PRELIMINARY RESULTS REGARDING THE FRUIT QUALITY AND YIELD OF SOME BLUEBERRY GENOTYPES

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Current Trends in
Natural Sciences

Abstract
Vaccinium corymbosum is one of the berry species with economic and food interest to Romanian growers and consumers. The development of blueberrty crop is a result of breeding activity, which has generated many cultivars of quality fruit and high productivity. The characters that are of economic interest in the cultivation of blueberries depend on the area of cultivation where the new cultivars are obtained. The study was conducted in summer 2020 in an experimental plot established in 2015 with seven blueberry genotypes, at Research Institute for Fruit Growing, Pitesti, Romania in the Small Fruit Laboratory, having an experience in the field of more than 40 years. The objective at this study is to compare some of fruit characteristics from genotypes 'Azur', 'Delicia', 'Duke', 'Northblue', 'Simultan', '4/6' and '6/38': plant yield, average fruit weight, fruit length, fruit diameter, the soluble solids, fruit acidity or pH, fruit firmness. During this study 'Delicia' cv. proved to have the highest production per plant (4.20 kg plant), the highest values of fruit diameter (19.70 mm), and the highest value of fruit total titratable acidity (01.25 %).

Key words: *Vaccinium corymbosum fruit characteristics, breeding*

1. Introduction

The blueberry (*Vaccinium corymbosum*) belongs to the *Ericaceae* family and the genus *Vaccinium* section *Cyanococcus*. Blueberry is one of the berry species with economic and food interest for growers and consumers. After Hancock et al., 2008, the primary focus of blueberry breeding programs in the United States is to improve two types of highbush blueberry cultivars (*Vaccinium corymbosum*, $2n = 4x = 48$) termed northern highbush blueberry (NHB) and southern highbush blueberry (SHB), the rabbiteye (RY) cultivars (*Vaccinium virgatum*, $2n = 6x = 72$) and their interspecific hybrids.

First blueberry plantation in Romania was established in 1968 at the Bilcești, Research Station situated in a mountain region (Asănică A. et al., 2016). The blueberry plant require specific soils with a low pH value (Williamson et al., 2006), high humus content, with stabilised groundwater level (Starast et al., 2002). The bushes at the natural sites grow in the forest soils with a low nutrient level.

Due to high yields and special nutritional qualities (high content of vitamins and minerals), in recent years, blueberry production and consumption have increased (Mengist et al., 2020; Rodriguez-Saona et al., 2019). Furthermore, blueberry production has gained consumer`s and commercial

interest based as recent studies regarding blueberry and their multiple health benefits improving lowering pressure blood, protecting against heart attack, cancer preventing, mental health and managing diabetes (Martineau et al., 2006; Krikorian et al., 2010; Norberto et al., 2013; Sun et al., 2019). About 10% of the worldwide highbush blueberry cultivation is located in Europe according to Faostat.ro. The blueberry breeding program was established at the Research Institute for Growing in 1982. Improving yield, fruit quality and adaptation to the Romania climate were the initial targets. Selection for new material began using F1 seedlings and open pollinated crosses obtained from the USA. After 1990, some of the early releases included the nine northern highbush cultivars: 'Safir', 'Azur', 'Lax', 'Pastel', 'Prod', 'Augusta', 'Simultan', 'Delicia' and 'Vital' (Mladin P. et al., 2007). The development of blueberry crop is a result of breeding activity, generating many cultivars with good quality fruit and high productivity. The characters that are of economic interest in the cultivation of blueberries depend on the area of cultivation when the new variety is obtained. The cultivars selection for use as genitors is one of the most important decisions for berry breeders and the development of new blueberry cultivars. The objective of this study is to evaluate attributes of fruit quality and production of some blueberry genotypes to be recommended as potential parents in future breeding programs.

2. MATERIAL AND METHODS

The study was conducted in summer 2020 in an experimental plot established in 2015 with seven blueberry genotypes, in the Small Fruit Laboratory, at the Research Institute for Fruit Growing, Pitesti, Romania. The experiment was monofactorial, where Factor A (genotype) had seven graduations: a1= 'Azur', a2= 'Delicia', a3= 'Duke', a4= 'Northblue', a5= 'Simultan', a6= '4/6' and a7= '6/38'.

