from trees in the region of Plovdiv on the 30th, 45th, 60th, 75th and 90th day. The seeds were sown in soil bed immediately after collecting. The percentage of sprouting and percentage of the developed and survived seedlings were recorded. In the stage of development of 3-4 leaves the morphological characteristics such as: length and weight of root; number of root brunches; length, diameter and weight of stem; number, weight and area of leaves were measured. The fresh weight and dry weight of root, stem and leaves were established. In these experiments it was observed that only seeds from the 90th day developed seedlings. The species differences were established. The highest stem was measured for Tilia tomentosa, followed by Tilia cordata. The seedlings from Tilia grandifolia developed the biggest root system. The propagation of linden by seed is most appropriate to be carried through by 90 daily seeds.

HP4

POSSIBILITY OF USING GREEN CUTTINGS IN VEGETATIVE PROPAGATION OF *Sequoiadendron giganteum* (Lindley) Buchholz

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An experiment was carried out studying the effects of genotype, treatment with growth regulators and duration of rooting period on the percentage of rooting and quality of the root system of green cuttings of gigantic sequoia (Sequoiadendron giganteum (Lindley) Buchholz). Cuttings were taken from 18 ten-year seedlings of 10 species of origin. The duration of rooting period (3 months vs. 4 months) was statistically reliable for rates in terms of root and callus formation. The extension of rooting period for one month affords 57.76% rooted cuttings more. The genotype is the main factor influencing the percentage of rooting, number of roots formed and the length of the main root. Treatment with auxin also increased the percentage of rooting, number of roots formed and the length of the main root. Treatment with 2000 ppm indolyl butyric acid (IBA) gave the best results at the end of the third month, but for the four-month rooting period, cuttings treated with 4000 ppm IBA showed the highest percentage of rooting.

HP5

THE INFLUENCE OF SET SIZE AND PLANTING TERM ON THE SPRING ONION QUALITY AND YIELD

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Yield and overall quality of the Spring Onion (Allium cepa L.) are determined by planting term, set quality and ecological conditions for its production. In this research, the aim was to examine the influence of the set size and planting term on the spring onion quality and yield, when it comes to open field spring onion production. The research was conducted in Banjaluka (Bistrica village; N 44˚48.421'; E 017˚02.637'; at 308 m altitude) in the Republic of Srpska. The variety Sturon (GO PRODUCTS BU, Netherlands) was used in the experiment. Sets were divided into 3 different categories: up to 13 mm (A1), 13-19 mm (A2) and over 19 mm (A3). Planting was conducted in 2 planting terms (B1 – 20.03.2016 and B2 – 31.03.2016). The experiment was laid out in Randomized Complete Block Design (RCBD) using 4 replicates. The obtained results showed that the largest sets in the first planting term (A3B1) produced the Spring Onion of the highest quality, having the average mass of 51.80 g per plant. Also, the other observed parameters were in direct relation to the increase of the set size: the average diameter of the pseudostem amounted to 14.00 mm, with its length of 13.00 cm, and the average height of the plant being 55.30 cm. The average yield was 3.70 kg m-1. The highest content of the dry matter was 15.20 % and the highest concentration of Vitamin C was observed at the plants grown from the smallest fraction of the first planting term (23.16 mg/100 g f.m.).

Keywords: spring onion, set size, yield, quality, planting term.

HP6

THE IMPACT OF DIFFERENT BUD LOADS ON AGRO-BIOLOGICAL AND TECHNOLOGICAL FEATURES ON SOME GRAPEVINE VARIETIES CULTIVATED IN PODGORICA SUBREGION

Sanja Vlaisavljević, Milica Filipović

"13 jul Plantaže", Podgorica, Montenegro

This paper presents the achieved results of examining the impact of five different bud loads on vine (6, 8, 10, 12 and 16 buds) on agro-biological and technological features of cultivars: Cabernet Sauvignon, Petit Verdot and Marselan cultivated in agro-ecological conditions of sub-region of Podgorica. The research was performed during 2013 vintage and the aim was to determine the impact of different pruning and bud load on yield and grape quality of examined cultivars. Yield indicators, mechanical composition of bunch and berry, yield and grape quality were determined during vegetation period within all different bud loads for examined cultivars. Based on achieved results it can be concluded that grape cultivars, Petit Verdot and Marselan, had the highest yield when 16 buds were left for winter pruning, 2.43 kg/vine and 1.16 kg/vine, respectively. Unexpectedly, grape variety Cabernet Sauvignon achieved highest yield (1.43 kg/vine) when only 10 buds were left for winter pruning. Regarding the highest sugar content, within all examined cultivars, different bud load treatments achieved the highest values. For grape cultivar Petit Verdot the load was made of 8 buds, for Cabernet Sauvignon it was 12 buds, while the highest sugar content in grape of Marselan cultivar was achieved when 10 buds were left for winter pruning.

Keywords: bud loads, yield, grape variety, grape quality.

HP7

THE EFFECT OF THE CULTIVAR ON THE CABBAGE HEADS AND HARVEST RESIDUES YIELD

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The importance of cabbage in the human diet is well known. In the vegetable crop rotation system it is grown predominantly in the open fields. After harvest, cabbage harvest residues (leaves and stems) remain in the field and could be utilized both for improving the soil quality and as animal feed. In our experiment, 20 late cabbage cultivars were grown in the field conditions to evaluate yield of heads and harvest residues. The average yield of cabbage heads was 60t/ha and 31.72t/ha of harvest residues. Heads yield varied between 39.31 to 87.68t/ha. The yield of harvest residues ranged from 7.11 to 63.37t/ha. There was a significant difference between cultivars for both, heads and cabbage harvest residue yields.

Keywords: cabbage, cultivar, yield, harvest residues.

HP8

EFFECTS OF MULCHING AND CULTIVAR ON PRODUCTIVE CHARACTERISTICS OF POTATO

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Soil mulching is a common practice in vegetable crop production, but there is scarce information about the influence of this technique on the yield of potato (Solanum tuberosum L.). Field experiments were conducted to investigate the effects of different mulch materials on productive characteristics of three potato cultivars: Marabel (medium early), Laura (medium early) and Agria (medium late) in agroecological conditions of southern Srem, Serbia. Treatments were arranged in a randomized complete block design with four replications with irrigation drip system at the site of Zemun Polje (44°88'S, 20°35'I, NV79 m) in 2011 and 2012. The variants with white plastic mulch, black plastic mulch and straw mulch were compared to a control plot with bare soil. The highest average number of tubers per plant was determined in cv. Marabel subjected to the straw mulch treatment and cv. Laura on control variant (11.85), while the lowest average number of tubers was determined in the cv. Agria on variants with white and black plastic mulch (8.20). In a two-year study, the highest average total yield in cv. Marabel (54,95 t ha-1) and cv. Agria (47,1 ha-1) was obtained by application of straw mulch, in cv. Laura on control variant (49,95 t ha-1). The study showed that investigated factors, types of mulch and cultivar, significantly affected the number of tubers per plant and total yield of potato.

Keywords: mulching, cultivars, number of tubers, potato yield.

HP9

EVALUATION OF MUST COMPOSITION AND WINE QUALITY OF SEVEN CLONES OF Vitis vinifera cv. Muscat

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The objective of this work was to characterize must and wine of eleven clones, MPG 154, MPG 454, MPG 455, VCR 5, VCR 100, VCR 102, R1, R2, FR 94, BEMK-33, B41/5 of Muscat. The experiment was carried out in Vipava Valley, Slovenia during 2015 harvest season. During grape ripening soluble solids, total acid and pH were evaluated. Individual free terpenes and physical-chemical properties of must and wine were evaluated. During ripening, clones FR94, BEMK-33 and B41/5 accumulated soluble solids more rapidly, because they ripe earlier than others, but harvest clones VCR 100, VCR 102 and VCR5 accumulated more soluble solids and less total acids than other clones. The clones showed different phenological cycle. The wines produced showed differences in physical-chemical properties and free terpenes content. Clone VCR 5 had the highest free terpene content and thus it was best rated.

Keywords: clone, Muscat, terpene, wine quality.

HP10

INDICATORS OF YIELD AND QUALITY OF GRAPES OF INTERVARIETAL GRAPEVINE GENOTYPES

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High production and quality of grapes depend primarily on the results of grapevine breeding i.e. potential of cultivated cultivars. Almost all cultivars that are now represented in the vineyard production were created through breeding. Genes contained in a cultivar affect yield, quality, resistance to diseases and pests, the relationship to the external environment and to all agro-technical measures applied from planting to harvesting, as well as the processes after harvest. This paper presents the results of yield and quality of grapes for three new intervarietal grapevine genotypes, created in the Center for Viticulture and Enology in Nis. Genotype NI 11-92 comes from the crossing combination of Prokupac x Gamay Noir, genotype NI 4-91 from the crossing combination of Tamjanika white x Smederevka, and genotype NI 8-92 from the crossing combination of Smederevka x Red Traminer. In all genotypes major agro technological and economic characteristics were researched for the period from 2006 to 2008. The earliest movement of buds and ripening time was found in the genotype NI 11-92 (14.04.; 09.18.), and the latest in the genotype NI 4-91 (16.04.; 22.09.). The initiation of flowering of all the genotypes was in the last decade of May. Genotype NI 8-92 (5.03 kg) had the highest yield per vine, and genotype NI 11-92 (4.14 kg) the lowest. The bunch weight in the genotypes ranged from 165.37 g (genotype NI 11-92) to 208.50 g (genotype NI 4-91). Genotype NI 8-92 (20.19%; 6.20 g/l) had the minimum sugar content and total acids in grape, and genotype NI 11-92 (22.06%; 7.43 g/l) the largest. Studied traits indicate that it was the gender and quality genotypes that met the objectives of the set selection.

Keywords: grapevine, selection, genotypes, yield, quality.

HP11

POMOLOGICAL AND CHEMICAL CHARACTERISTICS AND SENSORY EVALUATION OF AUTOCHTHONOUS POMEGRANATE CULTIVARS GROWN IN MACEDONIA

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The aim of this study was to evaluate some physical, chemical and sensory characteristics of seven autochthonous (Lifanka, Bejnarija, Karamustafa, Ropkavac, Valandovska kisela, Lifanka clone and Zumnarija) cultivars and one commercial (Higjas) pomegranate cultivar collected from the southern part of Macedonia. Fruit quality was assessed by standard parameters (fruit and aril weight and dimensions, soluble solids, total acid) and sensorial quality by panel tests (fruit size, shape and colour; juiciness, sweet/acid taste). Among evaluated cultivars high variability in fruit and seed weight and size were noticed. The highest weight was determined at cultivar Higjas (551,9 g) while the smallest was at cultivar Ropkavac (282,2 g). Large differences in sensory scores for fruit taste were found between cultivars. Highest score was given to the cultivar Karamustafa while cultivar Valandovska kisela got the lowest points in sensory evaluation.

Keywords: *P. granatum*, fruitquality, sensory evaluation.

HP12

INVESTIGATION OF THE CORRELATIONS BETWEEN QUANTITATIVE TRAITS WHICH DETERMINE YIELD IN THE VINE CULTIVAR BOLGAR AND THE HYBRID COMBINATION BOLGAR X RUSSALKA 1

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The correlations between quantitative traits, which determine yield in the vine cultivar Bolgar and F_1 progeny of the hybrid combination Bolgar x Russalka 1, have been investigated through Path-analysis. It has been found that there are no traits, highly significant for the formation of yield from the Bolgar cultivar, for which the correlation coefficients, direct and total indirect influences have positive values. Positive correlations have been reported between the two parent cultivars and F_1 progeny for the traits: shoot and fruiting shoot fertility coefficient, cluster width, total number of shoots, fruiting shoots and clusters. All studied fertility coefficients in the cultivar Bolgar exert positive direct influences, determined by moderate correlations, on the seedlings from F_1 progeny. The correlations of the other traits and the influence of separate parent cultivars have positive or negative values, which can be used in the selection of valuable elite forms.

Keywords: Bolgar, Bolgar x Russalka 1, yield, quantitative traits, path-analysis.

HP13

PHYSIOLOGICAL CHARACTERISTICS OF TWO APPLE CULTIVARS IN BANJA LUKA

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The objective of this one-year study was to examine morpho-physiological characteristics of two apple cultivars Ajdared (Turjak, Gradiška) and Zlatni delišes (Jablanica, Gradiška) purchased on two different markets in Banja Luka (open market located in the city centre and open market located in periphery). Fifteen apples from each variety were chosen for analyses. Fruit quality parameters total soluble solids (refractometric method), total titratable acidity and starch were analyzed. Results showed that almost all analyzed parameters of Ajdared and Zlatni delišes were higher in samples taken from market located in the city centre.

Keywords: fruit quality, apple, variety, market.

HP14

EFFECT OF RED, FAR-RED AND BLUE-LIGHT-EMITTING DIODES ON IN VITRO GROWTH OF Ocimum basilicum L.

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The effects of monochromatic blue, red and far-red light from commercially available light-emitting diode modules on in vitro growth of Ocimum basilicum were compared with the effect of fluorescent light. The plants were micropropagated on a standard MS medium with 5 µM meta-Topolin riboside (mTR). Our study showed that monochromatic blue, red and far-red and their combinations are not suitable for manipulating the number of shoots, shoot length, number of roots and roots length, fresh and dry weight of the plants and chlorophylls content. In general, the presence of blue light stimulated the shoot length, but also reduced shoot number. Grown under red light, the explants produced less, but had more elongated roots. Blue had a negative effect on biomass production in general with a reduction in the total number of shoots and both fresh and dry weight. No significant effect of different kind of light on the chlorophylls a and b contents.

Keywords: LED, micropropagation, Ocimum basilicum.

