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Determining Rooting Ability of Ennobled Blueberry Wood Pieces (*Vaccinium corymbosum* L.) with Presence of Growth Regulators IBA and NAA

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Abstract

Ennobled blueberry (V. *Corymbosum* L.) has many specific requirements for optimal growth, therefore, the increase of cultivated areas is limited. It requires acidic soils (pH 4,3-4,8), well drained, with full aeration and a constant moderate amount of moisture. The successful technique of asexual propagation will be necessary for rapid clonal propagation of selected cultivars. The objective of this experiment was to identify an efficient way to improve rooting with the help of growth regulators in the 'Bluecrop' cultivar using well-lignified one-year old wood pieces, collected at the end of winter, end of March prior to bud swelling. Treatments with various concentrations (1500, 3000, 4500 mg/l), show that treatment with IBA at 3000 mg/l has the highest rooting percentage in comparison to NAA. Whilst the torf-perlite substrate (at a 2:1 ratio), has produced a higher rooting percentage compared to the torf-only substrate, and the crucial factor for successful rooting is the time of collecting wood pieces. Treatment results have promoted higher rooting of wooden pieces compared to the control (untreated wooden pieces). The most efficient promotor in all concentrations was IBA.

Keywords: *Vaccinium corymbosum* L., growth regulator, rooting, substrate; torf-perlite.

1. Introduction

Cultivation of the giant blueberry (*Vaccinium corymbosum* L.) is mainly focused in North America, the genus *vaccinium* is also spread in Europe and Asia, whilst in Kosova taking into account the presence of a significant number of acidic soils, climatic conditions as well as high nutritional values and especially since it contains significant amounts of vitamin C, less than 25 mg/100g of fresh fruits, anthocyanin, iron etc. less than 0,5mg/100g in fresh fruits, its cultivation is increasing. The successful cultivation of blueberries is conditioned by many factors, in particular by the pH value of the soil, which should be between 4.3 and 4.8**,** that can be achieved by dressing and other measures[9]. However, recently there is a high interest among growers to cultivate blueberries taking into account its cost-benefit and its huge importance for human health.

In practice, the most important is the highbush ennobled blueberry (*Vaccinium corymbosum* L.). Generally, highbush cultivars were created relatively late and there are around 60 types identified until the current.

Out of these, the most important role in ennobling blueberries was played by *Vaccinium myrtillus* L. (the wild blueberry 2n = 2x =24), which is spread in the northern hemisphere North America, Europe and Asia [2,5]. The purpose of ennobling blueberries is to create selected cultivars for certain ecologic conditions (climate, soil), resistant to various pests and diseases, to start early fruit-giving, with regular fruit-giving, simultaneous ripening of fruits and with positive fruit properties size, quality, yield, colour, solidity, taste, higher nutrient amount etc.[6,8].

When cross-breeding between varieties of *Vaccinium* with the same number of chromosomes (homoploid) fruit-giving descendants are created, whilst when cross-breeding varieties with a different number of chromosomes (heteroploid) descendants are undefined and give fruits very rarely [6,7]

Highbush blueberry is highly adaptable. Its leaves are valuable if they are collected before fruit ripening. They are not curative if collected later [4].

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2. Material and Methods

For reproduction material well-lignified one-year old branches without fruit buds are used, which are collected at the end of the latent period at the end of winter before bud swelling (March). Branches with a diameter between 6 and 12 mm are cut at 15 cm length, i.e. several mm above the higher bud and several mm under the lower bud. The cut pieces are prepared, tied in bunches and their basic part is dipped up to 2.5 cm in a IBA and NAA solution with various concentrations of 1500 mg/l, 3000 mg/l and 4500 mg/l, for 5-7 seconds, whilst one row in each box is not treated (control). Boxes are filled with torf and torf-perlite at a ratio 2:1 (thickness of the substrate is 30 cm). At the bottom of boxes a layer of gravel is placed to ensure the drainage of excessive water.