The experiment was organized according to the method of plots subdivided into 3 repetitions on each genotype, with 4 plants per repetition. The planting distance was 3 m between rows x 1 m along the rows. The prevailing soil type in the trials field was medium-textured and heavy-clay soils: clay-illuvial that had medium to low humus content.

During the study period, the annual average temperature was 11.8°C, being with 1.8°C higher than the multiannual average temperature of the area of 51 years (respectively, 10.0°C).

The average annual rainfall was 679.1 mm, being very close to the multiannual average of rainfall from the area (680 mm).

The relative humidity of the air had an average value lower than the multiannual average (67.9% in 2020 compared to 75.5% average value of the last 51 years).

At harvest, the yield per plant was weighed and summing the weights to give a cumulative production. For average fruit weight was determined by weighing 50 berries with the aid HL-400 digital balance. The firmness of blueberry was determined for 50 fruits with the nondestructive testing penetrometer Bareiss HPE II, with a measuring surface at 25 cm². The diameter and length of the blueberry fruit were determined by measurements 50 fruits per sample by a digital caliper. Testing juice of 50 fruits was analyzed for soluble solid content by Hanna Instruments 96801 and for pH using a pH-meter (ISFET pH Meter, IQ 125, Japan).

The experimental data were classified using the MS Excel facilities, SPSS 14.0 software and the test for determining the significance of differences between the variants was multiple range test DUNCAN, for error probability of ≤ 0.05 their statistical processing was carried out using the Duncan test.

3. RESULTS AND DISCUSSIONS

The seven genotypes studied recorded variation in production. The accumulated yield per plant for the seven genotypes studied was statistically different. The highest production was obtained by 'Delicia' cv. (4.20 kg plant) (Figure 1). The genotypes 'Simultan', 'Azur' and '6/38' recorded the lowest values (1.91 kg, 1.48 kg and 1.67 kg). In New Zealand, Scalzo et al. (2013) evaluated the yield of 'Blue Bayou', 'Sunset Blue', 'Blue Moon', 'Dolce Blue','Sky Blue', 'Central Blue' and 'Velluto Blue' and on average, in fifth years, the yield was 3,355 kg/plant. The comparison between the cultivars studied showed that there were significant differences in fruit size and weight. Average fruit weight recorded similar values (Figure 1). The genotype '6/38' had a highest value (2.57 g), and the others follow very closely: '4/6' (2.53 g), 'Delicia' (2.37 g), 'Azur' (2.32 g), 'Northblue' (2.13 g), 'Duke' (1.93 g), 'Simultan' (1.83 g). These results are similar with those obtained by Ancu et al (2019), who evaluated the fruit weight at 32 genotypes and showed values between 1.62 g and 3.92 g and 'Delicia' cv. recorded same value as our study, respectively 2.76 g.

The fruit size had a wide variability being influenced by the genotypes, cultivation conditions and technology of pruning. In the last summer, the genotype 'Azur' recorded the highest value of the fruit length (14.36 mm), followed by 'Delicia' (14.33 mm), 'Northblue' (12.79 mm), '6/38' (12.44 mm), 'Simultan' (11.99 mm), 'Duke' (11.45 mm) (Figure 2). Regarding fruit diameter of all studied genotypes those varied significantly. The highest values of fruit diameter were registered by the genotypes 'Delicia' (19.70 mm), 'Azur' (19.02 mm), 'Northblue' (16.34 mm), '4/6' (16.05 mm), 'Duke' (15.51 mm), '6/38' (15.34 mm). The genotype 'Simultan' obtained the lowest value (14.42 mm) (Figure 2).
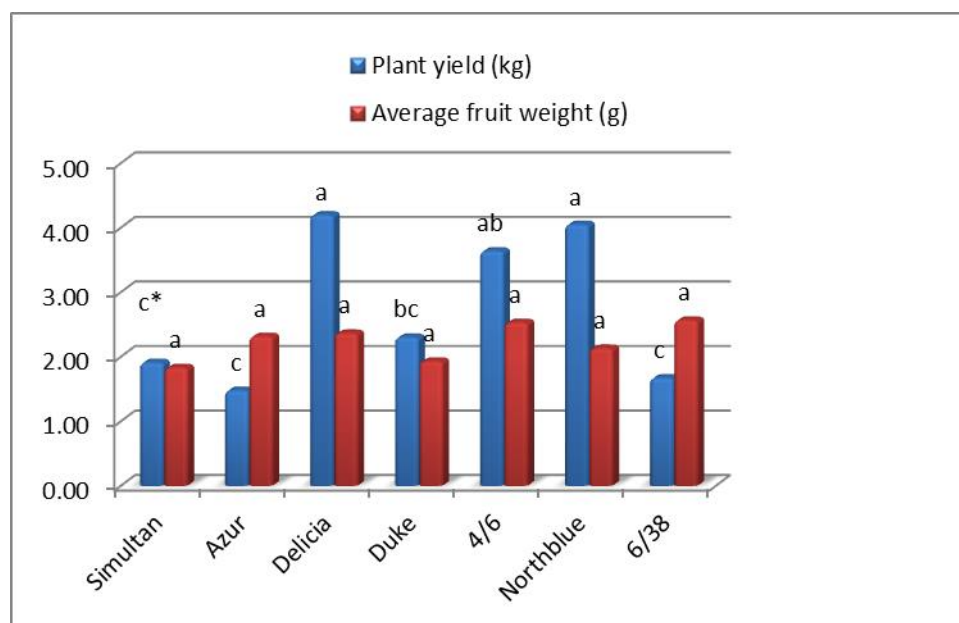
* The values in the table that do not have common letters differ significantly for a statistical assurance level of 5% (P≤0.05)
*Figure 1. The plant yield and average fruit weight*

