

RESEARCH REGARDING THE RESPONSE OF SOME BLUEBERRY VARIETIES IN GARDITSA AREA, GREECE

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Abstract

Blueberry culture has become more attractive to many pomiculturists due to the special quality of fruits and of their nutritive and nutraceutical value. The comparative research of 4 blueberry culture varieties: Duke, Draper, Patriot and Brigitta and 2 pruning variants proved different responses in similar culture conditions. The biological characteristics of the varieties selected manifested through different capacity of producing shoots in the collet area, through different reaction to pruning and through the capacity of forming inflorescences. Pruning influenced the growth in height of plants, the ramification capacity of the bush and the size of the fruits. Heavy pruning determined a bigger growth, larger fruits and eventually a higher capacity of production. From the studied varieties Duke was the earliest one but with a small production capacity, Brigitta was late and the most productive and Draper and Patriot registered mediate values.

Key words: growth, fructification, pruning.

INTRODUCTION

Blueberry (*Vaccinium* ssp.) is known since ancient times and the fruits are consumed due to a very appreciated organoleptic quality (20) and to some features highly beneficial to human health (2, 9, 13). The plant is traditionally used as tea plant, especially when collected from spontaneous flora where it grows as self-sown (4; 10). Blueberries can be consumed fresh, they can be stored for a given time in deposits, depending on variety and storage conditions (3, 6, 8), they can be processed and turned into comfiture, syrup, candied fruits, dry fruits, etc. (18). Blueberry fruits are very appreciated for their gustative features, for the high antioxidant action, for the high content of flavonoids and vitamins C and E (5, 12, 13, 16, 19). Anthocyanins, substances extremely useful to human body, are present in large quantities in blueberries and their accumulation can be enhanced through the application of abscisic acid during the fruit maturation process (15). Moreover, it had been observed that during maturation the biochemical composition changes, the total content of phenols, flavonoids and gibberellic

acid decreases and the content of anthocyanin and abscisic acid increases (1). Due to the extraordinary quality of fruits blueberry culture has become more appealing to small scale fruit growers but also for farmers, reaching second place after strawberry (7). In culture, the varieties used are from the American blueberry (*Vaccinium corymbosum*) because the fruits are larger and the plant more productive. Although the species seems to be quite rustic in reality is particular to soil reaction, preferring a soil with an acid reaction and a good water penetrability (4). Choosing the right area for blueberry culture is influenced also by the minimum temperature limit in winter and moreover by the late frosts in spring which can cause great damage (10, 11, 14, 18).

The present study presents the response of some blueberry variants in field culture using two pruning variants.

MATERIALS AND METHODS

The experiment was conducted during 2018-2019 on four blueberry varieties: Duke, Draper, Patriot and Brigitta in a plantation set up in 2014, with the planting distance of 3 m

between rows and 1 m on the row. Planting was made on billons on Polish acid peat with pH of 5.2 and the billon was covered (mulched) with agro textile.

Irrigation was done through a drip system with 2 lines located on each side of the plants. Fertilization was managed through irrigation water with 50 kg/ha nitrogen applied three times every 40 days during the intense growth of shoots and in order to maintain the acid reaction the product used was Nutex, with a pH of 4, 1.5 l/plant, applied three times.

Pruning was made in two stages in order to observe the reaction of the four varieties:

V1 - normal pruning;

V2 - heavy pruning.

Phenological observations have been taken and measurements have been done regarding

growth, ramification and the fructification capacity of plants.

The results obtained have been statistically interpreted through analysis of variance.

RESULTS AND DISCUSSIONS

The reaction of the four blueberry varieties used was good and the development of the phenological process was slightly staggered (Table 1). The shoots started opening in the second part of February at Patriot variety and continued through middle March at Duke and Draper varieties. Small differences have been noted between the two pruning variants, dependent of the climatic year as well, heavy pruning caused a slightly faster start, as year 2017 was rather early.

Table 1. Development of reproductive phenological phases of some blueberry varieties, Garditsa, Greece, 2016

Variety	Variant	Shoots opening	Beginning of efflorescence	Beginning of maturation	End of maturation
Duke	V1	5-11.03	15-20.03	10-25.05	9.06
	V2	1-5.03	10-12.03	10-22.05	6.06
Draper	V1	5-11.03	20-22.03	15.05-2.06	20.06
	V2	1-7.03	12-15.03	2-4.06	15.06
Patriot	V1	18-20.02	25-27.02	10-22.05	10.06
	V2	18-20.02	25-27.02	10-22.05	10.06
Brigitta	V1	25-30.02	5-10.03	25.05-2.06	23.06
	V2	25-30.02	5-10.03	25.05-2.06	23.06

Patriot variety effloresced faster, at the end of February and continued until the second decade of March. Fruit maturation was early at Duke variety, at the beginning of the third decade of May, this being the earliest of all, and the late one was Brigitta where fruits started maturing at the beginning of June. Maturation time ended between 6-23 of June, for Duke the last fruits were harvested on June 9th, and for Brigitta on June 23rd.

Plant growth capacity was influenced by the variety and the intensity of pruning (Table 2). Thus, plant height was higher at Duke and Brigitta at the heavy pruning variant and smaller numbers were registered at Draper, for both variants. Plant reaction to pruning was not the same, Duke and Brigitta reacted strongly and the growth gain caused by heavy pruning was between 19 and 35% for these varieties. Differences between varieties, variants and the

average value of the experiment were statistically assured.

