Propagation of blueberries by soft cuttings

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The data on vegetative propagation of highbush blueberry (*Vaccinium* × *covilleanum* Butkus et Pliszka) cultivars and breeder's lines are presented. Three groups of soft cuttings were used according to the part of shoot taken: basal, medial, and apical. Rooting of these cuttings depended on the properties of a particular cultivar or breeder's line as well as on the part of shoot they were taken from. The highest rooting percentage was obtained with basal and medial cuttings. The apical cuttings rooted better only in the accessions with a shorter growth season ('Meader' and No. 694). The root system and shoots developed better in blueberries propagated by basal and medial cuttings.

Key words: highbush blueberry, cultivar, breeder's line, accession, vegetative propagation, annual shoot, soft cutting, root system

INTRODUCTION

Not all perennial plant species and cultivars are suitable for vegetative propagation, as well as there are significant differences in rooting abilities of cuttings taken from the same shoot of a given individual [1]. Highbush blueberry is a cultigenic hybrid released by crossing the three tetraploid (2n = 48) North American blueberry species, *Vaccinium corynbosum* L., *V. australe* Sm., and *V. angustifolium* Ait. [2, 3]. Therefore, its vegetative propagation is very important. It is known that some of blueberry cultivars can readily be propagated by woody ('Bluecrop', 'Dixi', 'Rancocas') [4, 5] or soft cuttings with the application of growth regulators [6, 7], while some of them are poorly or even not prone to vegetative propagation. Propagation by soft cuttings under artificial mist conditions with the application of growth regulators is more effective. However, these conditions are only additional in the process of rooting. Selection of most suitable annual shoots and an appropriate preparation of cuttings are the most important things predetermining the effectiveness of vegetative propagation of blueberries. Although the vegetative propagation of blueberries was studied rather extensively, however, no particular attention was drawn to the part of shoot the cutting should be taken from.

The aim of this work was to clarify which blueberry accessions might propagate by soft cuttings without application of growth regulators and what part of a shoot exhibits the best regeneration properties.

MATERIALS AND METHODS

The studies on vegetative propagation of 16 highbush blueberry cultivars and 3 breeder's lines (BL) were carried out in 1996. Soft cuttings 10–12 cm long were prepared at the beginning of their lignification, which was detected visually after the colour alteration of basal and medial parts of shoots, formation of lateral and apical buds, and the cease of young leaflet formation. The cuttings were prepared from the basal (I), medial (II), and apical (III) parts of shoots (Table 1), removing leaves from the basal part of a cutting and leaving two leaves at the top. The prepared cutting were kept in water for 20 h and then planted into the oligotrophic peat substrate in a plastic greenhouse at a scheme of 5 × 10 cm. Artificial mist was applied in the greenhouse every 10–15 min. By this way the transpiration of cuttings was reduced. After the first adventitious roots appeared, cuttings were watered and ventilated more abundantly, but with longer intervals. Each treatment contained 100 cuttings. An acid peat substrate was chosen, because the blueberry is an acidophilous plant, besides, peat provides good aeration as well as moisture conditions. Chemical properties of the peat substrate were as follows: pH 4.04, humus 8.56%, total N 0.874%, P_2O_5 16.7 mg/kg, and K_2O 114.0 mg/kg.

Rooting percentage of the cuttings was estimated after the growth season had finished. The length of 50 shoots was measured in each treatment as well as 20 plants were dug up for root system mea-