In our study, a significant influence on the soluble solids content was recorded for genotype 'Duke' with the highest value of this parameter (12.44°Brix) and the genotype '4/6' recorded the lowest value (8.55°Brix) (Figure 3). In Colombia, Guasca, Cortés-Rojas et al. (2014) studied to compare

the crop yield and some quality related aspects of the blueberry cultivars 'Biloxi' and 'Sharpblue' in a commercial crop. On average, the TSS content of the harvested fruits was in a range of 12.4 to 14.5 °Brix for both cultivars.

Regarding the fruit firmness, significant differences were found between genotypes and ranged: from 19.73 N ('6/38') to 36.03 N ('4/6') (Figure 3).

The total titratable acidity expressed as citric acid showed statistical differences between the genotypes 'Delicia' with the highest value (01.25 %) and 'Simultan' with the lowest value (0.12 %) Figure 4. The fruit pH of the studied genotypes ranged from 3.27 for the '6/38' genotype to 3.92 for 'Azur' genotypes (Figure 4).
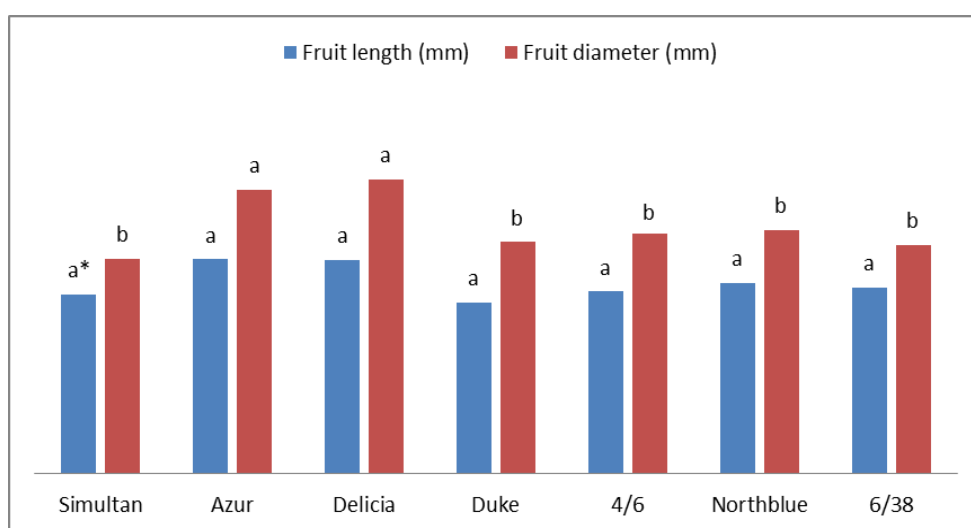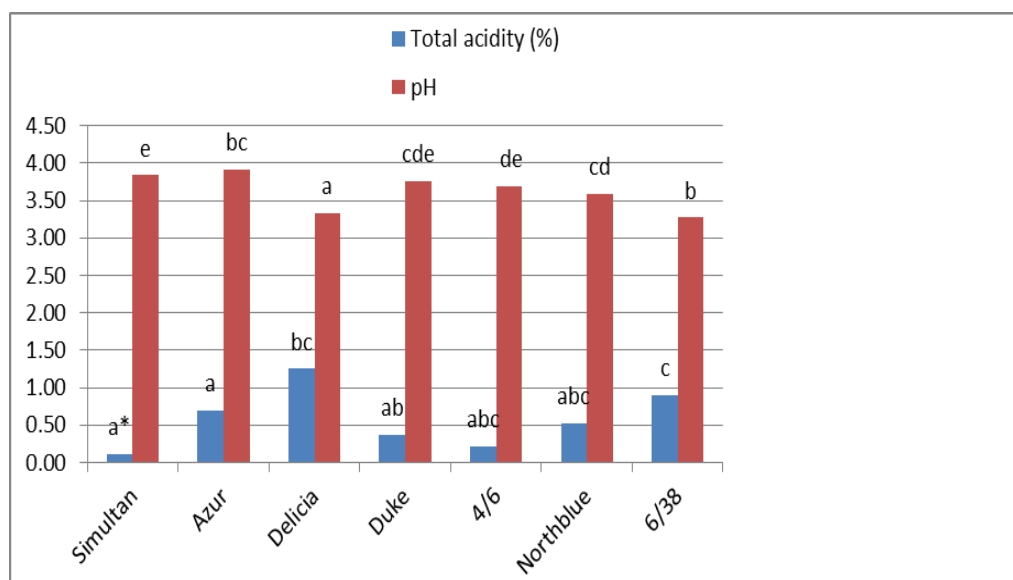

