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VEGETATIVE AND REPRODUCTIVE CHARACTERISTICS OF RASPBERRY CANDIDATE CULTIVAR 'TROYANSKI BISER'

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Abstract

The aim was to observe some characteristics dependences between vegetative and reproductive characteristics of a candidate raspberry cultivar 'Troyanski biser' at the foothill environment with over wetting soils.
The scientific experiment was conducted during the period of 2018-2020 in a collection plantation of the Research Institute of Mountain Stockbreeding and Agriculture in Troyan. The objective of study was a candidate cultivar 'Troyanski biser' propagated through in vitro technology. The vegetative and reproductive indicators were analyzed, such as average number of shoots (1 m^2), average height (cm) and average thickness (mm) of shoots and average fruit weight (g), and average yield (kg/1 m^2). The largest average number of shoots were formed in 2018 (17.33 total number) during the experimental period. The highest average height (146 cm) was registered during the same year. The highest values for the average thickness were registered in 2019 (9.14 mm). The average yield was comparatively stable for the whole period, as it was the highest for the second experimental year (1.33 kg).

Key words*: cultivars, fruit weight, raspberries, vegetative indicators, yield.*

INTRODUCTION

Raspberry is a half shrub fruit species that belongs to the *Rosaceae* family, of genus *Rubus*. It includes 12 subgenera, the most economically important being the subgenus *Ideobatus* and especially the European red raspberry, North American red raspberry and black raspberry (Ourecky, 1975; Ellis et al., 1991).
Currently, interest in raspberries is due to a number of advantages over some of the other fruit crops. It is a cosmopolitan fruit species, widespread in the world, characterized by early maturity, early fruiting bearing, regular and high yields and a quick return on capital investment (Hristov et al., 1988; 1991; Misić and Nikolić, 2003).
The productivity of raspberries is directly dependent on the soil and climate conditions, the applied agricultural cultivation techniques and the biological qualities of the crop.
Many researchers focus their work on the study of vegetative and reproductive manifestations. In this direction, new cultivars of raspberries are created with specific qualities and requirements, consistent with the specific growing conditions to the indicators of vegetative growth, yield, fruit characteristics and other qualities of the crop.
The selection activity is diverse, expressed in the improvement of each indicator of the manifestations of plants (Stanchev et al., 1991; Stanisavljevic et al. 2002; Leposavic et al, 2015).
The objective of the present study is to observe some relationships between vegetative and reproductive indicators of the candidate cultivar 'Troyanski biser'.

MATERIALS AND METHODS

The scientific experiment was conducted during the period of 2018-2020 in a collection plantation of the Research Institute of Mountain Stockbreeding and Agriculture in Troyan.
The object of the study is the candidate cultivar 'Troyanski biser', which was selected in RIMSA.
The following vegetative indicators were observed: average number of shoots per linear meter of intra-row area, average height (cm) of shoots (1 m^2), average thickness of shoots

(mm), measured at 10 cm height from the soil surface;
Reproductive indicators: average fruit weight (g), average yield (kg) per 1 m^2.
The experiment was set in six replications per one linear meter each.
The indicators are reported according to the methodology of plant resources (Nedev et al., 1979). The software product MS Excel - 2010 was used for data processing.

RESULTS AND DISCUSSIONS

In the first experimental year, the average number of shoots was the highest - 17.33 (Table 1). The average height of the shoots reached 146 cm and the average thickness was 7.45 mm. The average fruit weight was 3.16 g, the highest value of the three-year period. The average yield was 1.24 kg per linear meter.

Table 1. Vegetative and reproductive indicators in candidate cultivar 'Troyanski biser' for the period of 2018-2020

Average number of shoots per 1 m^2	Average height of shoots (cm)	Average shoots thickness (mm)	Average fruit weight (g)	Average yield (kg) per 1 m^2
2018				
17.33	146	7.45	3.16	1.24
2019				
14.33	130	9.14	2.21	1.33
2020				
16.83	86	6.97	2.85	1.29
Average				
16.16	120.67	7.85	2.74	1.29
ẋ ±SE				
0.93	17.94	0.66	0.28	0.03
St Dev				
1.61	31.07	1.14	0.48	0.05
VC %				
9.96	25.75	14.52	17.52	3.88

The results related to correlation treatments show that a moderate correlation is observed between the average height with the average number of shoots (0.36), as well as between the average yield with the average height (0.38) and with the average thickness (0.36) of the plants (Table 2). A high but negative correlation was reported at average thickness with the average shoot number (-0.77).
In the second experimental year, the average number of shoots was the lowest - 14.33. The average height was lower, compared to the first year - 130 cm, and the average thickness was the largest of the three-year period - 9.14 mm. The average fruit weight had the lowest values, compared to the whole period - 2.21 g, but the average yield was the highest - 1.33 kg.