Bush capacity to ramify was also influenced by the variety and the pruning variant. Generally, pruning determined a better bush ramification at Duke and Brigitta, whereas for Patriot the variant with the lighter cut provided better results. For Draper there were no differences registered at neither pruning variants. As numbers, most ramifications were observed at Patriot variety, variant V1, with 90 ramifications, and the least at Draper variety, variant V2, with only 40 ramifications.

Ramification capacity from collet was also different and influenced by the variety but not by the pruning variant. The best ramification was seen at Draper variety with roughly 10 new ramifications from collet and the weakest was registered at Patriot and Brigitta with 1.5 ramifications from collet.

Table 2. Growth and ramification capacity of the bush

Variety	Variant	Height of the bush (cm)	Number of ramifications in the bush	Average number of annual branches formed from parcel	Average length of annual branches (cm)	Sum of annual growth (cm)
Duke	V1	103.3 ^{ooo}	45	5.5 ^{**}	16.70 ^{ooo}	750.5 ^{oo}
	V2	141.2 ^{***}	67	4.5 ⁿ	17.07 ^{oo}	1145.5 ^{oo}
Draper	V1	112 ^{ooo}	46	10.5 ^{***}	22.12 ⁿ	1225.5 ⁿ
	V2	111 ^{ooo}	40	9.0 ^{***}	34.42 ^{***}	1031.0 ⁿ
Patriot	V1	113 ^{ooo}	90	1.5 ^{ooo}	22.12 ⁿ	1864.0 ^{**}
	V2	128 ^{***}	73	1.5 ^{ooo}	30.77 ^{***}	2236.5 ^{***}
Brigitta	V1	118 ^o	54	1.7 ^{ooo}	21.63 ⁿ	1163.0 ⁿ
	V2	141.6 ^{***}	77	1.3 ^{ooo}	22.39 ⁿ	1638.5 ⁿ
Average	Control	121.01	61.5	4.44	23.40	1340.02
LSD 5%		2.90	3.26	0.64	3.20	354.5
LSD 1%		4.03	4.54	0.89	4.56	492.6
LSD 0.1%		5.61	6.31	1.24	6.35	685.3

The average length of annual branches was different depending on the variety and the intensity of the pruning made. For these indicators, at all varieties, heavier pruning determined bigger growth numbers. The average length of annual branches was between 34.4 cm at Draper variety, V2, as maximum value and 16.7 Duke variety, less intense cut, as the minimum value. The differences in comparison to the average value of the experiment were statistically assured.

The sum of annual growth, indicator that highlights vigour of plants, was very fluctuant. The maximum value was obtained by Patriot variety, variant with heavy pruning of 2236 cm

and the minimum value at Duke variety, variant less intensely cut, of 750 cm. The other variants had mediate values. The differences in comparison to the average value of the experiment were statistically assured, at least for the 5% probability.

The blueberry production capacity is influenced by the number of inflorescences left on plant while pruning, by the number of fruits from the inflorescence and the average weight of the fruit.

The average number of inflorescences per plant fluctuated very much and spanned from 468 inflorescences at Patriot variety V2 and 212 inflorescences at Duke variety V1 (Table 3).

Table 3. Fructification capacity of some blueberry varieties

Variety	Variant	Number of inflorescences per plant (piece)	Number of fruits in inflorescence (piece)	Average weight of fruit (g)	Production per plant (kg)	Production per unit area (t)
Duke	V1	212 ^{ooo}	9.1	1.6 ⁿ	3.64 ^{ooo}	12,13
	V2	369 ⁿ	9.0	1.9 ^{***}	6.32 ^{***}	21.86 ^{***}
Draper	V1	392 ^{**}	10.0	1.3 ^o	5.10 ⁿ	16.99 ^{***}
	V2	322 ^{oo}	10.0	1.5 ⁿ	4.84 ^{oo}	16.13 ^{***}
Patriot	V1	416 ^{***}	10.1	0.96 ^{ooo}	3.99 ^{ooo}	13.29 ⁿ
	V2	468 ^{***}	10.2	1.16 ^{ooo}	5.53 ⁿ	18.43 ^{***}
Brigitta	V1	268 ^{ooo}	10.0	1.85 ^{**}	4.66 ^{ooo}	15.53 ^{***}
	V2	420 ^{***}	10.1	2.0 ^{***}	8.61 ^{***}	28.69 ^{***}
Average	Control	358		1.53	5.34	17.88
LSD 5%		23.05		0.18	0.27	1.21
LSD 1%		32.03		0.25	0.38	1.68
LSD 0.1%		44.57		0.36	0.53	2.34

The number of fruits in inflorescence was relatively equal except for Duke variety which had fewer fruits. The average fruit weight was influenced by variety and also by pruning. Heavy pruning determined the formation of larger fruits. Thus, the size of fruits at the variant with a lighter pruning was between 0.96 g at Patriot variety and 1.85 g at Brigitta variety, while for the heavy pruning the size limits were registered at the same varieties and had values of 1.16 g and 2 g, respectively. Production per plant oscillated between 3.64 kg at Duke variety V1 and 8.61 kg at Brigitta variety V2. In comparison to the average value of the experiment the differences of varieties were statistically assured. Potential production per unit area was between 12.3 t/ha at Duke variety, variant V1 and 28.69 t/ha at Brigitta variety, variant V2.

CONCLUSIONS

The following conclusions can be drawn from this study:

The behaviour of blueberries in the studied area was good, the differences between varieties are given by their biological characteristics. The development of the flowering phenophases was determined by the variety and the climatic year, the year 2017 was slightly earlier.

The intensity of pruning influenced the height of the plants, the branching capacity, the size of the fruit and the production capacity.

The production potential was between 12 and 28 t/ha, depending on the variety and the intensity of the cutting.

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