Table. **Propagation of blueberries by soft cuttings**

Accession	Rooting %			Length of vegetative shoots,cm			Length of root system, cm			Width of root system, cm		
	I	II	III	I	II	III	I	II	III	I	II	III
'Ama'	65.8	18.4	0	5.4 ± 0.8	5.6 ± 1.6	–	7.8 ± 0.4	5.7 ± 0.6	–	8.2 ± 0.4	6.5 ± 1.0	–
'Berkeley'	84.6	51.4	10.8	6.7 ± 0.9	3.9 ± 0.1	0	7.9 ± 0.5	7.3 ± 0.5	5.1 ± 0.5	10.7 ± 0.6	8.8 ± 0.6	4.6 ± 1.2
'Bluecrop'	58.0	37.1	9.1	4.7 ± 0.9	1.3 ± 0.5	0.2 ± 0.0	9.0 ± 0.7	10.1 ± 1.0	6.5 ± 0.9	10.1 ± 0.5	8.2 ± 0.3	6.0 ± 0.7
'Bluehaven'	71.7	28.6	16.7	8.3 ± 0.8	10.6 ± 1.3	9.8 ± 1.7	11.1 ± 0.5	11.2 ± 0.6	10.4 ± 1.5	9.4 ± 0.4	7.6 ± 0.5	7.4 ± 0.8
'Blueray'	85.0	25.0	0	3.5 ± 0.9	0.9 ± 0.1	–	8.1 ± 0.7	8.0 ± 0.7	–	6.2 ± 0.4	5.3 ± 1.2	–
'Dixi'	75.7	37.1	37.5	3.7 ± 0.8	1.2 ± 0.5	1.6 ± 0.1	7.3 ± 0.5	6.8 ± 0.7	7.3 ± 0.8	7.0 ± 0.4	5.3 ± 0.5	7.5 ± 0.8
'Gila'	50.0	23.3	0	1.8 ± 0.7	1.7 ± 1.0	–	8.1 ± 0.7	6.6 ± 1.1	–	5.5 ± 0.3	3.9 ± 0.7	–
'Gretha'	68.0	15.6	0	3.8 ± 0.8	2.2 ± 0.5	–	8.7 ± 0.6	6.0 ± 0.8	–	6.8 ± 0.5	3.8 ± 0.6	–
'Heerma'	60.0	45.0	31.4	6.1 ± 1.2	6.6 ± 0.9	2.3 ± 0.6	7.5 ± 0.8	6.7 ± 0.5	6.6 ± 0.5	7.6 ± 0.7	7.0 ± 0.6	5.3 ± 0.6
'Meader'	23.3	16.7	40.0	2.5 ± 0.3	1.3	1.0 ± 0.4	7.0 ± 1.0	6.9 ± 0.7	8.3 ± 0.8	7.5 ± 1.2	7.9 ± 0.8	5.9 ± 0.8
'Northland'	64.5	72.5	13.3	4.3 ± 0.9	5.9 ± 0.9	4.2 ± 2.1	9.6 ± 0.7	7.2 ± 0.5	6.9 ± 0.3	4.8 ± 0.6	6.1 ± 0.4	5.9 ± 0.8
'Northblue'	30.0	10.0	10.0	1.0 ± 0.2	0.2	5.5 ± 0.2	6.5 ± 1.5	6.0	7.2 ± 0.2	5.4 ± 0.2	3.2	5.8 ± 0.2
'Northcountry'	60.0	0	0	3.0 ± 0.2	–	–	5.7 ± 0.6	–	–	4.8 ± 0.7	–	–
'Patriot'	18.2	17.6	5.9	1.0 ± 0.1	1.0	2.0	9.5 ± 0.7	11.6 ± 1.8	8.5	5.5 ± 0.6	6.2 ± 0.5	13.0
'Rancoccas'	57.1	37.5	5.0	5.0 ± 0.8	6.3 ± 1.2	0	11.1 ± 0.8	10.2 ±0.8	4.3	6.1 ± 0.6	5.3 ± 0.3	5.3 ± 0.0
'Scammell'	43.3	43.3	0	6.1 ± 1.6	5.4 ± 1.9	–	6.7 ± 0.5	8.4 ± 1.0	–	5.7 ± 0.7	5.5 ± 0.4	–
No. 694	20.8	0	37.5	7.4 ± 1.4	–	0.7 ± 0.1	8.2 ± 2.3	–	8.8 ± 1.0	6.5 ± 0.6	–	7.0 ± 0.4
No. 526	76.9	36.4	31.4	12.8 ± 0.1	12.3 ± 1.7	9.5 ± 0.9	11.1 ± 0.7	11.5 ± 1.6	7.9 ± 1.1	8.1 ± 0.5	7.2 ± 1.0	5.5 ± 0.6
No. 382	14.3	60.0	0	3.9 ± 0.9	5.1 ± 0.5	–	10.0 ± 2.2	11.4 ± 1.6	–	5.8 ± 1.3	6.6 ± 0.6	–

I – cuttings from basal part of shoot; II – cuttings from medial part of shoot; III – cuttings from apical part of shoot.

surements and total biomass weight. The data were processed statistically.