Table 2. Correlation dependences between vegetative and reproductive characteristics of candidate cultivar 'Troyanski biser' in 2018

	Average number of shoots	Average height (cm)	Average thickness (mm)	Avarage yield (kg)
Average number of shoots	1			
Average height (cm)	0.362313	1		
Average thickness (mm)	-0.76713	-0.21095	1	
Avarage yield (kg)	-0.02305	0.379517	0.363796	1

Table 3. Correlation dependences between vegetative and reproductive characteristics of candidate cultivar 'Troyanski biser' in 2019

	Average number of shoots	Average height (cm)	Average thickness (mm)	Avarage yield (kg)
Average number of shoots	1			
Average height (cm)	-0.72281	1		
Average thickness (mm)	-0.02099	0.17354	1	
Avarage yield (kg)	0.218289	0.124495	-0.49716	1

Regarding the interdependence between the indicators, there is a strong negative correlation between the average height and the average number of shoots (0.72) and a significant also negative correlation between the indicators average yield and average thickness of the shoots (-0.50) (Table 3).
In the third year, the average number of shoots was high again - 16.83. The shortest average height for the reported period was 86 cm. The same downward trend was observed in the indicator of average plant thickness. - 6.97 mm. The average fruit weight occupied an intermediate value of three years - 2.85 g.
The reported yield was 1.29 kg, which shows that the values of the indicator are relatively constant for the period.

In the third experimental year, more correlations were observed between the indicators (Table 4). A moderate correlation was observed between the average height of the shoots and their average number (0.36) and between the average yield with the average thickness of the shoots (0.49). Significant correlation dependence was observed at the average thickness with the average number of shoots (0.62), as well as between the average yield with the average height of the plants (0.64 cm). A high correlation was observed between the average thickness and the average shoot height (0.78 cm).

Table 4. Correlation dependences between vegetative and reproductive characteristics of candidate cultivar 'Troyanski biser' in 2020

	Average number of shoots	Average height (cm)	Average thickness (mm)	Avarage yield (kg)
Average number of shoots	1			
Average height (cm)	0.357614	1		
Average thickness (mm)	0.620549	0.78046	1	
Avarage yield (kg)	0.261007	0.639876	0.487822	1

The average for the period, the average number of shoots per linear meter was 16.16, their average height was 120.67 cm and the average thickness - 7.85 mm (Table 1).

CONCLUSIONS

The highest number of shoots, average height and average fruit weight were reported in the first experimental year, average thickness and average yield in the second year.

High negative correlations were reported between the average shoot thickness with the average number of shoots (-0.77) in the first experimental year and between the average height with the average number of shoots (-0.72) in the second year.

In the third year, a positive correlation was found in the average thickness of the plants with their average height (0.78).

On average for the period a significant correlation was registered between the average yield and the average height of the shoots (0.66).

In terms of reproductive performance, the average fruit weight was 2.74 g and the average yield was 1.29 kg. The coefficient of variation according to the indicators is as follows, for an average number of shoots it was low - 9.96%, high for the average height - 25.75% and medium for their average thickness - 14.52%.

In the reproductive indicators, it was average for the average fruit weight - 17.52% and very low in the average yield - 3.88%.

Regarding the correlation dependences, we observe a significant correlation between the average thickness of the shoots with their average number (0.62) and the average yield with the average height (0.64 cm) (Table 5). It was high between the indicators average thickness with the average height of the plants (0.78 cm).

Table 5. Correlation dependences between vegetative and reproductive characteristics of candidate cultivar 'Troyanski biser', avarage for the period of 2018-2020

	Average number of shoots	Average height (cm)	Average thickness (mm)	Avarage yield (kg)
Average number of shoots	1			
Average height (cm)	-0.05639	1		
Average thickness (mm)	-0.22423	0.408213	1	
Avarage yield (kg)	0.18156	0.664728	-0.2446	1

REFERENCES

Ellis, M., Converse, R. & Williamson B. (1991). Compendium of Raspberry and Blackberry Diseases and Insects. *APS Press*. Wageningen. 1-2.

Hristov, L., Ivanov, A., Koserkov, A., & Nachevski, V. (1988). Berry crops in our garden. Sofia – Zemizdat, BG: 75-82.

Hristov, St. (1991). Studies on some biology and economic qualities of raspberry cultivars and ellites. *PhD Thesis*, Troyan (BG).

Leposavic, A., Durovic, D., Keserovic Z., & Jevremovic, D. (2015). Vegetative and yield potential of cultivars and selection of raspberry cultivated in conditions of west Serbia. *Bulgarian Journal of Agricultural Science,* 21 (1), 153-159.

Misić, D., & Nikolić, M. (2003). Jagodaste voćke, SR: 111-183.

Nedev, N., Grigorov, Y., Baev, Hr., Serafimov, S., Strandzhev, Al., Kavardzhikov, L., Lazarov, Kr., Nikolov, N., Dzhuvinov, V., Popova, L. , Slavov, N., Iliev, P., Stoyanov, D., Kanev, Il., Krinkov, H., Vishanska, Yu., Topchiyska M., & Petrova, L. (1979). Methods for studying of planting resources of fruit crops. Plovdiv, BG: 151.

Ourecky, D. (1975). Raspberries are Fall guys, *American Fruit grower,* (8), 22-27.

Stanchev, S. (1991). Vegetative and reproductive features of raspberry cultivars and elites. *Bulgarian Journal of Crop Sciences*, 7-10.

Stanisavljevic M., Mitrovic, O., & Gavrilovic Damjanovic, J. (2002). Comparative studies on raspberry cultivars, *Acta Hort.* (ISHS) 585:241-245.