Pieces treated in this manner are left to stay for 15 minutes (until phytohormone is fully absorbed) and after drying captan powder is applied at their base mixed with talk (at a ratio 1:10 – against rotting). Then, they are placed in boxes for rooting at a distance 10 x 5 cm at a depth of around ½ of the piece length leaving at least two buds above the substrate were they stay between 8 and 10 weeks. In the first weeks pieces must not be exposed to direct light therefore shadowing is applied. Our experiment was conducted during the year of 2014 in Kosovo – Lluke e Epërme, Deçan municipality. The pieces are placed in four boxes each with four repetitions. One repetition = 40 pieces. 40 x 4 = 160 pcs/box. Experiment is realised in a glass greenhouse where the relative air moisture is 75-80 % without basic heating, which included 640 pieces in total.

3. Results and Discussion

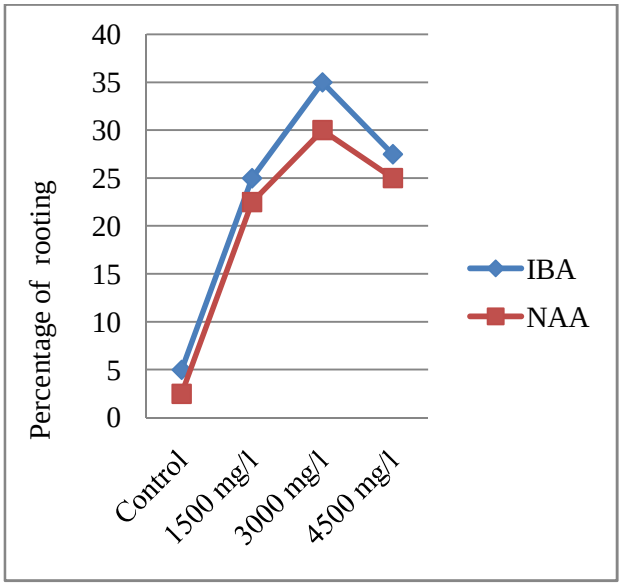

Figure 1. Rooting percentage of wood pieces substrate torf.

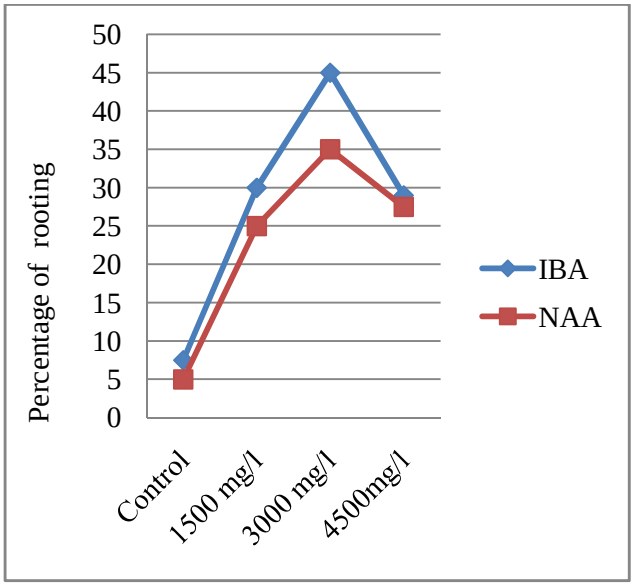

Figure 2. Rooting percentage of wood pieces substrate torf-perlite 2:1.

Research results from Figure1 show that the rooting percentage of wood pieces in the substrate torf, based on various concentrations of growth regulators reaches up to 35% for IBA 3000 mg/l, whilst for NAA with the same concentration reaches up to 30 %.

Concentrations above 3000 mg/l result with the decline of rooting percentage, taking into account that high concentrations of auxin may prevent the blossom of buds in pieces [1, 11].

Comparison of figure 1. with the figure 2. in the rooting substrate torf-perlite in ratio 2:1 a higher rooting percentage is achieved and it reaches up to 45% in the case of IBA at a concentration of 3000 mg/l, followed by NAA with 35% with the same concentration 3000 mg/l [10,3].