HP15

MORPHOLOGICAL CHARACTERISTICS OF LEAF AND FRUIT OF INDIGENOUS VARIETIES OF PLUM IN THE BANJA LUKA REGION

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Inventory and collecting of indigenous varieties of fruit trees is one of the main activities of the Working Group for fruit trees and vines in the framework of the Programme of conservation of plant genetic resources of the Republic of Srpska. In Banja Luka region, seven plum accessions were inventoried: Bjelica, Durgulja, Prskulja, Savka, Verićka durgulja, Nepoznato ime 1 and Nepoznato ime 2. Collecting graft branches from these accessions was done in order to produce planting material which will complement the existing collection of fruit trees of Genetic Resources Institute. Fruits and leaves of those accessions were collected in order to determine the following parameters: length and width of fruit, stone and fruit stalk as well as the weight of the fruit and the length and width of leaf blade and leaf stalks. The results showed that the accession Durgulja had the highest fruit length (36,45 mm) and length of the leaf blade (93,13 mm), accession Savka had the highest width of fruit (29,43 mm), the highest length of the fruit stalk (13,6 mm) and the highest length of stone (23,59 mm). Accession Prskulja had the highest width of the fruit stalk (5,79 mm), accession Nepoznato ime 2 had the highest fruit weight (21,17g) while accession Nepoznato ime 1 had the highest width (14,15 mm) and length of stone (8,68 mm) and the highest width of the leaf blade (46,84 mm) and width of leaf stalk (1,48 mm). Accession Bjelica had the highest lenght of leaf stalk (23,39 mm).The results showed that accession Prskulja had the minimum values according to these parameters while accession Nepoznato ime 1 had the highest value . For further evaluation of plum accessions, it is necessary to determine the nutritional value of fruits and the possibility of their storage, as well as a molecular characterization to determine the degree of genetic similarity between analysed accessions.

Keywords: characterization, evaluation, collection of fruit trees.

HP16

FORECASTING TRENDS IN APPLE PRODUCTION IN BOSNIA AND HERZEGOVINA UNTIL 2020

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The aim of the paper is to forecast apple production in Bosnia and Herzegovina until the year of 2020. The subject of the research is analysis of production trends in the apple production, respectively the number of trees, total quantity of production and the yield per tree. The analysis covers historical data in the period from 2006 to 2015, and forecasting parameters for the next five years. The interpretation of the status of apple production used statistical indicators such as: arithmetic mean value, interval variation, coefficient of variation, and rate of change. On the other side, the statistical trends have been used for the projections of development of apple production. In order to eliminate the influence of extreme weather conditions in the years of 2012 and 2014, corrections of the achieved yield data were made by the simulation method.Afterwards, the projections have been made in two scenarios, both original and corrected data. The outcomes of the projection imply that the number of trees has been increasing steadily, and it will reach a level of 9,8 million in 2020. The yield per tree will slightly decrease,so it is expected that there will be around 13,3 kg by 2020. Also, total apple production is expected to reach about 118 000 tons. In the observed period, total production will constantly grow, however the rate of growth will be lower than the growth of the number of trees due to slight decrease of the average yield per tree.

Keywords: apple, forecasting, number of trees, quantity of production, average yield.

Section: PLANT SCIENCE

Subsection: Crop Sciences

CSP1

PHENOTYPIC DIVERSITY AMONG MAIZE ACCESSIONS COLLECTED FROM MACEDONIA IN DIFFERENT PERIODS

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Since 1960-ties, a total of 2217 maize landraces, originated from the former Yugoslavia territory, were collected and stored at Maize Research Institute Zemun Polje (MRIZP) gene bank.Out of them, 222 landraces were collected in Macedonia.In 2014, new collecting missions were organized in Macedonia and about 100 new samples were collected. From MRIZP and Macedonian gene banks 30 accessions were chosen based on collecting site, kernel colour and kernel type. Accessionswere evaluated using 23 traits according to IBPGR maize descriptors. Total variation was tested by Principal component analysis. The first three principal components explained 66% of the total variation. The first component explained 32.3% of the variation among accessions and it was associated with variables related to plant architecture. The second principal component explained 23.8%, differentiated the accessions by precocity and kernel characteristics. The third component explained 10.3% of variation, related do ear diameter and shape.Founded differences and similarities allowed more successful conservation and maintenance of maize landraces,by preservation of existing biodiversity and elimination of possible duplicates. Cluster analysis obtained by heat map, separated all accessions in four groups, depending of plant phenology and ear and kernel traits.Obtained results indicate morphological traits for characterization of maize landraces that could be useful for differentiation of accessions aimed for creation of core collections for various purposes and future needs in breeding programs.

Keywords: maize, landraces, gene bank, IBPGR descriptors.

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CSP2

NITROGEN SOURCE, ROW SPACE AND HERBICIDE TREATMENT INFLUENCE ON MAIZE LEAF AREA PRODUCTION

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Fertilizers are important component of the agriculture production. Slow-realising urea has been widely adopted to increase nitrogen use efficacy and crop production. Maize morphological and phonological development usually depends on inter- and intra-row competition and it is limited by the presence of weeds. In order to successfully produce maize, growing technology requires application of more efficient forms of nitrogen and herbicides. The investigations were conducted during 2014-2015. Experiment was organised as split-split plot block design with four replications. Maize hybrid ZPSC 388 was sown in two different inter-row distances, 50 cm and 70 cm, during the second decade of April. Nitrogen fertilizer was applied in two forms: standard urea- N1 and slow-realizing urea with ureaze inhibitor (triamid UTEC (n-butil) thiophosphate, Eurochem Agro, Germany) - N2. Both forms were applied at maize stage BBCH 05. Herbicides mix for grasses and broadleaf weeds were applied pre-emergence (s-metolachlor 960 g ha^{-1} + mesotrione 120 g ha^{-1}) and post-emergence (nicosulfuron 40 g ha^{-1} + mesotrione 120 g ha^{-1}) with hand-held sprayer calibrated to deliver 15 l at 300 kPa (3 bar) with a flat-fan nozzle (Teejet, 1.4 mm E 04-80). The untreated control was also included. The maize leaf area was measured from three plants per elementary plot, at tasseling when all the leaves were completely developed by a LI-COR 3100C area meter (Lincoln, Nebraska, USA). The differences between the treatments were determined by analysis of the variance (ANOVA).The application of slow-realize urea did not make a significant influence on maize leaf area production during two similar years of investigation. On the contrary, row space and herbicide application influenced leaf area of maize, especially in 2014. Leaf area per maize plant reached the higher value when maize was sown at 70 cm distance in 2014 (12812.93 cm^2) than in 50 cm (10209.72 cm^2),while in 2015 no differences in leaf area production were observed between 50 and 70 cm row distance. Herbicide application contributed to maize competitiveness among all tested factors, with increasing maize leaf area and the highest value for this parameter was reached after pre-emergence application of herbicides, in 70 cm row distance in 2014 (14365.78 cm^2).

Keywords: maize, nitrogen fertilizer, row space, herbicides, leaf area.

CSP3

NITROGEN FERTILIZING, PRODUCTIVITY AND GRAIN QUALITY OF DURUM WHEAT

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The effect of nitrogen fertilizing in rates 0, 60, 120 and 180 kg N.ha-1 on the structural elements of the yield, productivity and grain quality of seven Bulgarian durum wheat varieties was studied under field trail in the period 2011-2014. There was an increase in the total number of tillers, length of the spike, number of spikelets per spike and grains per spike with the amount of applied nitrogen. Nitrogen fertilizing significantly decreased the 1000 kernel weight and there was a higher value obtained of 56.2 in unfertilized plants. The test weight of grain was changed in range 79.0 – 79.8 and nitrogen fertilizing was slightly influenced by this parameter. Nitrogen fertilizing increased grain yield and grain protein yield, but there was no significant difference demonstrated between rates N120 and N180. Grain protein concentration of durum wheat increased under fertilizing 120 and 180 kg N.ha-1. Wet gluten content, dry gluten content and vitreousness of the grain were slightly affected by the nitrogen levels. Grain and protein yields, and grain protein concentrations were strongly and positively associated with the total number of tillers, length of the spike, number of spikelets per spike and grains per spike, and negatively with 1000 kernel weight and test weight of the grain. Without nitrogen of durum wheat average yields of 3717.7 and 454.2 kg.ha-1 grain and grain protein might be expected, respectively, and 12.3% grain protein concentration. The potential additional yield per kg N input per hectare was 127.6 kg grain and 22.04 kg grain protein. Without nitrogen fertilizing durum wheat was characterized with 2.26 total number of tillers, 5.06 cm length of the spike, 16.07 numbers of spikelets per spike, and 24.95 grains per spike.

Keywords: nitrogen, durum wheat, yield, quality.

CSP4

VARIABILITY OF MINERAL ELEMENTS CONTENT IN MAIZE INBRED LINES

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Maize genotypes have a wide range of mineral content, which cause differences in nutrition quality. The objective of this study was to analyze genetic variations of four mineral elements (magnesium Mg, zinc Zn, iron Fe and phosporius P) in grain of twenty maize inbred lines (L1, 2, 3 European germplasm, L4-13 BSSS and L14-20 Lancester background) from MRI Zemun Polje. Mineral contents were determined by IPC (inductively coupled plasma) technique. The highest average concetration of Mg and P have inbred lines from European germplasm, for Fe inbred lines from Lancester and for Zn inbred lines from BSSS germplasm. High variation for Fe among inbred lines were noticed with concetration from 2,31mg kg^{-1} to 28,97mg kg^{-1}.The highest value (>24mg kg^{-1}) are obtained in L4, L9, L12, and L14. Mg concetration ranged from 587,81mg kg^{-1} (L10) to 965,94mg kg^{-1} (L4), in average 777,026mg kg^{-1}. Zn concetration varied from 10,85mg kg^{-1} to 34,59mg kg^{-1}, with the highest values (>30 mg kg^{-1}) in L6, L10, and L12 from BSSS germplasm. Concetration of P varied from 6039, 14 (L10) to 8706,27mg kg^{-1} (L16). Line 12 have high and line 8 low concetration of all minerals. The highest positive correlation was obtained between Mg and P, r=0,789, and the highest negative corerelation between Zn and Fe, as well as between P, and Mg and Zn. Inbred lines with high and low concetration of particular mineral were crossed and F_1 genotypes will be further use in breeding program to obtained F_2 mapping population. By backcrossing the mineral content in recipient inbred line will be improved.

Keywords: maize, mineral, genetic variability.

CSP5

INFLUENCE OF FOLIAR APPLICATION ON THE PRODUCTIVITY OF COMMON WHEAT

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The survey was conducted during 2013-2016 at the Department of Plant Agriculture Faculty at the Trakia University, Stara Zagora, Bulgaria. Two varieties of common wheat Bulgarian variety: Apolon and Bologna were subjects of the survey. Variants of the field study were: 1.Kontrol - zero fertilization; 2. Fertilizing with N14; 3. Fertilization with N14 + Laktifrost; 4. Fertilizing with N14 + Laktifrost + Laktofol major; 5. Fertilizing with N14 + Laktofol major. The analysis of structural elements of the variety of Apolon showed an increase in the mass of grain in class by 7.6% compared to fertilization with N14 to nurture Laktofrost. Double-treatment vegetation in the ordinary wheat Laktifrost and Laktofol main leads to the formation of a higher mass of 1000 seeds. An increase of 4.1% was registered in Apolon, while Bologna had an increase of 3.9%. The effect of supplementary feeding crops with Laktifrost and Laktofol major contributed to the yield increase in Apolon 5.7% and 22.2%. In Bologna, definite increase was in the range of 10.0 and 13.3%. Two-factor ANOVA strong influence of the factor variety, the force of impact by 94% for the indicator "plant height".

Keywords: common wheat, productivity, leaf feeding.

CSP6

EFFECTS OF DIFFERENT TYPES OF CYTOPLASM ON THE MEDIUM ROUNDED SEED FRACTION OF MAIZE INBRED LINES

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The aim of the present study was to determine effects of both, different types of cytoplasm (cms-C, cms-S and fertile) and environmental factors on the medium rounded seed fraction (MR) of 12 maize inbreds lines. The trial with inbred lines was set up in two locations (ZemunPolje - Selection field and ZemunPolje – Školsko dobro) in 2013 and 2014. The three-replicate trials were set up according to the randomised block design within each type of cytoplasm. Each plot within a replication consisted of four rows. Fertile versions of inbred lines were sown into two border rows and had a role of a pollinator for their sterile counterparts. Statistical-biometric data processing was based on means over replications and encompassed the analysis of variance. Very significant differences in the medium rounded seed fraction (MR) among inbred lines, in dependence on the type of cytoplasm and the location, were established by the analysis of variance. The average value of the medium rounded seed fraction (MR) of inbred lines ranged from 37.9% (L1) to 97.8% (L7). Depending on the type of studied cytoplasm, the average percentage of the medium rounded seed fraction (MR) significantly varied ($P \leq 5\%$). The highest, i.e. lowest value of this trait was recorded in inbreds with fertile cytoplasm (80,8%), i.e. sterile cytoplasm (cms-C, 79.2%), respectively. The average values of the medium rounded seed fraction (MR) of inbred lines varied very significantly ($P \leq 1\%$) in dependence on the year of investigation and the location. The average value recorded in 2014 was higher (86.9%) than the one established in 2013 (72.6%). With regard to locations, the average value of the medium rounded seed fraction (MR) was higher in the second location – Školsko dobro (81.2%), than in the first one - Selection field (78.3%). Gained results show the effect of different types of cytoplasm on the medium rounded seed fraction.The medium rounded seed fraction sown mechanically showed a regular seed arrangement in sowing devices and during seed.

Keywords: cytoplasmic male sterility, inbred lines, maize.

