

THE PROPAGATION OF CURRANTS AND GOOSEBERRIES BY SOFTWOOD AND COMBINED CUTTINGS UPEŅU, JĀNOGU UN ĒRKŠKOĢU PAVAIROŠANA IZMANTOJOT LAPAINOS UN DAĻĒJI KOKSNAINOS SPRAUDEŅUS

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Kopsavilkums

Lietuvas Dārzkopības Institutā (2002. - 2003.) tika veikta upeņu, sarkano jāņogu, zelta jāņogu un ērkšķogu pavairošana lietojot lapainos un daļēji koksnainos spraudēņus. Spraudēņus apstrādāja ar β -indolilietikskābes (IES), IES ar askorbīnskābi, un naftilietikskābes (NES) šķīdumiem. Vislielākais apsākņojušos stādu iznākums bija upeņu (75.2 %) un ērkšķogu (72.9 %) lapainajiem spraudēņiem, pielietojot 20 stundu mērcēšanu IES šķīdumā 50 mg l⁻¹ koncentrācijā. Sarkanajām un zelta jāņogām tika iegūti sliktāki apsākņošanās rezultāti. Sarkano jāņogu lapaino spraudēņu apsākņošanās variēja starp 33.3 - 50.0 %, bet zelta jāņogas - 42.9 - 54.2 %. Daļēji koksnaino spraudēņu apsākņošanās šīm sugām bija 36.8 %. Labākās kvalitātes spraudēņi iegūti izmantojot NES šķīdumu. *Ribes* ģints dažādu sugu spraudēņi apsākņojās atšķirīgi.

Abstract

Rooting in artificial mist of black (*R. nigrum* L.), red (*R. rubrum* L.), golden (*R. aureum* Pursh.) currant and gooseberry (*R. uva-crispa* L.) softwood and combined cuttings, affected by β -indoleacetic acid (IAA), mixture of IAA and ascorbic acid, and naphthaleneacetic acid (NAA) solutions, were studied at the Lithuanian Institute of Horticulture in 2002-2003. The biggest output of rooted plants was obtained from black currants and gooseberries. All applied growth stimulators increased the rooting of black currants softwood cuttings, and the rooting of the same cuttings of gooseberries was increased only by IAA. The best percent of rooted softwood cuttings of black currants (75.2) and gooseberries (72.9) was obtained when before the rooting these cuttings for 20 hours were affected by IAA 50 mg l⁻¹ water solution. The rooting of softwood cuttings of red and golden currants was worse than that of gooseberries and black currants. Depending on growth stimulator, the rooting of softwood cuttings of red currants on the average reached 33.3-50.0%, of golden currants – 42.9-54.2%, and of combined cuttings of these cultivars – 36.8%. The best quality of rooted cuttings was obtained using NAA solution. The rooting and quality of softwood and combined cuttings mostly depended on *Ribes* cultivar.

Key words: currants, gooseberries, propagation, stimulators, cuttings

Introduction

Lithuanian agroclimatic conditions are favourable for black currant and gooseberries growing. For the propagation of plants generative (by seeds) and vegetative (by root shoots, vertical and horizontal layers, woody and softwood cuttings, grafts and eyes) methods may be applied. In the practice of horticulture black currant and gooseberries are propagated by woody and softwood cuttings (Czynczyk, 1998).

Many factors determine the rooting of plants, the most important are as follow: biological properties of plant variety, healthiness and environmental conditions (Staniene *et al.*, 2004). It was showed that the intensivity of rooting is determined by the chemical structure and concentration of the growth stimulator (Novickiene and Darginaviciene, 2001; Novickiene *et al.*, 2004; Turetskaja and Polikarpova, 1968).

The aim of the investigation was to establish the influence of growth stimulators on the rooting of softwood and combined cuttings of black, red, golden currants and gooseberries and on the quality of rooted cuttings propagating these plants in the artificial mist.