RESULTS AND DISCUSSION

It was found that cuttings taken from different parts of shoots rooted differently. Cuttings taken from the basal part of a shoot exhibited the best rooting percentage in most of accessions. The number of rooted cuttings varied from 14.3% in the BL No. 382 to 84.6% in 'Berkeley'. In some cultivars quite a good rooting of medial cuttings was observed. These were 'Northland' (72.5%), BL No. 382 (60.0%), 'Berkeley' (51.4%), etc. The 'Northcountry' and BL No. 694 indicated no rooting of medial cuttings at all. The lowest rooting percentage was observed in apical cuttings. However, even 37.5% of apical cuttings produced roots, while medial ones did not at all in the BL No. 694. According to the preliminary data the best rooting of basal cuttings was obtained in 'Blueray' (85.0%), 'Berkeley' (84.6%), and BL No. 526 (76.9%). The best rooting of medial cuttings was obtained in 'Northland' (72.5%) and BL No. 382 (60.0%), while the best of apical cuttings were 'Meader' (40.0%) and BL No. 694 (37.5%) (Table). A higher rooting percentage of basal and medial cuttings is based on a more intensive tissue differentiation there.

The apical cuttings of poorly rooting 'Meader' and BL No. 694 rooted best. These blueberries have a shorter growth season, if compared to others, and their shoots get lignified earlier. Therefore, the apical cuttings rooted best since they were not lignified yet. The apical cuttings of 'Ama', 'Blueray', 'Gila', 'Gretha', 'Northcountry', 'Scammell', and BL No. 382 did not root. Those of 'Berkeley', 'Bluecrop', 'Bluehaven', 'Northblue', 'Northland', 'Patriot', and 'Rancocas' rooted poorly, and the rest of accessions rooted satisfactorily.

Vegetative propagation of blueberries, except for some accessions, is most effective by cuttings taken from the basal and medial parts of shoots. These are rich enough in nutrients and provide a better rooting and the development of the root system of cuttings. The best developed root system was observed on basal cuttings. The root length varied from 7.3 cm in 'Dixi' to 11.1 cm in 'Bluehaven', 'Rancocas', and BL No. 526. The width of the root system varied from 4.8 cm in 'Northland' and 'Northcountry' to 10.7 cm in 'Berkeley'. Quite good root systems were formed by the medial cuttings. Their root length also depended on the properties of a particular accession and varied from 5.7 cm in 'Ama' to 11.6 cm in 'Patriot', amounting in width from 3.2 cm in 'Northblue' to 8.8 cm in 'Berkeley'.

The basal cuttings produced shoots as long as from 1.0 cm in 'Patriot' to 12.8 cm in BL No. 526. The medial cuttings produced some shorter ones – from 0.2 cm in 'Northblue' to 12.3 cm in BL No. 526. The apical cuttings did not produce shoots ('Berkeley' and 'Rancocas') or produced ones from 0.2 cm in 'Bluecrop' to 9.8 cm in 'Bluehaven'. The best rooting cultivars distinguished not only by a more developed root system, but by longer shoots as well.

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E. Stackevičienė

ŠILAUOGIŲ DAUGINIMAS VASAROS AUGINIAIS

S a n t r a u k a

Naudojant 16 sodinės šilauogės veislių ir 3 selekcinių numerių metūglių frakcionavimą į bazinius, medialinius ir apikalinius auginius nustatyta, kad iš skirtingos metūglio dalies paruošti auginiai šaknijasi nevienodai. Daugelis šilauogių veislių – *Blueray* (85,0%), *Berkeley* (84,6%), Nr. 526 (76,9%), *Dixi* (75,7%), *Bluehaven* (71,7%), *Gretha* (68,0%), *Ama* (65,8%) – geriausiai dauginasi auginiais iš bazinės, kai kurios – *Northland* (72,5%) ir Nr. 382 (60,6%) – iš medialinės ar net apikalinės – *Meader* (40,0%), Nr. 694 (37,5%) metūglio dalies. Šaknų sistemos ir ūglių formavimasis priklausė nuo auginio frakcijos (bazinis, medialinis ar apikalinis) ir veislės ar selekcinio numerio savybių. Nustatyta, kad geriau besišaknijančios veislės tiek iš bazinių, tiek ir iš medialinių auginių suformavo geresnę šaknų sistemą, o ūgliai buvo augesni. Pastebėta, kad sunkiai besišaknijančios šilauogės, ypač turinčios trumpesnį vegetacijos periodą, pakankamai gerai šaknijasi dauginant jas apikaliniais auginiais.

Raktažodžiai: sodinė šilauogė, veislė, selekcinė linija, kolekcinis pavyzdys, vegetatyvinis dauginimas, metūglis, auginys, šaknų sistema