CSP7

WEEDINESS OF WINTER WHEAT IN DIFFERENT CROP ROTATION

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Crop rotation is important part of integrated weed management strategy. Sequences with diverse crops require application of different cultural practice that influence weed community composition. This paper presents results on effects of crop rotation on a weed community of winter wheat (genotype Pobeda-*Triticum aestivum* L.ssp. *vulgare*). A trial was settled on the experimental field of the Faculty of Agriculture, Radmilovac in 1992. The following cultivation systems have been observed: winter wheat continuous cropping, maize-winter wheat rotation (two crop rotation), maize-soybean-winter wheat rotation (three crop rotation) and winter wheat-maize-soybean-spring barley+red clover-red clover-sunflower (six-crop rotation). The common conventional cropping practices specific for winter wheat were applied in systems, continuous cropping and crop rotations. Crops are grown in non-irrigation regime, on leached chernozem. Long-term effects of various cropping systems on weed infestation were observed by the one square meter area method in 2014/15. Each crop rotation differently influenced number of weed species, weed plants per species and weed biomass. The best effects showed maize-soybean-winter wheat rotation in which biomass of perennial and annual weeds was significantly lower. Three and two crop rotations were more efficient in suppression of weed plants per species than continuous cropping and six crop rotations. Continuous cropping favours a very few weeds that are well adapted to that crop. Weed community has therophytic character, with a dominant perennial species *Agropyrum repens* (L.) Beauv., *Cynodon dactylon* (L.), Pers., *Cirsium arvense* (L.) Scop.and *Convolvulus arvensis* L. The total number of individuals per m^{-2} was the highest in the continuous cropping (36.47), followed six crop rotation (19.21) and the smallest in the three crop rotation (9.11). The minimum of fresh weed biomass (69.90 g m^{-2}) was recorded in the three crop rotation and the highest was obtained in continuous cropping (241.62 g m^{-2}). The effect of the crop rotation on weed infestation of crops is long lasting. The effects of crop rotations, particularly multispecies crop rotations, can be explained only after long-term cultivation of a certain crop in such cultivation systems.

Keywords: crop rotation, continuous cropping, winter wheat, weediness.

CSP8

PRODUCTIVITY OF BIRDSFOOT TREFOIL VARIETIES ON THE ALKALINE SOIL IN THE YEAR OF ESTABLISHMENT

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Production of quality forage is a prerequisite for the development of livestock production. In South-East Europe for less favorable growing conditions especially having in mind climate and soil, in order to improved quality and quantity of forage, one of the option is using birdsfoot trefoil (*Lotus corniculatus* L.). One of the solutions for improvement of birdsfoot trefoil production is the production of the enough amount of quality seeds. The aim of the study was to analyze forage and dry matter yield, seed yield and yield components: number of stems m^{-2}, number of inflorescences per stem, number of inflorescences m^{-2}, number of flowers per inflorescence, number of pods per stem, number of seeds per pod and thousand seeds weight of birdsfoot trefoil in the year of establishment. Field trial was established in 2014, on soil type fluvisol (pH (H2O) 7.8) in a randomized block design with three replications and plot size of $6m^2$. Cultivars of birdsfoot trefoil (Zora, K-37 and Bull) were sown at a inter row spacing of 20 cm, using 10 kg ha^{-1} of seeds. The forage and hay yield were analyzed on the first cut, and the seed yield and yield components in the second cut. The obtained results indicate that the forage yield ranged from 24.9 t ha^{-1} at variety Zora to 28.4 t ha^{-1} at variety Bull and dry matter of 3.68 t ha^{-1} at variety Zora to 4.5 t ha^{-1} at variety Bull. Varieties did not differ significantly regarding yield components. However, variety Zora had a significantly higher potential seed yield (calculated on the basis of yield components) (699 kg ha^{-1}) as compared to the other varieties (K-37 - 429 kg ha^{-1} and Bull - 289 kg ha^{-1}). This is mainly the result of higher number of stems m^{-2}, inflorescence per stem and seeds per inflorescence. Choice of varieties for cultivation in specific environmental conditions is important for obtaining higher seed yield.

Keywords: birdsfoot trefoil, forage, seed, yield.

CSP9

EFFECT OF DIFFERENT MANAGEMENT SYSTEMS ON ISOTOPIC SIGNATURE AND MULTI-ELEMENTAL COMPOSITION OF OAT GRAINS

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Oat (Avena sativa L.) is an annual crop species important for human and animal nutrition. The aim of this study was to examine how different management systems influence isotopic signature and mineral composition of oat grains. Slovenian spring oat variety 'Noni' was grown as the main crop in the long-term field experiment, following three management systems (A – no organic fertilization, B – farmyard manure and C – straw/catch crop). Different mineral nitrogen (N) fertilization rates were applied during the oats development within each system, i.e. 0, 55, 110 and 165 kg ha-1. The experiment consisted of ten different treatments in three repetitions and was conducted at the Infrastructure Centre Jablje, Agricultural Institute of Slovenia (46°7´N 14°34´E; altitude 308 m a.s.l.; sub-Alpine climate) in two consecutive years, 2015 and 2016. Mature oat grains were harvested at the end of July 2015 and beginning of August 2016. Dried grains were milled using laboratory mill (Retsch ZM 200) and homogenised. Stable isotope analysis of sixty bulk samples was performed using isotope-ratio mass spectrometry (IRMS). The 13C/12C and 15N/14N ratios were expressed in the delta notation, δ13C, δ15N as the deviation, in parts per million (‰), from the Vienna Pee Dee Belemnite (VPDB) standard for carbon and the atmospheric nitrogen (AIR) standard for nitrogen. The average δ13C values in oat grains ranged from –28.2 to –30.5‰, and δ15N values from 2.2 to 7.5‰. The multi-elemental analysis of the same sixty samples was performed non-destructively, using the energy dispersive X-ray fluorescence spectrometry (EDXRF). Twelve elements were identified and divided into two groups: the macro-elements (g kg-1 dry weight) Si, P, K, S, Cl and Ca, and the micro-elements (mg kg-1 dry weight) Ti, Fe, Zn, Br, Rb and Sr. On average the most abundant element in oat grains was Si, followed by K>P>S>Ca>Cl>Fe>Ti>Zn>Br>Rb>Sr. Significant ($P \leq 0.05$) differences were observed between the management systems and mineral N fertilization rates in the view of grain isotopic signature and elemental composition.

Keywords: oat, isotopes, IRMS, elements, EDXRF.

CSP10

CURRENT STATUS AND PROSPECTS OF ORGANIC PRODUCTION OF CEREALS IN THE WORLD

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The aim of organic agriculture is production of high quality food, which will contribute to human health, nature protection and conservation of the complete ecosystem. Globally, cereals are the most organically grown crop. Cereal organic production in the world has been growing, encompassing the area of 3,3 million ha, and with the increase of 2 032 099 ha during the last decade. The greatest production is performed on the European continent (1 911 845 ha). The share of field crops in total areas under organic production in EU countries amounts to as much as 42,8 %. The most cultivated species are as follows: wheat, maize, rice, barley, oat, sorghum, millet, triticale and buckwheat. The greatest production is performed in Europe (1 911 845 ha), then in Asia (755 473 ha), North America (557 329 ha), Latin America (123 223 ha), Africa (6845 ha) and Oceania (2724 ha). China (565 000 ha) and USA (330 000 ha) are global leaders in cereal production in the organic system. Organic production in the Republic of Serbia is organised on 15298,02 ha, out of which cereal organic production ranking first is performed on the area of 4251,94 ha. The majority of this production is done in the region of the Autonomous Province of Vojvodina, while the smallest areas under cereal organic production are located in southern and eastern Serbia, Šumadija and western Serbia. Germany, the most important importer of not only cereals produced in Serbia, but also of all categories of organic products, is followed by France (17 %), Great Britain (10 %) and Italy (8 %). According to obtained scientific results, nutritive value, and especially to the status and requirements of market, cereal production is extremely actual production. Moreover, due to unlimited possibilities and market requirements, cereal production is a great challenge to agricultural producers.

Keywords: cereals, organic food, areas under organic production, organic soil, market.

CSP11

AGRONOMIC AND QUALITY TRAITS OF ZP POPCORN HYBRIDS

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Popcorn is an important snack food worldwide with significant nutritional benefits, including minerals, vitamins and fibers. Popcorn quality depends on many factors and there are a number of indicators for the quality. Popping quality is a critical factor for selection in popcorn. The main indicators for popcorn expansion volume are the percentage or number of unpopped kernels and grain moisture content at the time of popping. With regard to popping quality, yield is very important factor to justify value for cultivation and use. Hence, there is a need to quantify the relationship between popping quality traits and crucial agronomic traits. The objectives of the study were to determine variability among ZP popcorn hybrids for yield, physical and popping quality traits and relationships among the quality traits in ZP popcorn. Twelve popcorn hybrids developed at the Maize Research Institute Zemun Polje have been studied. Grain yield and size, 1000-kernel weight, share of hard endosperm fraction, share and thickness of pericarp, and popping volume were evaluated and ranged from: 4.9-7.0 t ha^{-1}; 60-84; 103.5-148.6 g; 71.8-74.1%; 8.9-12.5%; 140-240 micron; 30.0-42.0 cm^3 g^{-1}, respectively. The study found significant variability among selected ZP hybrids for yield, physical and popping quality traits, which presents an opportunity for selection of ZP specialty hybrids with good popping ability.

Keywords: popcorn, yield, physical traits, popping volume.

CSP12

PRODUCTION CHARACTERISTICS OF SOME SMALL GRAINS DEPENDING ON THE APPLICATION OF MINERAL FERTILIZERS

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Application of fertilizers in agricultural production is a agro-technical measures for the conservation and yield increase. The aim of this study was to investigate the effects of mineral fertilizers on the yield and some quality properties of small grains. Investigations were carried out in the vicinity of Kraljevo during the 2011-2013 year. The experiment included wheat, winter barley and triticale, with two varieties and three variants of fertilizer (K - control; I. N_{70} P_{60} K_{60}; II. N_{80} P_{80} K_{80} i III. N_{80} P_{100} K_{100}). In addition to grain yield were observed absolute and hectoliter mass. The research results show that the use of mineral fertilizers has caused a multiple increase in yield compared to control. Also, the difference in yield between fertilization variants for all small grains, were different. So that, in all investigated small grains, between II and III variants was not statistically significant difference in yield. For wheat grain yield in the variant III was statistically higher than in the variant I, while the difference in grain yield between the varieties I and II did not. Grain yields of barley and triticale was statistically greater in the variant II according to variant with I. This indicates a positive reaction to these cereals increased doses macroelements. The highest yield of small grains has been achieved in the variant III. So the wheat variety Pobeda had a yield of 3390 kg ha^{-1}, triticale variety KG-20 3310 kg ha^{-1} and variety of barley Rekord 3150 kg ha^{-1}. Absolute and hectoliter mass grains have shown smaller variations, so that the difference between II and III variants were not statistically significant. The largest absolute value and hectoliter mass grains were in variants III and these differences were significant in relation to the variant I and control. The reason for the lower yield of small grains as their production on acid soils (pH< 4.5). Recommendation for a given agroecological area, on the side of economy, the use of combinations of NPK fertilizer in a ratio N_{80} P_{80} $K_{80.}$

Keywords: small grains, mineral fertilizers, absolute mass, hectoliter mass and yield.

CSP13

CHARACTERISTICS OF FIVE TURKISH RICE VARIETIES (Oriza sativa L.) GROWN UNDERTHE ENVIRONMENTAL CONDITIONS OF REPUBLIC OF MACEDONIA

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Five newly introduced Turkish rice varieties (*Kiziltan, Gala, Halilbey, Gönen*and *Paşali)* were evaluated under typical rice producing conditions of Republic of Macedonia. The field trial was set up in the Rice experimental station of the Institute of Agriculture Skopje, in Sredorek area in Kochani, during 2013 and 2014 in randomized complete block design. Standard rice production technology was applied. *San Andrea,* the most common rice variety in cultivation was used as a standard. Statistically significant differences between mean values of the Turkish rice varieties and the standard variety were obtained for the plant height, panicle length, number of productive tillers m^{-2} and paddy rice yield. The Turkish rice varieties showed shorter average period from seeding to flowering compared to the standard variety *San Andrea,* where the highest value was determined (99.5 days), while thelowest in *Paşali* (89.5 days). In the Turkish varieties significantly lower plant height and panicle length was measured compared to the standard variety *SanAndrea,* where the highest plant (114.50 cm) and the longest panicle (16.67cm) were determined. The lowest plant (65.10 cm) was measured in *Kiziltan,* whiletheshortest panicle in*Gala* (11.87 cm). *Paşali* variety produced the highest number of productive tillers (586.67 m^2), while *Gönen* the lowest (448.50 m^{-2}). The standard produced 527.17 productive tillers m^{-2}. The Turkish varieties had a significantly lower spikelet sterility compared to the standard *San Andrea,* where the highest average was determined (22.67 %).The lowest spikelet sterility was determined in *Halilbey* (8,15 %). The Turkish rice varieties achieved higher average paddy rice yield, with significant difference between means only for *Paşali,* where the highest paddy rice yield was obtained (9,591.78 kg ha^{-1}). The lowest paddy yield was obtained in*San Andrea* (8,306.40 kg ha^{-1}). The Turkish rice varieties generally showed better results than the standard and as such are potentially suitable for cultivation in Republic of Macedonia.

Keywords: days to flowering, plant height, panicle length, spikelet sterility, paddy yield.

CSP14

VARIABILITY OF PLANT HEIGHT IN CULTIVARS OF TRITICALE (*X* triticosecale Wittm.)