* The values in the table that do not have common letters differ significantly for a statistical assurance level of 5% (P≤0.05)
Figure 2. The fruit length and diameter
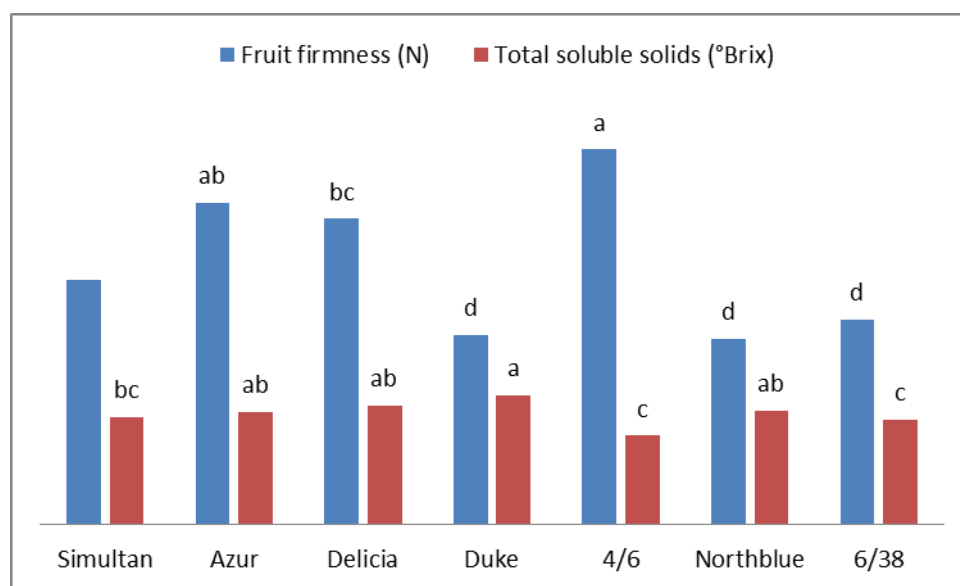
* The values in the table that do not have common letters differ significantly for a statistical assurance level of 5% (P≤0.05)
Figure 3. The fruit firmness and total soluble solids

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* The values in the table that do not have common letters differ significantly for a statistical assurance level of 5% (P≤0.05)
Figure 4. The fruit total acidity and pH

4. CONCLUSIONS

Among the seven studied genotypes, 'Delicia' cv. recorded the highest production per plant, the highest values of fruit diameter and the highest value of fruit total titratable acidity.

Based on this evaluation and the following years of the seven genotypes studied, can be recommended as potential parents in future breeding programs as well as for their extension in commercial cultures.

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