Materials and Methods

In 2002-2003 at the Institute of Lithuanian Horticulture black currant cvs. 'Joniniai' (Lithuania), 'Titania' (Sweden) and 'Minay Shmyriov' (Belarus), red currant cvs. 'Rondom' (The Netherlands) and 'Werdavia' (Germany), golden currant cvs. 'Corona' (Germany), 'Brekht' (Germany) and selection number AuG-1 (Lithuania) and gooseberry cvs. 'Nesluchovskij' (Ukraine), 'Kirdeikiai' (Lithuania) and 'Kursu Dzintars' (Latvia) were investigated.

The shoots were taken from selection nursery at the last decade of June, while the plants were actively growing. Softwood and combined (softwood +0.5 cm of last year wood) cuttings were obtained from 2-3 internodes (9-14 cm long). The influence of growth stimulators on softwood and combined plants were investigated according following scheme: 1) control (H_2O), 2) IAA (50 mg l^{-1}), 3) IAA + ascorbic acid ($50\text{ mg l}^{-1} + 0.25\text{ g l}^{-1}$), 4) NAA (25 mg l^{-1}).

32 softwood and combined cuttings were prepared for each variant. The bottom part of cuttings (1 cm) was soaked for 20 hours in water or solutions of growth stimulators. Then they were planted in substrate (2 parts of peat and 1 part of sand) of artificial mist at distances of 5x5 cm. Cuttings of each variant were grown in four replications by randomized block design. In the second half of September the rooted cuttings were replanted in an unheated greenhouse at distances of 20x20 cm. Before planting their quality was evaluated according to the original 5 scores scale (1 – the length of the main roots up to 4 cm and 1 full leaf is remained, 2 – the length of the main roots 4-8 cm and 3 full leaves are remained, 3 – the length of the main roots 8-12 cm and new shoots up to 1 cm in length are grown, 4 – the length of the main roots 12-16 cm and new shoots up to 1-4 cm in length are grown, 5 – the length of the main roots more than 20 cm and new shoots more than 4 cm in length are grown).

All data were subjected to analysis of variance. The significance of differences between the cultivars was estimated at a level of 0.05 (Manly, 1994).

Results

Rooting of plants. Softwood and combined cuttings of black, red, golden currants and gooseberries affected by the growth stimulator rooted in the artificial mist during 20-25 days. Black currants rooted most quickly, and gooseberries were the latest.

The percent of the rooted cuttings depended on the cultivar of cultivar *Ribes* and growth stimulator (Table 1). The rooting of black currant softwood cuttings affected by growth stimulator reached 53.1-78.1%, and in control variant (soaked only in water) – 44.4-62.5%. The percent of combined cutting rooting was higher. Combined cuttings of control variant cv. 'Joniniai' rooted best of all.

The influence of growth stimulators on the both cultivars of red currants was insignificant. The rooting of softwood cuttings reached up to 50.0% and the rooting of combined cuttings – up to 41.6%. The addition of ascorbic acid into IAA solution improved the rooting both of softwood and combined cuttings. The rooting of combined cuttings of cv. 'Rondom' was better then this of cv. 'Werdavia'. From 4 investigated variants, in 3 variants softwood cuttings of cv. 'Rondom' rooted better than combined cuttings.

Growth stimulators differently affected the rooting of cuttings of the investigated golden currant cultivars. After the effect by the growth stimulator up to 28.5-71.9% of softwood cuttings took roots. Combined cuttings rooted better (62.5%) in the control variant. In all cases, growth stimulators improved the rooting of selection number AuG-1 cuttings. Growth stimulators almost didn't influence the cuttings of cv. 'Brekht', but they increased the rooting of cutting cultivar 'Corona'.

Growth stimulators differently affected the rooting of gooseberry cuttings also. They decreased the rooting of cutting cv. 'Nesluchovskij', and the amount of rooted cutting cv. 'Kursu Dzintars' significantly increased. The addition of ascorbic acid into all solutions of growth stimulators improved the rooting of combined cuttings of investigated cultivars. The rooting of combined cuttings 'Kursu Dzintars' affected by IAA solution enriched with ascorbic acid reached even 96.9%. The comparison of the rooting of gooseberry softwood and combined cuttings showed that combined cuttings rooted significantly better.