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Triticale is an inter-genus inter-tribal hybrid created by crossing genus Triticum with Secale. Within the new plant species Triticale developed numerous cultivars during the breeding program Triticale is more tolerant high adaptive plant species to unfavorable environmental conditions reaching higher yield of grain and biomass than wheat and rye. The high potential of grain and straw yield of triticale are due to genetic control and effect of environmental factors as well G/E their interaction. The aim of this work is to study the variation of plant height in five genetic divergent triticale cultivars grown under different environmental conditions. The five triticale (xTriticosecale Wittm.) cultivars: KG 20, Bolero, Rtanj, Odisej and Bogo, were used for investigation in the field experiment designed by randomized block design on plot 5m2 in five replications. The experiment was carried out during the period of three successive years. At the ripening time 100 plants were harvested (20 per replication) for measurement of plant height (cm). Obtained data was used for estimating mean values of plant height and for computing components of variance by using MSTAT-C program. According to the results of analysis, cultivar Rtanj had the highest average value of plant height (119.10cm) whilst cultivar Odisej had the lowest average height of plant (108.60cm). In this study significant differences were established among studied triticale cultivars in terms of plant height. Also established were the significant differences of average plant height per year for the same cultivars as well the genotype/year interaction.

Keywords: plant height, triticale, cultivars.

CSP15

DISPERSAL OF BIRDSFOOT TREFOIL SEED, DEPENDING ON THE SEED YIELD AND YIELD COMPONENTS

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Birdsfoot trefoil (*Lotus corniculatus* L.) is a perennial legume characterized by a high propensity of pod shattering and dispersal of seed during maturing. Seed dispersal and often large losses are a problem that causes low and highly variable yields. The aim of this study was to determine the existence of correlation between the amount of dispersed seeds of birdsfoot trefoil until the moment of the harvest and value for seed yield and yield components. The field experiment was set up in 2012 in Čačak on acid soil (pH(H_2O) 4.8). The varieties of birdsfoot trefoil (K-37 and Rocco) were sown at a distance of 20 cm of row spacing with 10 kg ha^{-1} of seed. The experiment was designed in a randomized block design with three replications and plot size of $5m^2$. Analyses were carried out on the second rise in the second year when the seed production is most commonly performed. The quantity of dispersed seeds is determined by collecting the seeds in containers placed between the rows of plants from the moment of maturity of the first pods. The results indicate that in the cultivar K-37 was reported a significant positive correlation (r=0.68) only between the quantity of dispersed seeds and the number of inflorescences per unit area. In variety Rocco there was no significant correlation between seed dispersing and the value for seed yield components. At the same time, the variety Rocco had a greater potential seed yield (calculated on the basis of yield components) in relation to the variety K-37, mostly due to higher number of seeds per pod and inflorescences per unit area.

Keywords: birdsfoot trefoil, dispersal of seed, pod shattering, seed yield components.

CSP16

YIELD RESPONSE OF WHEAT AND CHANGES OF MICROBIAL ACTIVITIES IN INDIGENOUS *Azotobacter chroococcum* INOCULATED SOILS WITH DIFFERENT PLANT RESIDUE APPLICATION

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The objective of this study was to determine yield response of spring wheat in indigenous *Azotobacter chroococcum* inoculated soils with different plant residue applications, to compare change of microbiological properties such as Basal Soil Respiration (BSR) and Microbial biomass (C_{mic}) in *A.chroococcum* inoculated soils with tobacco waste, rice husk, soybean waste and wheat waste applications, and to explore the best plant residue inoculated with *A.chroococcum* strain into the soil under greenhouse conditions. The grain and straw yield increased in all treatments and maximum increase was obtained from *A.chroococcum* inoculation with tobacco waste. The inoculation of *A.chroococcum* and plant residues into the soil caused different responses of soil microbiological properties. Generally, stimulatory effects of *A.chroococcum* with plant residues on C_{mic} and BSR in the soil were observed. The inoculation of *A.chroococcum* with wheat residue and tobacco waste caused significant increases in BSR and C_{mic} in soil statistically.

Keywords: soil, *A.chroococcum*, wheat yield, soil microbial activity.

Section: ANIMAL SCIENCE

ASP1

ANIMAL WELFARE WHEN CONDUCTING A RESEARCH

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The term"experimental animals" is automaticallyassociated withrodents,such asmouse (*Mus musculus*), rat (*Rattus norvegicus*), guinea pig (*Cavia porcellus*) and other rodents(Rodentia). It alsoremindsof dogs (*Canis familiaris*) and cats (*Felis catus*), as well as of reptiles (Reptilia), amphibians (Amphibia) and fish (Pisces). However, it should be noted that the implementation of theabovecan becarried outonanimalssuch ascattle (Bos), goats and sheep (Capra & Ovis), pigs (Sus), horses, donkeys andcrossbreds (Equidae), birds (Aves),othercarnivores(Carnivora) and other mammals (Mammalia). In accordance with the Law on Animal Welfare ("Official Gazette of RS", 41/2009), research on animals cannot be carried out if there is an alternative method for carrying out a research, achieving the same goal (article 41). Furthermore, scientific works cannot be publicized when animal studies are contrary to the provisions of the above Law (article 45). Based on the above mentioned, this paper is aimed at directing, providing and stimulating the raising of awareness about the importance of the welfare of experimental animals. When carrying out experiments on animals, methods must be used that do not cause a condition opposite to well-being (suffering, stress, pain, fear, boredom). Performing experiments on animals, as well as breeding, reproduction and transport of experimental animals, can be exercised only if certain conditions are met in terms of objects, equipment and training for welfare of experimental animals. Although to more and more insisting on reducing the number of researches involving experimental animals, the reality is quite the opposite and consequently a large number of different species of animals still suffer pain, fear, discomfort, stress and suffering. If a research on animals is approved by a competent authority, experiments involving an animal must be carried out by using professional methods which exclude pain, suffering, fear and stress. All animals should be adequately treated in line with a prescribed method for every species of experimental animals, with appropriate care before, during and after the implementation of the experiment, as well as along the deprivation of life.

Keywords: fear, pain, stereotypes, stress, suffering.

ASP2

ANALYSIS OF THE INFLUENCE OF SUMMER HEAT STRESS ON MILK CONTENT AND TECHNOLOGICAL PROPERTIES

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This work is targeted on the analysis of the influence of summer period on milk content and technological properties of three breeds kept in the same environment. The experiment took place in ZD Okrouhlička between June and August 2015. We observed 18 dairy cows, that were kept in identical conditions. We used cows of 3 breeds: Czech Fleckvieh (C) Holstein (H) and Ayrshire (A). Samples were taken weekly and analyzed in laboratory of Lactology on Mendel University in Brno. The analyzed parameters were: total yield per observed period, fat, protein and dry matter content, non-fat solids content, density, active and titrable acidity, rennet coagulation time (RCT) and curd class quality. During the observed period of three months, the average daily temperatures were 19.72 °C for June, 21.85 °C for July and 19.86 °C for August. Average yield during the observed period was 2050.19 (A), 2530.31 (H) and 2195.96 (C) liters. Average daily yield was 22.8 (A), 28.1 (H) and 24.4 (C) liters. All cows were on the same lactation (2nd) and in the same stage of lactation (100-200 DIM). All breeds showed increase in dry matter and fat content during July. Non-fat solids, protein and density remained constant or slightly increased throughout the experimental period. Titrable acidity was increasing (mainly in July), active acidity was decreasing for all three breeds throughout the experiment. When it comes to technological properties (RCT and curd quality) Czech Fleckvieh and Holstein cattle showed decrease in RCT and curd quality, Ayrshire breed showed increase in both RCT and curd quality.

Keywords: stress, summer, heat, technological properties, milk content.

ASP3

THE INFLUENCE OF AVERAGE MONTHLY TEMPERATURE AND RELATIVE HUMIDITY IN THE STABLE ON CONCEPTION RATE IN CZECH FLECKVIEH-SIMMENTAL CATTLE

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The climate of the Czech Republic is between continental and oceanic. The continental climate is typical with high temperatures in summer and low in winter. Course of daily temperature is usually minimal in the morning and reaches its maximum after the noon. With extreme deviation of microclimatic conditions in a stable comes also the change of reproduction parameters because of disruption in hormonal secretion, which influences physiological processes. In this study we analysed the influence of mean monthly temperature and humidity in the stable on percentage of impregnated cows. This observation was made between January 2015 and July 2016 on the private farm of GenAgro Říčany (GPS 49°12'32.319" n. w., 16°23'42.666" e. l.). Average temperatures and relative humidity were obtained by data logger HOBO (Onset). Data about parturition of heifers and cows at first (n=690) were obtained from monthly records of breeder company and from the farmer himself. Heat stress can have a long-term effect, which can be observed weeks or even months after summer period. This statement is supported by the fact, that results of our work show worse parturition at the end of summer and in autumn (conception rate from 40 to 91.7%).

Keywords: conception rate, temperature, humidity, heat-stress.

ASP4

IMPACT OF DILUENT ADDITIVE ON MOTILITY PARAMETERS OF FRESH-DILUTED BOAR'S SEMEN

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The aim of study was to examine the parameters of motility fresh diluted semen of boars with and without the addition to the diluent during the storage period of six days. The study included a total of 60 commercial doses of fresh diluted semen of boars, divided into two equal groups (n = 30). In the experimental group, ejaculate was taken into additive to diluent, aimed to preservation of the vitality of sperm cells, containing a cocktail of antibiotics, and then it was diluted through a standard procedure with commercial diluent. Semen samples of the control group were diluted by standard procedure and commercial diluent. Parameters of sperm motility were determined by computer program for sperm analysis (Computer Assisted Sperm Analysis CASA), immediately after taking (0 hours), after 24, 72, 120 and 144 hours. The following parameters in sperm motility were determined: the average velocity on the average path (VAP); curvilinear velocity of sperm (VCL); straight-line velocity (VSL) and the amplitude of lateral head displacement (ALH). The research results suggest a beneficial effect of additive to diluent on sperm motility parameters and their preservation during successive test periods.

Keywords: boar semen, motility, CASA.

ASP5

EFFECT OF DIFFERENT METHODS OF BREEDING ON THE NUMBER AND QUALITY OF QUEEN BEE BROAD

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Nowadays in beekeeping practice there are methods for natural and artificial breeding of queen bees as a major member of the colony. Natural queen bee breeding is not economically profitable and quality of the obtained queens does not match the set breeding objectives. In our research, which was conducted during 2015, three methods of queen bee breeding were used: Alley's, Miller's and Doolittle's. The study was conducted on the registered selection apiary in the Republic of Srpska, owned by Nebojsa Andric from Karanovac, Petrovo Municipality with 350 hives. Indigenous Kranjska honeybee (Apis meliffera carnica) breed was used. The aim of our research is to determine whether there are important differences between these methods of breeding in terms of their impact on the number and quality of queen bee broad, which further has a big impact on their quality in bee hives. The results indicate that most of the queen bee broad were obtained by Doolittle's method (average of 26), and the least by using Alley's method (average of 15). Quality of queen bee broad was graded on a scale of 1-5, so the best quality was obtained by Alley's and Miller's method (average of 4.3), while the average score for Doolittle's method was 4. All the above methods, according to the results, can be used for the cultivation of high quality queen bees, depending on the needs of the market, apiary and the season.

Key words: queen bee, breeding, method, number, quality.

ASP6

COMPENSATORY GROWTH OF BROWN TROUT (Salmo trutta m. fario) FRY

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Experiment feeding of brown trout (Salmo trutta m. fario) with different initial body mass and different levels of nutrition in order to analyze the characteristics of the subsequent growth of the mass and length of the body was carried out in the laboratories of Aquaculture - Faculty of Agriculture, University of Banja Luka during the period of 44 days. A total of 126 populated brown trout, 42 individuals per tank were included in the experiment. Initial individual weight (IBW), total body length (TL) and fork length (FL) of brown trout in the experiment was in the control group (CG) IBW 1.59 g, TL 5.30 cm and FL 5.05 cm, in the treatment 1 (T1) IBW 1.19 g, TL 4.85 cm and 4.64 cm FL and treatment 2 (T2) IBW 0.96 g, TL 4.50 cm and 4.29 cm FL. After 44 days FBW, TL and FL amounted in CG FBW 6.39 g, TL 8.25 cm, 7.97 cm FL, the T1 FBW 5.30 g, 7.75 cm TL and FL 7.49 cm and T2 FBW 4.43 g, 7.28 cm TL and FL 7.02 cm. The same amount of feed was given every day in the control group and in the treatments. The daily amount of feed in the CG was determined according to the tables of feed, while in the T1 and T2 feeding norms were significantly higher 25% - 66% in relation to the table values. The coefficient of condition (CF) at the beginning was the highest (slightly) in the CG, and after 44 days in T2. Specific growth rate (SGR) had a decreasing trend with increasing mass and body length. The statistical analysis of the data at the beginning and during the experiment showed there were statistically significant differences in mass and body length in all analyzed periods. Higher norms of feeding individuals in the T1 and T2 did not affect the growth of additional weight and body length, while the conversion ratio (FCR) was the lowest in the CG (0.61 to 0.76), the highest in T2 (0.8-1, 07), while the T1 ranged from 0.75 to 0.92.

Keywords: compensatory, growth, weight, length, brown trout fry.

