

Research on the Production of Blueberry Cultivars over the 2nd Year of Crop in the Lower Hilly Area of Banat Region, ROMANIA

Merca (Laies) Maria Marina,^{1*} Cosmulescu Sina Niculina^{2*}

¹University of Craiova, Horticulture Faculty, Doctoral School of Plant and Animal Resources Engineering, A.I. Cuza Street, 13, Craiova, Romania

²University of Craiova, Horticulture Faculty, Department of Horticulture and Food Science, A.I. Cuza Street, 13, Craiova, Romania

*Corresponding author. Email: maria_laies@yahoo.com; sinacosmulescu@hotmail.com

Abstract The paper presents the influence of weather conditions in Caras-Severin county (Romania) on the production of three cultivars of blueberries. The research was carried out on a plantation located in Ghertenis village, Caras-Severin county (45°25'48"N, 21°34'55"E) belonging to SC Collini SRL, a private company. The plantation was established in 2015. Three cultivars of blueberries ('Duke', 'Legacy', 'Hannah's choice') were tracked in terms of productive potential in year 2 after planting. It has been found that blueberry culture has development prospects in the low hilly area of Banat region. The market value of fruits and crop volume are significantly influenced by the applied technology.

Key words

blueberry, cultivars, production

Blueberry is a highly valued shrub for its fruits that are consumed fresh or processed, and also for the therapeutic value of fruits and leaves, having a number of medicinal uses [3, 11, 12]. From business point of view, the species is increasingly sought after and due to the income, it can bring where all the conditions of growth and development are ensured, taking into account the features of this culture. The current trend is to expand the blueberry plantations in many countries, which have no tradition with this species, both in Europe and on other continents. Soil reaction has key importance, it is a characteristic that is limiting the culture of blueberry. Of major importance for economic efficiency is the assortment and culture technology [5, 6, 14]. There is a different range of cultivars that differentially use the culture area. Fruits have distinctive characteristics depending on cultivar, soil conditions, climate and farming techniques [7, 15]. The production of five American blueberry cultivars were evaluated in the first years of fruit-setting in the western part of Poland in order to recommend a specific assortment [8]. In Romania, the first plantation of blueberries was established in 1968, and nowadays there is the trend of rapid growth of blueberry farming areas, motivated by the increasing market demand for the consumption of fresh fruits and by the incentive of profit compared to other fruits [2]. Among 26 blueberry cultivars grown in Romania were evaluated by consumers, 'Coville' and 'Handler' obtained the best overall score [1]. Favourable culture conditions are found in Maramures area, Romania [9]. The aim of the paper is to evaluate the yields of three blueberry cultivars ('Duke', 'Legacy', 'Hannah's choice') on a

small plantation, in the 2nd year of fruiting.

Material and Method

The observations regarding the production of three blueberry cultivars were carried out in the blueberry plantation in Ghertenis village, Caras-Severin county (45°25'48"N, 21°34'55"E) belonging to SC Collini SRL, a private company. The plantation was established in 2015. Three cultivars were studied: 'Duke', 'Legacy', 'Hannah's choice'. The research was carried out during the year 2019. To determine the production, every 10 shrubs were labelled in 3 repetitions. Harvesting was carried out in several stages, depending on the rate at which the ripening of blueberry fruit developed. It was also taken into account that, by harvesting by hand, there were also production losses, losses that were recorded. The technology applied was in accordance with the literature and specific recommendations of plantation. The data presented represent the average of determinations.