The quality of the rooted cuttings. Growth stimulators most often improved the quality of softwood cuttings, but worsened the quality of combined cuttings (Table 2).

Table 1. The influence of growth stimulators on the rooting of currant and gooseberry cuttings

Cultivars		The amount of rooted cuttings (%)							
		Control (H ₂ O)		IAA		IAA + ascorbic acid		NAA	
		SWC*	CC**	SWC	CC	SWC	CC	SWC	CC
Blackcurrants	‘Joniniai’	53.1	96.9	68.8	81.2	53.1	75.0	56.2	62.5
	‘Titania’	44.4	68.8	70.5	56.2	53.1	37.5	62.5	41.7
	‘Minay Shmyriov’	62.5	78.1	78.1	75.0	71.9	62.5	56.2	62.5
	LSD ₀₅	18.0	21.9	17.4	23.1	18.4	22.8	18.8	20.6
Red currants	‘Rondom’	41.7	40.6	33.3	37.5	41.6	40.6	50.0	31.2
	‘Werdavia’	-	24.0	-	25.0	-	28.8	-	28.1
	LSD ₀₅		15.5		12.1		10.1		8.0
Golden currants	‘Breckt’	53.1	62.5	53.1	30.9	62.5	31.2	53.1	25.0
	‘Corona’	65.6	31.2	71.9	21.9	68.8	28.1	40.6	19.4
	AuG-1	26.1	16.7	28.5	35.4	31.2	20.4	35.1	21.5
	LSD ₀₅	20.7	12.4	17.9	13.2	17.4	10.6	15.8	16.2
Gooseberries	‘Nesluhovskij’	62.5	81.2	65.6	65.6	37.5	78.1	43.8	65.6
	‘Kirdeikiai’	71.9	84.4	75.0	68.8	56.2	90.6	56.2	59.4
	‘Kursu Dzintars’	75.0	84.4	71.1	93.8	78.1	96.9	78.1	87.5
	LSD ₀₅	18.7	21.3	11.6	18.7	18.5	12.5	21.3	20.2

*- Softwood cuttings ** - Combined cuttings

Table 2. The influence of growth stimulators on the quality of cuttings of currants and gooseberries rooted in the artificial mist

Cultivars		The quality of rooted cuttings (scores)							
		Control (H ₂ O)		IAA		IAA + ascorbic acid		NAA	
		SWC*	CC**	SWC	CC	SWC	CC	SWC	CC
Blackcurrants	‘Joniniai’	2.8	3.3	3.0	3.0	3.2	2.8	2.9	2.7
	‘Titania’	3.3	3.4	3.5	3.2	2.8	3.1	3.3	3.1
	‘Minay Shmyriov’	3.0	3.2	3.4	3.1	2.8	3.0	3.9	3.0
	LSD ₀₅	0.8	1.1	0.5	0.7	0.4	0.5	0.9	0.6
Redcurrants	‘Rondom’	1.0	1.2	1.0	1.0	1.5	1.1	1.2	1.5
	‘Werdavia’	-	1.0	-	1.0	-	1.0	-	1.0
	LSD ₀₅		0.4		0.1		0.3		0.4
Golden currants	‘Breckt’	2.1	1.7	2.1	1.6	2.8	3.0	2.1	2.0
	‘Corona’	3.1	1.5	3.2	1.4	2.9	1.9	3.5	3.5
	AuG-1	2.6	1.1	2.9	1.4	2.6	1.8	2.0	1.6
	LSD ₀₅	0.9	0.6	0.8	0.6	0.5	0.9	1.1	0.6
Gooseberries	‘Nesluhovskij’	2.6	3.2	3.2	3.0	3.4	3.0	2.1	3.5
	‘Kirdeikiai’	2.2	2.9	4.0	4.1	2.5	3.3	3.5	3.6
	‘Kursu Dzintars’	2.7	2.8	3.5	4.3	2.8	3.5	2.6	3.5
	LSD ₀₅	0.8	0.8	0.6	1.1	0.8	0.5	0.8	0.6