ASP7

IMPROVEMENT OF QUALITY AND QUANTITY OF MILK IN THE AREA OF BRČKO DISTRICT

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Bosnia and Herzegovina has a relatively small scale milk production. Most of the producers own less than 30 cows while around half of them have only one or two cows. Such a small scale production is partly compensated by creation of cooperatives among milk producers. An example of it is the establishment of milk collection points. The current low efficiency of production, as well as the lower quality of milk, are due to, among other things, lack of knowledge of good practices by milk producers. The project of international development cooperation between Czech Republic and Bosnia and Herzegovina, implemented by GEOtest Company and assisted by Mendel University, is trying to make significant improvements through cooperation with selected milk producers and the Agricultural Cooperative Brka that purchases milk from member farmers and is itself engaged in milk processing. As of 2016, the project has been joined by the total of 117 producers out of which 70 were selected for intensive cooperation. Research through questionnaires showed that producers, on the average, own 6 milking cows, with the average milk production of 4, 99 liters daily. (This refers to milk given to the Cooperative and is therefore not a reliable data due to the nature of incentives in Brčko District). The research further showed that majority of milk produced do not meet the required standards. The qualitative goal of this project is to improve the technologies of breeding the milking cows and the production of milk so that 80 percent of milk produced by farmers of Agricultural Cooperative Brka reaches the qualitative E class in 2017 (starting point is 30 percent). Quantitative goal of the project is that the quantity of milk processed in 2017 is at least 5, 5 million liters and 6, 2 million liters in 2018 (starting point is the year of 2015 with 5,000.000 liters). The purpose of the project is to contribute to the improvement of quality of milk produced in Bosnia and Herzegovina, particularly in Brčko District. A significant part of the project shall be devoted to the work with the Cooperative on implementation of advanced practices of production and processing of milk, i.e. getting as close to the EU standards as possible and enabling that the milk and its products may be sold not only in the local market but in the EU as well.

Keywords: Brčko District, milk, production, improvement.

Thank you note: The project is funded by the Czech Development Agency (CZDA) within the international cooperation between Czech Republic and Bosnia and Herzegovina.

Section: AGRICULTURAL ECONOMICS AND RURAL DEVELOPMENT

AERDP1

ANALYSIS AND FORECASTING OF ONION EXPORT FROM SERBIA

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Onion production in the Republic of Serbia could have a far greater significance, but, unfortunately, the opportunities are insufficiently used. Onion export from Serbia in the period from 2004 to 2014 was analyzed in this paper. The following were analyzed: exported quantities (t), export value (US $) and average export prices. The analysis was performed by descriptive statistics. Forecasting of onion export parameters in the forthcoming period (2016-18) was carried out based on the established rate of change in the analyzed period. Fresh onion export had a positive rate of change of 20%. The average exported quantity of onions amounted to 4.491,1 tons, at an average price of 240 $/t, with the total export value of US $1.078.500 on average, annually. Further increase in the quantity, price and export value is expected in the following three years. That way Serbia will become one of the leading exporters of onion in the region.

Keywords: onion, Serbia, export, forecasting.

AERDP2

THE HABITS OF CONSUMERS IN THE PURCHASE AND CONSUMPTION OF FRESH FRUITS IN BANJA LUKA

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According to the information from the Republic of Srpska's Institute of Statistics, the consumption of primary fruit species produced here, is on the level of 25,9 kg per capita. On the other hand the citizens of the Republic of Srpska consume almost the same amount of tropical fruits 23,1 kg per capita, most of which are imported. Generally, the fruit consumption here is much lower in comparison to the consumption of fruits in developed countries. The World Health Organisation (WHO) recommends a daily intake of 400 grams of fresh fruits and vegetables. The aim of this study is to understand the most important characteristics of fruit purchase and consumption in Banja Luka. The research was conducted through a structured questionnaire with 20 questions on a sample of 224 survey research respondents. The survey research was conducted over the internet and at the fruit sale location (Hypermarkets and City markets). The data were analysed by using univariate analysis. Using the questionnaire enabled the collection of primary data on facts, motives and viewpoints of consumers. The research results show that the average age of respondents was 38,5 and that over 56% of them grew up in the city. The respondents buy fruits once to three times a week (78%), while respondents most commonly consume fruits daily (34%), which coincides with the research conducted in Croatia (32%). The research data show that the majority of the respondents buy their fruits in supermarkets, more than a half of them and less than ¼ of them use the market as their source of supply of fruits. Likewise, the importance of fruit origin (domestic and/or imported) for the consumers has no meaning because ¾ of them do not take in count the origin. The origin of the products they are buying and hence consuming does not matter to them. The main aspect when buying fresh fruits for the respondents is the quality and then the price. The respondents stated that they usually buy bananas and apples, which is similar to the data from the survey research on the consumption. According to the official statistics, apple and banana products have the largest consumption per capita (16 and 11,4 kg per capita).

Keywords: consumers, buying and consumption characteristics, fresh fruit, survey research.

AERDP3

ROLE OF COOPERATIVE MODEL OF ORGANIZATION IN ECONOMIC STRENGTHENING OF AGRICULTURAL PRODUCERS IN THE POTKOZARJE AREA

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Potkozarje area is located in the northwestern part of Bosnia and Herzegovina. It is characterized by a very favorable geographical position and good natural conditions for agricultural production. Fruit production is characterized by a low level of technology, the most common being a semi-intensive production of fruit. From fruit varieties, apple is the most common, followed by plum, pear and peach. The aim of the research was to find potential solutions to the problem of product placement of "small fruit growers' from Potkozarje area through cooperative model of organization. The paper used a method of structured questionnaires for understanding the situation, and econometric methods of analysis of income, expenses and profit. The survey proved all initial assumptions: the given area is dominated by "small orchards" with a variety of assortment, outdated technology of production, and there is a high exposure to the production by the external influences. These factors are reflected in the quality of end products and their potential for further placement on the market. The paper proposed the cooperative model of organization demonstrating that, by working through cooperatives, growers in this region can earn more revenue, lower production costs, improve production quality, improve sales channels and increase knowledge and awareness. In addition, the proposed cooperative model offers the possibility to manufacturers of fruit a planned and improved production technology making it dependent on the environment to the lowest possible extent.

Keywords: cooperative model of organization, production of fruit, Potkozarje area.

AERDP4

APPLICABILITY OF Z-SCORE MODELS IN ESTIMATING FUTURE FINANCIAL DISTRESS OF THE REPUBLIC OF SRPSKA'S AGRICULTURAL COMPANIES

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Edward Altman's Z-score model is one of the most famous models, based on financial data that is used for analyzing companies' financial position and predicting future financial distress. Since its first appearance in 1968, this model has undergone a number of revisions and re-estimations. Today, besides the standard Z-score model, that has been designed for predicting bankruptcy of publicly traded companies, there are also Z'-score model designed only for private manufacturing firms and Z''-score model designed for all private firms as well as developing countries. The aim of our research was to determine if Z-score models (Z, Z' and Z'') can be used in predicting bankruptcy and financial difficulties of the agricultural companies in the Republic of Srpska, which model is more reliable and for which purposes. The models were applied on 270 agricultural companies, i.e. on their financial statements for 2010, available in the official data bases, in order to classify these companies in three zones (critical, grey and safe). Since Z-score model assumes that companies from critical zone are likely to go bankrupt in next five years, these critical companies have been analyzed in 2012 and 2015 in order to estimate the efficiency of Z-score models in predicting bankruptcy and financial difficulties of these companies. The results of our analysis show that Z-score models are not able to predict bankruptcy in the near future. The reason, however, does not lie in their inefficiency but more in the fact that the companies in the Republic of Srpska survive despite their economic reality and financial unsustainability. Nevertheless, Z' and Z''- score models are reliable enough in predicting future financial difficulties since they indicate deep financial imbalance that cannot be easily overcome in the future. Also, after testing each Z-score model, we have concluded that for publicly traded companies, Z''- score model is more reliable than Z and Z'- score model, while for all other companies Z' – score model is more precise in recognizing companies with long term financial difficulties than Z''- score model.

Keywords: Z-score model, agricultural companies, predicting.

AERDP5

POSSIBILITIES FOR SUSTAINABLE RURAL TOURISM DEVELOPMENT IN BOSNIA AND HERZEGOVINA

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Rural areas in Bosnia and Herzegovina cover more than 80% of the country's territory and are inhabited by more than half of the population. About 30% of the population is engaged in agricultural production on small farms and generate low income with the lack of productivity. In order to preserve the natural environment, traditions and customs, rural tourism is developing and rural areas are activating for tourism purposes. The development of rural tourism reduces unemployment, reduces movement from a countryside to the city, allows an evaluation of the work of women in rural households, increases revenues from sales of goods and services, allows the development of the local community. The authors analyze the current state of rural tourism in the territory of Bosnia and Herzegovina and provide recommendations for its sustainable development. Tourismexperts from Bosnia and Herzegovina (156) wereasked to evaluatethe current conditionof all24attributes which affect thecompetitiveness ofrural tourismdestinations. The survey was conducted from January to March 2016. The analysis shows that the basic problems that could slow down the development of rural tourism are: lack of incentives for the development and improvement of the state and government institutions, lack of subsidies for young people who want to live and work in the countryside, inability to use quality land for non-agricultural purposes, lack of defined standards for rural development and underdevelopment of infrastructure. Future directions of development of rural tourism in Bosnia and Herzegovina should be based on the hospitality of the local population, the attractive tourist facilities and offerings, continuing education, raising the quality of services, significant investments in tourism, in order to raise the competitiveness of Bosnia and Herzegovina as a rural tourism destination.

Keywords: rural tourism, sustainable development, resources, Bosnia and Herzegovina.

AERDP6

FINANCIAL PERFORMANCE ANALYSES OF COMPANIES IN THE AGRICULTURE AND FOOD INDUSTRY SECTOR IN THE REPUBLIC OF SRPSKA

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The subject of the research is the analyses of financial performance of the selected companies. The analyses covered the period from 2012-2015, and the geographical area of research was the Republic of Srpska, one of the two entities in Bosnia and Herzegovina. Data were analyzed from "short" balance sheets and income statements from the database of Agency for IT and financial services to which the companies had submitted their financial reports. The aim of the research was to determine and analyze the level and structure of total income and expenses, financial result and the number of employees of companies whose dominant business concerns agriculture and fisheries, and one of the 30 subsectors, or food industry, and one of its 28 subsectors. Indicators of financial performance of these two sectors were calculated, along with their productivity, efficiency, return on assets, return on equity, liquidity ratios, debt ratios and financial position. The research includes several scientific-research methods: method of analyses of historical data series, methods of data classification, compilation and comparison, analyses of amounts and structure, method of descriptive statistics, calculation of usual indicators for financial performances and method of inference. The results of research showed that during the four observed years the agricultural sector in the Republic of Srpska operated with losses, while the food industry had positive financial results (profit) in all four years, whereby the financial position of certain subsectors varied. The number of employees in the agricultural sector decreased, leading to an increase in terms of productivity (despite of income reduction), while the number of employees in food processing industry was growing, with an increase in its productivity as well (due to faster revenue growth). Return on equity and return on assets in the sector of agriculture were negative, while being positive and growing in the sector of food industry. Both sectors are illiquid due to high indebtedness, but their assets are higher than debts, indicating that they are solvent in the long-term.

Keywords: Republic of Srpska, agriculture, food industry, financial performance.

AERDP7

STATISTICAL ANALYSIS OF CUSTOMER SATISFACTION SELECTION OF FRESH AND DRIED FRUIT FIGS

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Customer satisfaction affects consumption and preconditions their repurchase. The study was conducted through a questionnaire on four selling places in Mostar, from August to September (fresh figs) and November-December (dried figs) in 2015 on a sample of 250 respondents of different sex, age and education randomly. The goal of the interviews was to determine the attitudes of consumers towards the purchase or what features are most affected in the selection. The questions in the questionnaire were closed. The collected data were statistically analyzed using SPSS package, using the descriptive statistical methods, chi-square test and rankness strength by the coefficient of contingency. The results showed relative customer satisfaction in the selection of products, information about the origin and location; important when choosing the organoleptic properties and consumer habits, but there are differences and socio demographic characteristics. The results will provide a background for future program design according to customer requirements.

Keywords: selling places, analysis, survey.

AERDP8

ESTABLISHING A SYSTEM OF SUPPORT TO UNDERDEVELOPED AREAS IN THE REPUBLIC OF SRPSKA FOR REGIONAL DEVELOPMENT

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Taking into account the different theories of regional development, there is no universal system of support or system that can be copied to the areas of the Republic of Srpska, but there are systems and mechanisms that can be adjusted and modified according to the needs of the region. In addition to the analysis of secondary data, the most important conclusions of the research are based on an analysis of primary data obtained from two groups of respondents, the local population and local government representatives. The research was conducted in the fall of 2016 and included 200 local population and 24 local governments. Research methods used were the interviewing method and statistical-mathematical method. The objective of this research was to find out whether stakeholders in underdeveloped areas are acquainted with existing support mechanism and whether this support has a positive effect on their development, their level of participation in the pre-accession funds and projects implemented by development agencies and the Government of the Republic of Srpska, major issues that hinder economic development, the reasons for migration and the quality of life in terms of access to infrastructure, public services, employment, etc. Primary data was made parallel between developed and underdeveloped areas, and based on the research results it can be concluded that stakeholders in underdeveloped areas have low participation in various projects, face a number of issues during the implementation of project ideas, physical and social infrastructure is at a lower level of development in comparison with developed areas and have a greater interest in cooperation with neighboring municipalities in relation to the developed areas. The final part of the work is based on identifying the mechanisms for establishing a system of support to underdeveloped areas, assessment for establishing a system of support to underdeveloped areas, and the assessment of the strengths and weaknesses of underdeveloped areas that are of great importance for the proper formation of the support system.

Keywords: regional development, disadvantaged areas, development support systems.

AERDP9

MARKETING CONCEPT OF SUSTAINABLE RURAL TOURISM IN BANJA LUKA REGION

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Rural part of Banja Luka region represents an unused potential, in which rural tourism can be in service of sustainable rural development, and serve for the improvement of tourist offer in this region. A study conducted in Banja Luka area was aimed at demonstrating that the inevitable factor for rural tourism development is consisted in the creation of a single marketing concept focused on one sole area. Factors in favor of creating a single marketing concept are: untouched nature, cultural and historical heritage, rural way of life, advantageous geographical position, rich flora and fauna, moderate continental climate suitable for vacation and relaxation, and many other factors. A previous research has shown a negative trend of representation of individual households as well as inadequate use of marketing instruments in promotion, which are just some of the key issues to help further development of rural tourism. The advantage for the expansion of rural tourism is agricultural production. The study found that most households in Banja Luka area had not linked these two branches successfully, which resulted in less than a modest tourist offer. Having that in mind, this marketing concept aims at creating a unique image of ideal tourist offer in a rural household. Significant progress could be a collective local one in finding information about services and offers in rural tourism, but it could also be made through overcoming the ignorance of householders of incentives, public promotions, their poor communication with local authorities and representation of all households. The best example would be in Šipovo area, which has 20 registered households at the moment. The research has shown it is necessary to solve problems that tourists and tourist development organizations have. Creating a single strategy for rural tourism as a special field of rural development, would make a big progress. In conclusion, the application of these measures to the marketing concept would link target groups in rural tourism and bring results that would preserve and revitalize Banja Luka countryside area.