Results and Discussions

The harvesting of cultivars was done distinctively according to the time of fruit-ripening and the precocity of each one. Under the climatic conditions of the crop area, the rainy spring and the extremely dry summer, the first cultivar was 'Duke' starting on June 15, this cultivar being the earliest. The last harvest was done at the beginning of July (July 3); 5 stages were

needed for harvesting. The average number of fruits per plant was 382.73, with variation limits ranging from 0 to 1234. The very large variation between the numbers of fruits harvested in different stages, is given by the different vigour of the plant, respectively the number of inflorescences, the number of fruits / inflorescence (Table 1). Starting from these observations, measures were taken in order to carry out

differentiated cutting according to the way the shrub developed. The losses of fruit / plant were on average 10.4 pcs. For all crops (3%). The average weight of a fruit was 0.89 g, the average weight of a fruit decreased from one harvest to another, the largest fruits were obtained at the first harvest (1.76g/fruit). The decrease of fruit weight from one harvest to another was observed also by Ehlenfeldt et al. (2008) [4].

Table 1. Descriptive analysis for fruit characteristics and production in 'Duke' cultivar

Descriptive analysis	No of fruits / plant	No of lost fruits / plant	Production / plant (kg)
Mean	382.73	10.4	0.330
Standard Error	95.86	2.08	0.127
Median	298	12	0.335
Standard Deviation	371.26	8.08	0.291
Sample Variance	137838.35	65.4	0.089
Range	1234	23	0.703

Production per plant was about 0.330 kg, with limits of variation between 0.001 and 0.705 kg, indicating a very large unevenness over plants development. An average weight of 0.8 kg of fruit per plant (the average of 3-5 years after planting) in 'Duke' cultivar was found by Masłowska & Liberacki (2018) in culture conditions specific to the western part of Poland, much higher than that obtained in the present research conditions

[8]. The next blueberry cultivar that followed in harvesting was 'Hanna's Choice', a newer cultivar that was launched on the market, starting on June 18, the last harvest taking place on July 08, requiring 4 harvesting stages in total. The average number of fruits per plant was 305.91, with variation limits between 36 and 664 (Table 2).

Table 2. Descriptive analysis for fruit characteristics and production in 'Hanna's Choice' cultivar

Descriptive analysis	No of fruits / plant	No of lost fruits / plant	Production / plant (kg)
Mean	305.91	6.91	0.417
Standard Error	69.94	1.48	0.112
Median	228	6	0.29
Standard Deviation	242.29	5.13	0.390
Sample Variance	58705.41	26.41	0.152
Range	628	18	1.145

The losses of fruits per plant during the harvest had an average value of 6.91, with a percentage of 2.3% in total. The average weight of a fruit was 1.3 g, the highest weight being recorded in the first harvest (1.7 g). In researches conducted by Varga et al. (2014) the average fruit weight was between 0.685-2.005 g in 'Hannah's Choice', and between 0.756-1.890 g in 'Elliott', under the culture conditions in Maramures county. The average production per plant was 0.417 kg, with limits of variation between 0.015 and 1.16 kg, being determined by shrub vigour. In 'Legacy' variety, harvesting started on July 2 and ended on July 19, with the number of crops being reduced to 3. For the

average number of fruits per plant, the value 545 was determined, the limits ranging from 61 to 999 (Table 3). The harvest losses were on average 8.33 fruits per plant, with volumes ranging from 4 to 13. The average weight of a fruit was 0.8 g, also with the highest production, of 1.2 kg per plant, at the first harvest. 'Legacy' cultivar has good production potential, potential that it expresses under the conditions of a suitable technology. Under conditions of sandy soil in south-central Chile, the average fruit weight in the first production season ranged from 1.56 to 2.63 g; the highest weight was obtained in 'Corona' followed by 'Legacy' and 'Liberty' (Muñoz-Vega et al., 2016) [10].

Table 3. Descriptive analysis for fruit characteristics and production in 'Legacy' cultivar

Descriptive analysis	No of fruits / plant	No of lost fruits / plant	Production / plant (kg)
Mean	545	8.33	0.459
Standard Error	92.04	0.93	0.064
Median	559	8	0.51
Standard Deviation	276.14	2.78	0.193
Sample Variance	76254.66	7.77	0.037
Range	938	9	0.624

The average production was 0.459 kg, very close to the previous cultivar, 'Hanna's Choice'; the variation limits being between 0.045 g and 0.669 g. Regarding fruit production, in the first production season of blueberry crops, it varied between 128.29 and 264.92 g / plant; the highest yield was obtained in 'Corona' ($p < 0.05$), followed by 'Legacy' and 'Liberty' under the conditions of sandy soil from south-central Chile [10].