The increase of rooting percentage in the torf–perlite substrate in ratio 2:1, results from the presence of perlite which helps the aeration of the substrate.

Table1. Data averages for wood pieces

Factor-A	Factor-B	Factor-C	Repetition				
substrate	growth regulators	concentration (mg/l)	I	II	III	IV	Average
Torf		Control	1.00	1.00	0.00	0.00	0.50
	IBA	1500 mg/l	4.00	2.00	3.00	1.00	2.50
		3000 mg/l	3.00	6.00	3.00	2.00	3.50
		4500 mg/l	3.00	4.00	3.00	1.00	2.75
	NAA	Control	0.00	0.00	1.00	0.00	0.25
		1500 mg/l	2.00	3.00	3.00	1.00	2.25
		3000 mg/l	3.00	5.00	1.00	3.00	3.00
		4500 mg/l	2.00	1.00	3.00	4.00	2.50
Torf-Perlite	IBA	Control	1.00	0.00	2.00	0.00	0.75
		1500mg/l	3.00	4.00	3.00	2.00	3.00
		3000 mg/l	4.00	6.00	4.00	4.00	4.5
		4500 mg/l	2.00	3.00	4.00	3.00	3.00
	NAA	Control	0.00	1.00	0.00	1.00	0.50
		1500 mg/l	2.00	3.00	3.00	2.00	2.5
		3000 mg/l	4.00	3.00	2.00	5.00	3.5
		4500 mg/l	2.00	4.00	3.00	3.00	3.00

Table 2. ANOVA three way for wood pieces

Factor A - Substrate		Factor –B	Factor -C	Average- AB	Average-A
Torf	Torf-Perlite	growth regulators	concentration (mg/l)		
0.50	0.75	Control	-	0.63	0.50**
0.25	0.50	Control	-	0.38	
Average AC					
0.38	0.63				
2.50	3.00	IBA	1500 mg/l	2.75	2.56*
2.25	2.50	NAA	1500 mg/l	2.38	
Average AC					
2.38	2.75				
3.50	4.50	IBA	3000 mg/l	4.00	3.62*
3.00	3.50	NAA	3000 mg/l	3.25	
Average AC					
3.25	4.00				
2.75	3.00	IBA	4500 mg/l	2.88	2.81
2.50	3.00	NAA	4500 mg/l	2.75	
Average AC					
2.63	3.00				
Average C					
2.06*	2.68				
Average BC				Average B	
0.50	2.56			1.53**	
3.62	2.81			3.21**	

Factors		A	B	C*	AB	AC	BC**	ABC
LSD	1 %	1.12	0.66	0.66	1.72	1.72	1.05	3.33
	5 %	0.81	0.50	0.50	1.18	1.18	0.76	2.01

The statistical analysis Anova shows that there are high significant differences in the percentage of rooting treatments (treated wood pieces) compared to the control (untreated pieces) at the reliability level 0.01 (LSD), whilst regarding concentrations IBA 1500, 3000 mg/l there are significant differences at the reliability level of 0.05. Effects of growth regulation concentrations for IBA at 3000 mg/l were important when compared to the control. In the case of treatments with IBA and NAA in concentrations 1500 and 4500 mg/l there were no significant differences except in few cases.

The increase of concentration during treatment with IBA and NAA from 1500 to 3000 mg/l increases the ratio of rooted wood pieces, followed by a decline of the ratio in treatments with concentrations over 3000 mg/l [3].

4. Conclusions

Results of rooting blueberry wood pieces show that IBA is more positive whilst the most favourable concentration is the one at 3000 mg/l, in terms of rooting substrate, torf-perlite substrate 2:1 has shown higher results in the rooting of blueberry wood pieces. This is explained by the fact that perlite helps the aeration of the substrate knowing that all biochemical processes occurring when adventive roots are formed are aerobic processes (oxygen presence is necessary).

Of crucial importance is the time when pieces are collected in the rooting of blueberries, and the date of piece collection bearing in mind that wood pieces at various stages also have various ratios of certain nutrients especially nitrogen and carbohydrates.

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