Keywords: rural tourism, marketing, rural development.

AERDP10

POSSIBILITIES OF INCOME INCREASING OF RURAL HOUSEHOLDS AT THE LOCALITY OF KOZINCI

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Agriculture and food production are not the only activities in rural areas. There can be a whole range of other activities that are aimed at: the development of the rural economy, reducing the gap between rural and urban areas and improving the living standards of the population in rural areas. Diversification of activities reduces the risk of high dependence on only one source of income and exposure to adverse market movements, by dividing agricultural production into a number of areas. The paper analyzes the rural households of the village Kozinci, municipality of Gradiska. A pattern of 103 households is formed randomly. The aim of the paper is to investigate and present the possibilities of diversification of the rural economy, especially the processing of agricultural products and income increasing on that basis, so that money earning of rural households is made tenable. A starting assumption is that apart from the primary income from agriculture there are opportunities for making additional income from agriculture (by adding value to primary agricultural products). The research results obtained through a survey with the holders of households or their members, show that about one-third of households is engaged in the processing of agricultural products, and less than one-fifth or 19% of households are engaged in the processing of animal origin, as well as the processing of milk in various types of cheese. The research results presented with the method of modeling show that the processing of agricultural products can generate additional income that has the effect on the increase in the total income of their households.

Keywords: diversification of rural economy, processing of agricultural products, village of Kozinci.

Section: SUSTAINABLE MANAGEMENT OF NATURAL RESOURCES

SMNRP1

PEA WEEVIL AS THE MAIN LIMITING FACTOR IN THE PRODUCTION OF PEA

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Field pea (*Pisum sativum* L. subsp. *sativum*) is one of the most important agricultural crops worldwide. It represents one of the main sources of proteins in human diet and in animal fodder. Pea weevil, *Bruchus pisorum* (L.) (Coleoptera: Bruchidae), is one of the major insect pests of peas. It is a primary limiting factor for worldwide production of field pea, especially in developing countries where it causes severe looses in pea production. Pea weevil attacks field pea in the flowering stage. Upon hibernation adult males are sexually mature, but females must be additionally fed with pollen and flowers, before they start mating. Few weeks after mating, adult females lay eggs on young green pods of peas. After hatching on the surface of the pods, larvae make an entry hole in the seed. Larvae develop through four instars inside the seed where they consume cotyledon content and create an exit hole, behind which they turn into pupae. Adults overwinter inside the seed (hibernation) or leave the seed. After the eclosion, adults overwinter in shelters such as forests, pea straw and buildings. Pea weevils attack pea only in the field, causing the quality losses of seeds. Infested seeds lose capability to germinate, but if the seedling emerges, it is very week, with low yield and quality potential. As a result of feeding on peas, larvae cause reduction of yield and quality of pea. Even with only a small amount of actual biological losses by seed yield per plant (only a germ damage), economic losses can reach up to 100% (seed not viable). One of the most important measures of suppression of this pest is the application of contact insecticides before females start oviposition.

Keywords: peas, pea weevil, life cycling, damages.

SMNRP2

MANURE PRODUCTION IN REPUBLIC OF SRPSKA FROM 2004 TO 2015

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The aim of this study was to examine the volume of manure production in the Republic of Srpska during the period from 2004 to 2015. Evaluation of the amount of manure produced in the period examined was based on the data from the Statistical Office of the Republic of Srpska regarding the number of domestic animals. The production of all types of manure during the examined period followed the variations in number of animals. Production of cattle manure was the lowest in 2004 (1,565,242.64 tons), and the highest in 2006 (2,030,385.50 t). The production of pig manure was the lowest in 2008 (365,088.77 t), and the highest in 2006 (566,648.19 t). The production of poultry manure was the lowest in 2004 (132,300.09 t), and the highest in 2010 (350,294.88 t). The production of sheep manure was the lowest in 2004 (276,956.16 t), and the highest in 2010 (377,208.52 t). The production of horse manure was the smallest in the period from 2013 to 2015 (83,512 t per year), and the highest in the period from 2004 to 2007 (121,472 t per year).

Keywords: manure, production.

SMNRP3

AGRO-ECOLOGICAL RISK ASSESSMENT OF BEYŞEHIR LAKE WATERSHED IN TURKEY

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An ecological risk assessment is the process for evaluating how likely it is that the environment may be impacted as a result of exposure to one or more environmental stressors such as chemicals, land change, disease, invasive species and climate change. The agricultural risks are an important factor in stressors. Agricultural chemicals are risk source for soil and water due to their properties. In addition, application of agricultural machine and equipment on soil is a risk factor for soil structure. For this reason, the determination of ecological risk arising from soil and land, and evaluation of agricultural risk in ecological risk need for sustainable land management especially lake watersheds. The aim of this study is to determine the ecological risk in Beyşehir Lake Watershed and to generate a solution for agricultural risks. Study was included office, land and laboratory applications. Data collection, sampling and measurements were conducted in land surveys. Laboratory studies were consisting of analysis of the sampled soil and plants. To risk assessment, thematic layers of study area were produced with a systematic method. The classification result was compared with the natural structure of the classes and the long-term sustainability of the land was evaluated. Results show that the most important risk component is insecticides application on apple orchards which in grown sandy soils in early spring.

Keywords: agricultural risks, lake watershed, sustainable land management, geographic information systems.

SMNRP4

IMPACT OF SOME MIXTURES BETWEEN RETARDANTS AND ANTIGRAMINACEOUS HERBICIDES ON THE SOWING PROPERTIES OF THE DURUM WHEAT SOWING-SEEDS

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The research was conducted during 2010 - 2012 on pellic vertisol soil type. Factor A – cultivars, include 2 Bulgarian durum wheat cultivars: Deyana and Zvezdica (*Triticum durum var. valenciae*). Factor B – stimulators, include 9 variants: untreated check and 5 growth stimulators – H - 40 in doses of 300 and 500 ml/ha, XH - 100 in doses of 1 and 1.2 l/ha, TH - 140 in doses of 2.5 and 2.8 l/ha, X – 80 in dose of 800 ml/ha and T – 100 in dose of 2.5 l/ha. All stimulators were treated during the tillering stage of durum wheat. It was found that the highest grain yield at durum wheat cultivars Deyana and Zvezdica is obtained by influence of growth stimulators XH - 100 and TH - 140. The dose of stimulator H - 40 depresses durum wheat increased. The lowest yields were obtained by use of stimulators X - 80 and T - 100 at both durum wheat cultivars. The grain yield increase by investigated stimulators due to the increase in the grain number per spike and the grain weight spike in main tiller and second tiller. The 1000 grain weight, test weight, vitreousness, protein quantity, wet and dry gluten quantities are increased by influence of the investigated growth regulators. Physical and biochemical properties of the grain are the highest by treatment with stimulators XH - 100 and TH - 140. The use of these two plant growth regulators is suggested as an element of the technology for growing durum wheat.

Key words: durum wheat, stimulators, grain yield, structural elements of the yield, grain quality.

SMNRP5

STATUS AND AREAS UNDER ORGANIC PRODUCTION OF VEGETABLES IN THE REPUBLIC OF SERBIA

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Due to extremely favourable soil and climate conditions, vegetable production has been traditionally developing in the Republic of Serbia. The production of safe food, such as organic food, is a priority of the development of the entire sector of agricultural production. The study presents the areas under organic productions of vegetables in Serbia in the period from 2012-2015. According to this presentation, it is obvious that this type of production has been permanently increasing. In comparison to 2012, the areas in 2015 increased by 56.76 ha. The areas under organic vegetable production amounted to 170.5 ha in 2015. The smallest areas with organic production of vegetables were recorded in the Belgrade municipality (3%): 5.1 ha in 2014 and 3.02 ha in 2015. Areas somewhat greater than in the Belgrade municipality were located in the regions of southern and eastern Serbia (9.68 ha), then in Šumadija and western Serbia (21.21 ha or 12%). In recent years, areas with this type of production have increased threefold (by 15.55 ha). The organic system in our country mostly encompasses the production of potato (13.74 ha), popping maize (14.25 ha), cabbage (7.3 ha), carrot (8.9 ha), pepper (10.38 ha), tomato (6.58 ha), French bean (15.6407 ha), pumpkin (12.0426 ha), garden beet (6.5084 ha), onion (9.3962 ha) and Jerusalem artichoke (12.84 ha). The lack of adequate knowledge about organic production of vegetables, inadequate government policies, uninformed consumers and underdeveloped market are just some of the drawbacks of this type of agricultural production. In spite of poorly developed market not only of vegetable production, but also of the entire sector of organic food production in Serbia, the number of organic food producers has been rapidly growing and with the adequate investment, credit-monetary and export support by the government, vegetable production would become the most important production in our country.

Keywords: organic vegetable production, production areas, producers, cost, market.

SMNRP6

IDENTIFICATION OF FUNGAL COMMUNITIES FROM COMPOSTING HAZELNUT HUSK

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The objective of this study was to determine the fungi enabling the degradation of hazelnut husk and determine some chemical properties of decomposing hazelnut husk.Hazelnut husk picked from orchards was stacked on a land and left under aerobic conditions for fragmentation. The fungal strains were being detected in samples during 2 years. Efficient cellulase-producing fungi were isolated from different sampling time in hazelnut husk composting process decayed lignocellulosic waste etc. using different isolation strategies. Among the various isolates obtained from different environments, five fungi were selected depending upon the diameter of clear zone produced in Carboxy methyl cellulose agar for further screening in liquid media and one potent strain NASC3 was identified as efficient cellulolytic fungi. Molecular identification of strain NASC3 was done by PCR amplification of 18s rDNA region using primers ITS4 and ITS5. The phylogenetic analysis of strain NASC3 showed and identified as *Penicillium piceum* IMI 392509^{T}, *Penicillium citrinum* C1-1^{T}, *Emericella rugulosa* 14^{T}, *Penicillium brasilianum* KUC1433^{T}, *Acremonium* sp. ATT196^{T}, *Penicillium verruculosum* 101119^{T}, *Penicillium piceum* IMI 392509^{T} and *Aspergillus tubingensis* SAB-B3C-T^{T}.

Keywords: hazelnut husk, fungi, compost, identification.

SMNRP7

EFFECT OF DIFFERENT ORGANIC WASTES ON UREASE ACTIVITY OF MAIZE (Zea mays indendata) RHIZOSPHERE AND ROOT FREE SOIL

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This study was carried out in order to determine the effects of various organic wastes (tobacco production waste, wheat straw, tea waste and hazelnut husk) under greenhouse conditions on urease activityin clay loam soil and rhizosphere (*Zea mays indandata*)soil of maize plant. The organic wastes were thoroughly mixed with the soil at a rate equivalent to 50 g kg^{-1} on air-dried weight basis. Experimental design was a randomized plot with replications in a greenhouse. The moisture content in soil was maintained around 60 % of maximum water holding capacity by weighing the pots every day. Changes in the urease activity (UAc) were determined in the soil and rhizosphere (*Zea mays indendata*) samples and root-free soil taken on the 15th, 30th, 45th, 60th, 75th and 90th day after the experiment was conducted. At the end of experiment, all organic waste increased UAcin the soil in comparison with the control ($P<0,01$) at all experimental periods. Moreover, UAcin rhizosphere soil were higher than in root-free soil at all organic waste applications ($P<0,01$).Increased amount of organic wastes had different effects on UAc ($P<0,01$).The most increases are in the UAcin the soil treated with tea and tobacco production wastes with supplying of low initial C/N ratio compared to the other organic wastes.

Keywords: organic waste, soil, rhizosphere, urease activity.

SMNRP8

EFFECTS OF SOIL PROPERTIES ON AGGREGATE STABILITY

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In this study, the effects of soil physicochemical properties on aggregate stability (AS) were determined. Surface soil samples (0-20 cm depth) taken from different agricultural fields were analyzed to determine AS, clay, silt and sand contents, soil reaction (pH), electrical conductivity (EC), organic matter (OM) content and exchangeable cations (Ca, Mg, K, Na). The relationships between AS and measured soil properties were determined using SPSS program. Aggregate stability values varied between 2.01% and 79.14% with a mean of 23.50%. While AS values had significant positive correlations with OM, clay, Ca and K contents, they had significant negative correlations with pH, silt and sand contents. A significant linear regression was obtained between AS values and the variables of OM, silt, clay, pH, K, EC values. The results indicated that OM, clay and silt contents are the most effective soil properties on aggregate stability of agricultural fields.

Keywords: aggregate stability, soil properties, cultivated fields.

SMNRP9

EFFECT OF FARMYARD MANURE APPLICATION ON SOIL COMPACTION

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The objective of this study was to determine the effect of farmyard manure on soil penetration resistance. Manure was applied into soil with four different doses (0, 36, 67 and 100 ton ha-1) in a randomized plot design with three replicates. Some soil properties such as; bulk density, total porosity, penetration resistance, gravimetric water content and organic matter content in soil samples were determined according to basic soil test methods. Soil bulk density, relative saturation and penetration resistance values decreased with increasing the manure application doses. On the other hand, total porosity, gravimetric water and organic matter content of the soil increased. Penetration resistance values gave significant negative correlations with total porosity, gravimetric water content, and positive correlations with bulk density and relative saturation. The results indicated that increasing the application doses of farmyard manure changed the soil structure and decreased soil compaction.