Conclusions

Blueberry culture has development prospects in the low hilly area of Banat. The market value of fruits and production are significantly influenced by the applied technology. The research will continue to determine the ability of cultivars to adapt to the climatic conditions specific to the research area.

References

- Asanica A. 2018. Sensorial evaluation of 26 highbush blueberry varieties in Romania. Scientific Papers. Series B, Horticulture LXII:181-186.
- Asanica A., Badescu A., Badescu C. 2016. Blueberries in Romania: past, present and future perspective. Acta Hort. 1180: 293-298.
- Cosmulescu Sina. 2014. Pomicultura ornamentală. Editura Sitech Craiova.
- Ehlenfeldt M. K., Martin Jr. R. B. 2008. Seed set, fruit weight, and yield in highbush (*Vaccinium corymbosum* L.) blueberry cultivars 'Duke' and 'Bluecrop'. Acta Hort. 810: 93-96.
- Esau T. J., Zaman Q. U., MacEachern C., Yiridoe E. K., Farooque A. A. 2019. Economic and management tool for assessing wild blueberry production costs and financial feasibility. Applied Engineering in Agriculture 35(5): 687-696.
- Holzappel E. A., Hepp R. F., Mariño M. A. 2004. Effect of irrigation on fruit production in blueberry. Agricultural Water Management 67(3): 173-184.
- Kotrotsios I., Hoza D. 2017. Preliminary research regarding the behavior of some blueberry varieties in the area of Garditsa, Grecia. Journal of Horticulture, Forestry and Biotechnology 21(1): 47-49.
- Masłowska W., Liberacki D. 2018. The yield of selected varieties of American Blueberry (*Vaccinium corymbosum* L.) in the first years of fruiting in the western part of Poland. Acta Horticulturae et Regiotecturae 21(1): 13-16.
- Moldovan L., Mărghitaș M., Poruțiu A. 2017. Favourable conditions for establishing a culture of *Vaccinium corymbosum* (blueberry) in Maramureș County, Romania. ProEnvironment 10(32): 267-270.
- Muñoz-Vega P., Paillán H., Serri H., Donnay D., Sanhueza C., Merino E., Hirzel J. 2016. Effects of organic fertilizers on the vegetative, nutritional, and productive parameters of blueberries 'Corona', 'Legacy', and 'Liberty'. Chilean Journal of Agricultural Research 76(2): 201-212.
- Nour V., Trandafir I., Cosmulescu S. 2015. Central composite design applied to optimize the hydroalcoholic extraction of bilberry (*Vaccinium myrtillus* L.) fruits. Journal of Food Biochemistry 39(2): 179-188.
- Prior R. L., Cao G., Martin A., Sofic E., McEwen J., O'Brien C., Mainland C. M. 1998. Antioxidant capacity as influenced by total phenolic and anthocyanin content, maturity, and variety of *Vaccinium* species. Journal of Agricultural and Food Chemistry 46(7): 2686-2693.
- Varga N. S., Luca E., Gabor T., Rozenberg M., Micu O. 2014. Research on growing blueberry (*Vaccinium corymbosum* L.) fruits in irrigated cultures. Agricultura-Revistă de Știință și Practică Agricolă 23(3/4): 78-87.
- Warman P. R. 1987. The effects of pruning, fertilizers, and organic amendments on lowbush blueberry production. Plant and Soil 101(1): 67-72.
- Zenkova M., Pinchykova J. 2019. Chemical composition of sea-buckthorn and highbush blueberry fruits grown in the Republic of Belarus. Food Science and Applied Biotechnology 2(2): 121-129.