

# Effect of irrigation on fruit quality and yield of Red Cap apple cultivar depending on crop load

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## INTRODUCTION

Successful cultivation of apple orchards in Serbia requires about 750 mm of precipitation per year. Whether this quantity will actually be sufficient depends on the temperature of the air, the type of soil, the distribution of rainfall during the year, and the characteristics of the plantation itself (number of plants per ha, method of soil maintenance, crop load, etc.). The most critical months in terms of water supply are July, August and September, since the most important varieties of apple fruits ripen in late August, September and October.

In addition to water, the fruit load on the tree has a great influence on the quality of the fruit, its mass, as well as the differentiation of flower buds for the next year.

The aim of the paper is to determine how many apple fruits can be left on trees in third vegetation, growth under different irrigation treatments (without irrigation, normal irrigation - control and with increased irrigation - double irrigation rate).

## MATERIALS AND METHODS

The experiment was carried out in the village of Novi Slankamen, Indija municipality. Apple orchard has been planted in the autumn of 2016. The planting distance is 3.25 meters between the rows, and the distance within a row is 0.62 meters. The variety being tested is Red Delicious (Red Cap Valtod clone) grafted on M26 rootstock.

In May 2019, after manual thinning, a trial was set up with varying degrees of crop load: load I (25 fruits per tree), load II (30 fruits per tree), load III (40 fruits per tree) and load IV (50 fruits per tree).

Three different irrigation treatments were established during July and August: deficit irrigation (no watering), control irrigation (one lateral in a row) and double irrigation rate (two laterals in a row). In each irrigation regime, they were trees with all four crop loads treatments. Each plant was irrigated with 3.2 liters of water during the day in July and 4.8 liters of water during the day in August (control irrigation). The plant was irrigated in July with 6.4 liters of water during the day in July, and 9.6 liters of water during the day in August (double irrigation rate).

Fruits from all treatments were picked at the same time. measured for fruit firmness, soluble solids content, titratable acidity, and starch index.

## RESULTS

Effect of irrigation on the yield per tree (kg) depending on crop load

Irrigation treatment	Crop load (number of fruits per tree)				Average
	I	II	III	IV	
Without irrigation	3.89a	3.86a	3.89a	4.86a	4.12a
Control	3.59a	3.98a	4.28ab	4.90a	4.19a
Double irrigation rate	4.16a	4.39a	5.03b	4.37a	4.49a
Average	3.88a	4.07a	4.40ab	4.71b	

Effect of irrigation on the fruit weight (g) depending on crop load

Irrigation treatment	Crop load (number of fruits per tree)				Average
	I	II	III	IV	
Without irrigation	164.0a	131.2a	107.6a	103.5a	126.6a
Control	162.5a	147.7a	117.4ab	117.0a	136.2ab
Double irrigation rate	172.5a	146.1a	137.8b	118.8a	143.8b
Average	166.3c	141.6b	120.9a	113.1a	

Effect of irrigation on the proportion of fruit with diameter larger than 70 mm (%) depending on crop load

Irrigation treatment	Crop load (number of fruits per tree)				Average
	I	II	III	IV	
Without irrigation	88.7a	32.6a	24.4a	15.4a	40.3a
Control	71.9a	67.3b	26.1a	27.1a	48.1ab
Double irrigation rate	92.7a	59.6b	54.9b	28.3a	58.9b
Average	84.4c	53.2b	35.1a	23.6a	

Effect of irrigation on starch pattern index (SPI) depending on crop load

Irrigation treatment	Crop load (number of fruits per tree)				Average
	I	II	III	IV	
Without irrigation	2.33	3.33	3.50	3.17	3.08 b
Control	2.17	3.00	3.50	3.00	2.92 ab
Double irrigation rate	2.83	2.17	2.83	3.00	2.71 a
Average	2.44 a	2.83b	3.28 c	3.06 d	

Effect of irrigation on total soluble solids (TSS) in fruit depending on crop load

Irrigation treatment	Crop load (number of fruits per tree)				Average
	I	II	III	IV	
Without irrigation	12.4	10.8	12.1	10.2	11.38 a
Control	11.1	13.8	10.7	11.6	11.80 a
Double irrigation rate	12.5	11.7	11.3	12.3	11.95 a
Average	12.00 b	12.10 b	11.37 a	11.37 a	

Effect of irrigation on total acids (TA) in fruit (%) depending on crop load

Irrigation treatment	Crop load (number of fruits per tree)				Average
	I	II	III	IV	
Without irrigation	0.20	0.17	0.17	0.23	0.19 a
Control	0.19	0.21	0.22	0.19	0.20 a
Double irrigation rate	0.18	0.23	0.19	0.20	0.20 a
Average	0.19 a	0.20 a	0.19 a	0.21 a	

❖ Different loading of trees with fruits has a significant effect on the yield in kg per tree, on the size of the fruit, on the proportion of first class fruits, as well as on the degree of ripeness of the fruits.

❖ For the Red Kap variety in the third year after planting, in order to achieve good fruit quality and satisfactory yield, it is necessary to leave a maximum of 25 fruits per tree, or 3.5 fruits per cm<sup>2</sup> of TCSA.

❖ Different irrigation treatments have influence on the size of the fruit, on the proportion of first class fruits, as well as on the degree of ripeness of the fruits. Increased irrigation during the months of July and August affects these parameters, but to a lesser extent than the crop load.

❖ The largest irrigation effect on the fruit size increase had trees from load III, who had 5,5 fruits per cm<sup>2</sup> of TCSA. On trees that had less than 4,5 fruits per cm<sup>2</sup> of TCSA and those with more than 6,5 fruits per cm<sup>2</sup> of TCSA increased irrigation during July and August had no statistically significant effect on tested parameters.