Keywords: manure, penetration, compaction, soil properties.

SMNRP10

THE EFFECT OF NPK ON THE POPULATION DYNAMICS OF *Parlatoria ziziphi* (Homoptera: Diaspididae) ON CLEMENTINE (Citrus clementina) IN THE BOUFARIK AREA MITIDJA ALGERIA

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A study undertaken during one year (July 2014- June 2015) on the effect of NPK on the population dynamics of Parlatoria ziziphi on Clementine (*Citrus clementina*) in the Boufarik area revealed that this cochineal shows three annual generations, coinciding with three sap thrust of Clementine. Furthermore foliar analyzes of NPK were carried out. In order to study their influence and understand nutritional requirements of the population of this cochineal, by determining the chemical content of fertilizers including Nitrogen, Phosphorus, and Potassium, which showed a strong correlation on the infestation of this cochineal. The population is lower when the NPK content is higher

Keywords: Citrus, population dynamics, *P. ziziphi*, NPK.

SMNRP11

INSECTICIDAL ACTIVITY OF THREE ESSENTIAL OILS AGAINST Tribolium castaneum Herbst (Coleoptera: Tenebionidae)

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This laboratory study was carried out for the purpose of determining the insecticidal activity of three essential oils extracted from three plants: *Daucus carota*, *Juniperus phoenicea* and *Melaleuca quinquenervia* for control of *Tribolium castaneum* (Herbst), an important species of products stored using the contact oil penetration method. Three solutions of each of the essential oils at concentrations of 20µ/ ml, 40µ/ml, 80µ/ml and 160µ/ml of essential oils per 1ml of acetone were prepared. Each solution was evenly spread on a filter paper disk 9 cm in diameter using a micropipette. After complete evaporation of the diluting solvent, each treated or control disc was carefully placed in a Petri dish of the same size, 9 cm in diameter and 2 cm in height. A batch of 20 adult insects is introduced into each petri dish which was immediately closed by a fine mosquito net. The contact effect in the case of the three essential oils tested shows a fairly high mortality rate on the *T.castaneum* , the determination of the median lethal dose LD_{50} corresponding to each essential oil allowed to classify them according to their toxicity, *D. carota* with the best insecticidal potential equal to 39.81µl/ml, followed almost equally by the *M. quinquenervia* at 43.65 µl/ml and lastly comes the *J. phoenicea* which is equal to 61.65 µl/ml for 20 days of exposure. In the light of the results obtained, we can conclude that the three essential oils tested have good insecticidal activity to *T.castaneum*. The experience has shown that the activity of essential oils depends on the nature of the oils, the doses used and the time of exposure. These essential oils may constitute, to varying degrees, potential candidates for methods of alternative struggles to chemical protection

Keywords: essential oils, control, *Tribolium castaneum.*

SMNRP12

THE STUDY OF ANTAGONISTIC ACTIVITY OF *Trichoderma atroviride* AND THE INFLUENCE OF WHEAT GENOTYPES IN THE PROTECTION AGAINST ROOT ROT DISEASE

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Fusarium head blight and root rot are two major diseases that affect wheat, causing yield loss and also grain contamination by mycotoxins. In Algeria as in the Mediterranean area, over the last years *F. culmorum* has been the most predominant species, which can be associated with root and collar rot and head blight. The use of chemical control method against *Fusarium* diseases is still possible but with limited effectiveness. This status involves the use of biological control agent as an alternative method to manage these diseases. In this way, the main objective of this work is to study the antagonistic activity of an isolate belonging to *T. atroviride* species (Ta.13) against *F. culmorum*. The *in vitro* test of Ta.13 antagonistic activity isolate showed that this isolate effectively inhibited *F. culmorum* isolate growth. Data recorded showed that the percentage of growth inhibition varied between 88.47 and 97.35% in the case of direct confrontation (dual cultures) and 51.95 and 84% by indirect confrontation under the Ta.13 antifungal volatils substances. By *in vivo* test, seed treatment of seven wheat genotypes (Vitron, Waha, Bousselem, GTA, ARZ, Ain Abid, Hiddab 1220) by Ta13 conidia suspension before sowing in soil already infested by *F. culmorum* showed that this strain effectively reduced disease index compared to the untreated control. Significant differences depending on the variety were obtained and the highest percentage of disease reduction was 86% recorded for Waha variety.

Keywords: fusarium head blight.

SMNRP13

ENTOMOLOGICAL BIODIVERSITY ASSOCIATED WITH POTATO CULTURE IN THE ALGERIAN SAHEL

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The present study was carried out in the station of the ITCMI (Technical Institute of vegetable crops and Industrial Cultures) in Staoueli; The Barber pots technique was used to identify 52 species (S = 52), or 411 individuals of arthropods. The insect class predominated with 40 species (S = 40), i.e. 310 individuals. Hymenoptera was represented by 10 species (S = 10) or 34.34% (AR% = 34.34), followed by Diptera, which was represented by 13 species (S = 13) or 11.75% , 75), Coleoptera come in the 3rd position with 8 species (S = 8) or 9.02% (AR% = 9.02).

Keywords: barber pots, biodiversity, potato.

SMNRP14

CHANGES OF SOIL ORGANIC CARBON IN CONVENTIONAL AND CONSERVATION TILLAGE

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In the temperate agro-ecological conditions of Serbia there is a lack of research on the impact of different tillage to the soil organic carbon (SOC) change. Simultaneously, the introduction of conservation tillage systems is expanding, as a viable option for climate friendly agriculture. The aim of this study is to compare the effects of conservation and conventional management in winter wheat and sunflower production on the SOC change. The study was performed in Padina (South Banat) on the calcareous chernozem soil. Soil samples were taken from a depth of 0-10 cm, 10-20 cm, 20-30 cm and 30-40 cm. Conventional tillage was done with a plow at a depth of 25 cm for winter wheat, and 27 cm for sunflower, while conservation tillage was carried out with heavy harrows at a depth of 15 cm for winter wheat, and with combined tool Horsch Terrano at a 25 cm depth for sunflower. The total content of SOC in the soil was higher in the conservation tillage as compared to plowing. The highest content of SOC with conservation tillage was found at a depth of 10-20 cm after sunflower, and 0-10 cm in winter wheat plot. The higher content of labile organic carbon soluble in hot water (HWOC) was found in the plowing of winter wheat and sunflower in a plow layer of 0-20 cm, and the lowest content was found at a depth of 20-30 cm. In the conservation tillage higher HWOC content for winter wheat was found at the depth of 0-10 cm, and 10-20 cm in sunflower, indicating that crop residue deposition and amount affect the accumulation of SOC. Soil depth manifested a higher impact on HWOC content in relation to the tillage system and crops. With plowing, Carbon Management Index indicated the SOC accumulation at a depth of 20-40 cm in winter wheat, and 0-20 cm in sunflower. Conservation tillage resulted with the SOC accumulation in a 20-40 cm soil layer for both crops. The regression analysis showed that with the increase of the labile organic matter fraction, associated with crop residue retention, the total SOC could also be preserved.

Keywords: tillage, soil organic carbon, HWOC, CMI, winter wheat, sunflower.

SMNRP15

CHALLENGES AND POSSIBILITIES OF ORGANIC SEED PRODUCTION WITH THE EMPHASIS ON CONTROL OF PATHOGENS

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The excessive use of agrochemicals in agriculture has led to various disturbances of the agroecosystem. Organic farming as an alternative agricultural system originated as a response to many consequences of such a production. An exceptional place in organic agriculture belongs to the organic seed production, which was initiated in Serbia within the demonstration fields of the Institute "Tamiš" in Pančevo in 2008/2009. The objective of this study is to present an overview of the status of organic seed production in Serbia and to point out to the problems this production faces. Significant technical challenges exist in relation to the production of healthy organic seed with high germination percentage. Therefore numerous studies are carried out to increase germination. Current regulations applied worldwide recommend that the production of seed and planting material, which will be used in organic agriculture, should be performed in accordance with prescribed methods, and therefore the certification of the organic production system is a key requirement. Organic seed production, compared to conventional one, is exposed to a greater risk of contamination by weed seeds and seed borne diseases, which is why it is very difficult to achieve high quality standards of seeds. Early harvest is one of the possible measures to improve seed health. Special attention in organic seed production should be focused on the biennial species, because a great problem is the development of diseases in the first year and a continued increase of the disease pressure in the second pose. Treatments of seeds with acetic acid, natural plant extracts, and oils of tea tree, coconut and lemon, priming, treatments with antagonists, use of warm or hot water, seed coating with mustard flour, powder milk are just some of effective methods in control of seed borne diseases. Farms with organic food production in Serbia should be linked into a group that would deal with conservation of plant landraces (in situ or on-farm conservation) and the exchange of their seed, because the development of such programmes would serve as a model for the production of organic seed material required by producers of organic food in Serbia.

Keywords: organic seed, certification, seed-borne diseases.

SMNRP16

CAPABILITY CLASSIFICATION OF THE LAND BELONGING TO THE BUŽIM MUNICIPALITY

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One of the primary soil functions is the production of food and raw materials, but the soil is used for other purposes as well outside the sphere of agricultural production, e.g. road construction and housing, exploitation of mineral resources, etc., and thus the quality within the agricultural surface is often lost, which is why one must be extremely careful when assigning use purpose to the land. The research in this paper, apropos agricultural land capability classification, was carried out in the Bužim municipality using the guideline of unique methodology regarding the classification of agricultural land in the rating categories and criteria for individual soil properties, based on which land capability classes of the land are determined. As the result of investigation six agricultural land capability classes (LCC) and land capability subclasses (LCS), ranging from III to VII, were determined, and beside that, areas marked as forest and built land. The most common land areas were marked under the VI LCC with the total area of 18.99% of the territory of the municipality. The V LCC was represented with a percentage of 11.65, while the IVa LCS were only represented with 1.02%. Currently the relationship between high-quality land and lower quality categories moved towards less quality categories. The VI LCC is represented with a total area of 2,607.86 ha. This leads to the conclusion that the agricultural land in the area of Bužim municipality is more favorable for livestock production and fruit growing rather than arable farming and vegetable growing.

Keywords: land capability class, land capability subclass, Bužim municipality.

SMNRP17

THE STUDY OF THE MOBILITY OF HERBICIDE BY BIOASSAY METHOD

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The research was conducted by the short-term bioassay in laboratory and greenhouse conditions, with four different types of soil, two herbicides (Deltacet PLUS and Lumax), two different test plants (wheat and barley), three concentrations (doses) and three amounts of water for elutriation. The mobility study was done by the combination of methods that were applied by Woondimagegnehu Marcia and Chester (1986), Janjic et al. (1992), Mitric (2011), in columns with disturbed soil samples. The effective dose (ED50) of Deltacet plus herbicide ranged from 240.22 to 1077.6 µg/kg soil, depending on the soil type. The effective dose of herbicide Lumax ranged, depending on the type of soil, from 226.32 to 469.49 µg/kg. Inhibition mass of shoots test plants depends of the herbicide dose, profile depth, soil type and quantity of leaching water. It is possible to describe this correlation by multiple linear regression. The regression was done by taking the dose and the amount of water as independent variables, at the profile depth of 5 cm, and the percentage of inhibition of test plant seedling was used as depending variable. The amount of water required to elutriate the Deltacet plus herbicide from the first 5 cm of the natural soil layer is 570.95 l/m^2 in SM soil type, in P soil type it is 1398.46 l/m^2, while in K soil type the amount of water is 7021,84 l/m^2. Correlation analysis indicated that the content of clay is a dominant characteristic of the soil, which affects adsorption Deltacet plus herbicide, as well as the leaching. The amount of water required to elutriate the Lumax herbicide from the first 5 cm of the natural soil layer is 493.57 l/m^2 in SM soil type, in P soil type it is 715.77 l/m^2, while in K soil type the amount of water is 590.0 l/m^2. The humus content and pH of the soil are dominant factors for the adsorption of Lumax herbicide which is established by correlation analysis.

Keywords: herbicides, mobility, bioassey.

SMNRP18

REPAIR OF FLORISTIC COMPOSITION OF NATURAL GRASSLAND MEADOW AREA OF BANJA LUKA

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Natural grasslands are the most important source of the fodder production in the mountainous area of Banja Luka region. This paper analyzes the impact of the application of various agricultural practices (fertilization, harrowing and different moments of cut) on the floristic composition of natural grassland type *Agrostietum vulgaris* (Pavlović,1955) on the site of Manjača. A trial was conducted in two growing seasons (2012. and 2013. year). The experiment was set up on 32 plots in a randomized complete block design with eight variants with four replications. The presence of 31 species, of which florist group of grasses (*Poaceae*) belonging to nine species, legumes (*Fabaceae*) four species, the bad and worthless grasses (*Cyparaceae, Juncaceae*) four species and forbs (*Asteraceae, Brassicaceae, Caryophillaceae, Euphorbiaceae, Equisetaceae, Lamiaceae, Polygonaceae, Plantaginaceae, Ranunculaceae, Rosaceae*) fourteen species are identified. Application of fertilization, harrowing and different moments of cut has led to differences in the floristic composition in two growing seasons.

Keywords: natural grassland, fertilization, harrowing, terms of cutting.