*- Softwood cuttings ** - Combined cuttings

Various growth stimulators differently affected the softwood cuttings of the investigated cultivars. The best quality was of rooted softwood cuttings of cv. ‘Joniniai’ IAA + ascorbic acid (3.2 scores), cv. ‘Titania’ – IAA (3.5 scores), and cv. ‘Minay Shmyriov’ – NAA (3.9 scores) under the effect of solutions. The best quality (3.2-3.4 scores) of combined cuttings of all investigated black currant cultivars was in the control variant.

Growth stimulators almost did not improve the quality of both softwood and combined red currant cuttings (1.0-1.5 scores). The best quality of softwood cuttings (1.5 scores) was obtained under the effect of IAA + ascorbic acid solutions.

All the investigated growth stimulators improved the quality of rooted golden currant cuttings. Both softwood and combined cuttings of cultivar 'Corona' were of best quality (3.5 scores) when affected with NAA solution, and cuttings of cv. 'Breckt' – affected with solutions of IAA + ascorbic acid (respectively 3.2-2.8 scores). The quality of cuttings of cvs. 'Breckt' and 'Corona' in most investigated variant was better than the quality of cuttings of selection number AuG-1.

From all the investigated varieties of *Ribes*, growth stimulators significantly increased the amount of the rooted gooseberry cuttings and their quality. The rooted cuttings of cvs. 'Kirdeikiai' and 'Kursu Dzintars' were of best quality (3.5-4.3 scores) and significantly better than the cuttings of cv. 'Nesluchovskij' (2.1-3.4 scores). The evaluation of all rooted softwood and combined cuttings of gooseberry cultivars showed that in most cases combined cuttings were of best quality.

Discussion

Many berry plants (*Ribes*, *Rubus*, *Vaccinium*, *Hippophae*) may be propagated by softwood cuttings (Abolins *et al.*, 2003; Coorts, Hull, 1972; Czynczyk, 1998). Black and red currants most often are propagated by woody cuttings, but the propagation by softwood cuttings is used also in order to propagate new cultivars quickly. By this propagation method *Cecidophyopsis ribis* free blackcurrant material is obtained (Jermakov, 1981). This method is the most important in gooseberry propagation (Czynczyk, 1998). The data of our investigations showed that combined cuttings of gooseberries rooted best of all and this partly coincided with the results obtained in Russia (Sergejeva, 1989). Nowadays the interest in *R. aureum* is increasing. They are used as rootstock in currant and gooseberry growing and berry production. The investigations about the propagation of golden currants by softwood cuttings are not abundant.

In our investigation all cuttings planted in unheated greenhouse survived the winter and grew on. The further growth of bushes mostly depended on root the quality of the rooted cuttings. Growth stimulators increased the rooting of black currant softwood cuttings and decreased the rooting of combined cuttings. It is best of all to propagate in the artificial mist red and golden currants by softwood cuttings, gooseberries – by combined cuttings, and black currants – both by softwood and combined cuttings.

Conclusions

The biggest amount of rooted softwood cuttings of black currants (75.2%) was obtained, when they were affected by 50 mg l⁻¹, red currants (50.0%) - NAA (25 mg l⁻¹), golden currants (54.2 %) and gooseberries (72.9 %) - IAA + ascorbic acid (50 mg l⁻¹ + 0.25 g l⁻¹) solutions. Gooseberry combined cuttings rooted best of all (70.8-88.5%), and the combined cuttings of currants rooted worse than softwood cuttings.

The best quality of rooting of currant and gooseberry cuttings was obtained with the solution NAA (25 mg l⁻¹). The rooting and quality of softwood and combined cuttings mostly depended on *Ribes* cultivar.

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