SMNRP19

INNOVATION RESEARCH BIOGAS FERMENTORS

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Nowadays, when we produce electrical energy primarily from non-renewable sources such as nuclear power, coal, lignite, petroleum, natural gas, etc., it is necessary to find renewable sources (Biogas from waste and renewable resources: an introduction, 2016). One option is to use renewable biogas, which can be a processed animal manure, sludge from sewage treatment plants, chaff from the grain and etc. The aim of the entire paper is to introduce innovation research biogas reactors. Based on the experience from the older version of the reactor was our innovation in design of new reactors and replacement of existing software (SW) and hardware (HW) for the management of processes inside the reactor. As software built with the latest version of Control Web 7 from a hardware example, we used IO4 unit connected via Ethernet. IO4 unit was installed switching cards and measuring cards. SW and HW is from Czech company Moravian Instruments, which manufactures equipment for automation. The resulting solution was reflected in increasing the efficiency of the entire management and data storage. Improvements design helps facilitate insertion of the charge and improve mixing of the contents of the reactor and thus improve the homogeneity of the batch. The newly created software allows storing data in the database and the data can be easily analysed obtaining valuable information to increase production biogas.

Edited by Dieter Deublein and Angelika Steinhauser. Biogas from waste and renewable resources: an introduction. 1. Aufl. Weinheim [Germany]: Wiley-VCH, 2008. ISBN 9783527318414.

Keywords: biogas reactors, biogas, control, automation.

SMNRP20

ENTOMOPATHOGENIC NEMATODES IN THE REPUBLIC OF SRPSKA

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Among the numerous beneficial organisms that can be considered as biocontrol agents are nematodes. Many nematodes are associated with insects but entomopathogenic nematodes from families Steinernematidae and Heterorhabditidae are receiving the most attention as control agents of insect pests. They are obligate and lethal parasites of insects that kill their hosts by mutualistic interaction with their symbiotic bacteria. They are exceptionally safe for human beings, environment and beneficial organisms. National legislation of the Republic of Srpska requires confirmation of presence of biological control agents on species level prior to their registration.The study on the biodiversity of entomopathogenic nematodes was conducted for the first time in the Republic of Srpska during 2014 and 2015. 225 soil samples from agricultural fields and natural vegetation were tested on the presence of steinernematid and heterorhabditid nematodes by baiting with greater wax moth - Galleria mellonella L. larvae. We obtained 10 positive samples (4.4%) for the presence of entomopathogenic nematodes, with 9 (4%) containing Steinernema and 1 (0.04%) containing Heterorhabditis isolate. Morphological, morphometrical and molecular observations were carried out to characterise isolates. The Steinernema isolates were conspecific with 3 species S. feltiae, S. carpocapsae and S. krauseri and Heterorhabditis with H. bacteriophora. S. feltiae was present in 8 samples, whereas S. carpocapsae and S. krauseri in one sample each.This study reveals the presence of 4 species from two genera of EPN in the Republic of Srpska. These species are commonly applied as biocontrol agents in many European countries and suggested by European and Mediterranean Plant Protection Organization (EPPO) as safe for application. Considering this, legal authorities can place these organisms on the list of allowed biocontrol agents.

Keywords: Steinernema, Heterorhabditis, survey, biological control, biodiversity.

SMNRP21

INTEGRATED PROTECTION OF CABBAGE IN LIJEVČE POLJE AND CENTRAL BOSNIAN CANTON

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Integrated protection of cabbage is an optimal combination of biological, chemical, agro-technical measures, wherein the use of pharmaceutical plant protection products is restricted to the most essential quantity allowed of pesticides, which are needed for the retention of harmful organisms under the limit which causes loss-threshold harmfulness. Cabbage is one of the most important vegetable crops in Bosnia and Herzegovina and it is attacked by a large number of pests, diseases and weeds. In Bosnia and Herzegovina it is grown in a number of different environmental conditions. Monitoring was carried out in two localities: Lijevče polje and Turbe. In Lijevče polje area, yellow sticky traps were placed on a surface area of 1,2 ha. Also, yellow sticky traps were placed in the area of the municipality of Travnik, the locality of Turbe in the total area of 1,5 ha. Modern cabbage production technology was used and pesticides were an integrated protection. Depending on the occurrence, phytopathogenic disease causes, insects and weeds were chosen. In the locality of Kosjerovo, pre-crop used for cabbage was barley and fertilization was carried out with beef manure, while on the locality of Turbe cabbage was grown in monocultures for 3 years and fertilization was carried out with chicken manure. During the monitoring, the biggest problems in cabbage production at both localities were cabbage moth, cabbage white butterfly and cabbage flies. Visual inspection indicated the presence of cabbage diseases such as bacterial disease Xanthomonas campestris var. campestris and because cabbage irrigation system was performed in the morning and evening. In the locality of Turbe, the presence of downy mildew of cabbage Peronospora parasitica was suspected. Weeds which were present were Ambrosia artemiisifolia L, Cirsium arvense L, Sorghum halepense L in individual specimens. In the locality of Turbe, dominant weeds were Chenopdium album L, Amaranthus retroflexus L and Galinsoga parviflora Cav. The study was aimed at monitoring and giving recommendations for production of high quality cabbage with minimal application of pesticides in accordance with the modern agrotechnics and integrated protection principles.

Keywords: pesticides, cabbage, disease, pests and weeds, Turbe, Lijevce polje.

SMNRP22

MORPHOLOGICAL CHARACTERISATION OF THE WILD PEAR FRUITS (*Pyrus communis* L.) IN THE STARCEVICA FOREST PARK

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The subject of this study is the morphological characterization of wild pear fruits (*Pyrus communis* L.) in the area of the Starčevica Forest Park in order to determine diversity of naturally occurring populations. The analysis was conducted for two years in a row for the available fruit or for trees that brought fruit in the year of the research. Fruits were analyzed from a total of eight trees from eight different sites. On selected accessions following were analyzed: height and width of the fruit, fruit weight, stem length, fruit skin base color, hardness of the fruit, pH and the total solid content of the fruit. The average fruit weight of wild pears on the study area ranged from 6.43 grams to 25.53 grams; the average height of the fruit ranged from 18.58 mm to 35.94 mm; the average width of the fruit was in the range of 22.87 mm to 35.88 mm; the average stem length was in the range of 8.80 mm to 30.90 mm. The pH value was approximately the same for all the fruit, and was in the range of 2.96 to 3.5. The total solid content in the fruit ranged from 10.34 to 22.78%. The wild pear fruit hardness ranged from 2.70 to 11.50. Wild pear fruit color ranged from green to brown. Analyses of variance determined statistically significant differences in the fruit characteristics among studied wild pear trees. According to principal components analyses (fruit dimensions, pH value, solid content) we can group wild pear fruits from the Starcevica Forest Park into two groups. Research results indicate high variability according to studied morphological characteristics. These data are important in terms of preserving the diversity of fruit trees but are valuable for the purposes of a possible inclusion in breeding programs.

Keywords: wild pear (*Pyrus communis* L.), morphological characterization, analysis of variance.

Note: The research was co-financed by the Ministry of Science and Technology of the Republic of Srpska, through the project "Characterization of germplasm of fruit trees" grant agreement number 19 / 06-020 / 961-158-3/11.

SMNRP23

ASSESSMENT OF PLANT ENERGY INTENSITY OF PRODUCTION IN FARMS WITH DIFFERENT ACREAGES

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In the work, we conducted a comparative assessment of the process of crop production in two farms from different areas and the nature of the production. Both tested farms were located on the territory of Łódź Voivodeship (middle part of Poland). We compared the process of production of winter wheat under the conditions of traditional soil cultivation and using tillage. Agronomic treatments were examined, which were performed in both cultivation systems, and their duration and fuel consumption to carry out individual agricultural science treatments. The aim of the study was to balance economic crops of winter wheat in the farms. The economic analysis showed that cultivation without plowing brings more profit. Cultivation without plowing requires less in terms of fuel and labor costs.

Keywords: traditional soil, cultivation without plowing.

SMNRP24

IS THE FARMER POPULATION IN VOJVODINA REGION (SERBIA) THREATENED BY SKIN CANCER DUE TO CLIMATE CHANGE?

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Climate change is a worldwide phenomenon, having different manifestations in various regions. Although the cause of the changes is still unexplained the effects are pretty observable. Increasing rate of incidence of skin cancer (melanoma) in Vojvodina region is highly evident in the last few decades. In this study we have focused on Novi Sad (Rimski Šančevi) and meteorological parameters related to the maximum air temperature and solar radiation. We have analyzed the number of warm days, with the maximum temperature above the predefined threshold, during the period 1951-2010. We have used two thresholds with daily maximum temperature greater than or equal to 25 °C (summer days) and 30 °C (tropical days). The insolation was measured by the number of hours with direct solar radiation on the monthly basis, during the period 1991-2015. The results show an increase in the number of warm days (5% of summer days and 22.4% of tropical days) and the increasing trend of insolation in Novi Sad, in the last few decades. The results indicate a higher potential exposure to the UV radiation for the people who spent a lot of time outdoors, especially farmers working in the fields. This concerning fact demands more informative measures, advices and actions by governmental institutions, authorities and media to be directed to the farmers.

Keywords: warm days, insolation, UV, melanoma.

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DRVAR'S CORNELIAN CHERRY– BASIS FOR STARTING THE PRODUCT PROTECTION AND BRANDING

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Cornelian cherry (*Cornus mas*) was well known to the ancient Greeks and Romans, and references to the plant abound in their literature. The plant was grown in monastery gardens of continental Europe through the Middle Ages and was introduced to Britain about the sixteenth century. Within our area, cornelian cherry is most present at the area of Drvar municipality and surroundings, making this municipality recognizable. Cornelian cherry is a synonym for health because it is believed to have high nutritional and medicinal values. The products made of cornelian cherry originating from Drvarska valley are: juice, jam, sweet, compote and the most famous product is "rakija drenja". In order to start protection and branding of cornelian cherry products we made an inventory and preliminary evaluation of selected trees which are fruiting regularly and give large and high quality fruits. For each fruit sample we filled the collection form and minimal passport descriptor. Detailed photographs of each fruit sample, during the field work and in laboratory, were taken. Ethnobotanical data collection was conducted through interviews with the owners of the estates. On leaf samples we measured the length and width of the leaves and stems, while on the fruits we measured the length and width of the fruit, length and width of fruit stem and stone, weight of fruits and stone and total sugar content in the fruits. In order to analyze the nutritional fruit values, especially vitamin C, titratable acidity and antioxidant activity we homogenized the pulp of fruit samples. Based on the preliminary research we can isolate cornelian cherry trees with very large fruits and high sugar content, which are important characteristics of the fruit used for the production of traditional products, primarily famous "drenjina brandy". This research represents the basis for starting the procedure for the protection of traditional cornelian cherry products and know-how knowledge. This would lead to the improvement of direct sale of the products on the producers' farms, contributing to a sustainable development of local communities. Also, protection and branding of cornelian cherry products would result in economic, social and tourist growth of this region.

Keywords: *Cornus mas*, evaluation, traditional knowledge, branding.

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Fabrika stočne hrane „Farmofit“, kao poslovna jedinica preduzeća Rapić iz Gradiške, od 2011. godine se izgradnjom najmodernijeg postrojenja na ovim prostorima uspješno bavi proizvodnjom stočne hrane. Fabrika stočne hrane je izgrađena uz upotrebu najnaprednije tehnologije i predstavlja najmoderniji pogon te vrste na širem području. „Farmofit“ raspolaže savremenom tehnologijom za proizvodnju potpunih i dopunskih krmnih smješa namijenjenih ishrani svih kategorija životinja. Iz pogona fabrike izlaze visokokvalitetne smješe za ishranu živine goveda, svinja, ovaca, koza, kunića i drugih životinja. U proizvodnji smješa daje se prednost sirovinama domaćeg porijekla, čime se pozitivno utiče na ekonomski razvoj domaće privrede. Proizvodni pogon fabrike kapaciteta je 20 t/h, a finalni proizvod se, uz dvije odvojene linije peletiranja, isporučuje u peletiranom obliku. U sklopu fabrike se nalazi i sušara i skladišni prostor namijenjen za čuvanje rinfuzne robe. Kompletan proces proizvodnje je poluatomatizovan i prati se računarskim sistemom nadzora, tako da su faktori ljudske greške svedeni na minimum. Cijeli proces je zaokružen i praćen kontrolom kvaliteta u sopstvenoj savremenoj opremljenoj laboratoriji, uz izuzetno strogu kontrola kvaliteta svih ulaznih sirovina. Naši proizvodi su vrhunskog kvaliteta i zadovoljavanju najviše evropske standarde, a naročito su prepoznati od strane kupaca u BiH i regiji, pa je „Farmofit“ lider u proizvodnim količinama u komercijalnoj proizvodnji stočne hrane u BiH. Svu kupljenu hranu besplatno dostavljamo na lokaciju kupca, na cijeloj teritoriji Bosne i Hercegovine, i to sopstvenim voznim parkom u roku od 24 časa. Primjenjujemo sistem upravljanja kvalitetom prema zahtjevima standarda ISO 9001:2008. i HACCP sistema kvaliteta od 2011. godine, a implementacijom Halal standarda 2016. godine postali smo prva fabrika stočne hrane u BiH koja je svoju proizvodnju uskladila sa zahtjevima Halal standarda BAS 1049:2010. U 2016. godini predstavili smo dva nova Farmofit proizvoda, smješe komercijalnog naziva UKS-11 i UKS-14, a od domaćih poljoprivrednika otkupili rekodrnih 4.000 tona domaće pšenice, 3.000 tona sojinog zrna i 15.000 tona merkantilnog kukuruza. Broj radnih mjesta se konstantno povećava, a preduzeće trenutno zapošljava preko 70 najboljih stručnjaka iz ove oblasti. Najviše zaposlenih je sa srednjom stručnom spremom, a jednu trećinu ukupnog broja zaposlenih čine visokoobrazovani stručni kadrovi iz oblasti poljoprivrede i srodnih grana. Kao društveno odgovorna kompanija u toku prethodne godine pružili smo podršku studentima Poljoprivrednog fakulteta u Banjaluci kroz projekat stipendiranja, koji će mladim inženjerima nakon završetka školovanja omogućiti radno mjesto u kompaniji.