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THE QUALITY OF SEEDLINGS OF DIFFERENT CULTIVARS AND ROOTSTOCKS OF APPLE PRODUCED BY THE "KNIP" METHOD

SUMMARY

In Kosovo, apple seedlings production material has until recently been mainly derived from one traditional source – one-year seedling material. Recently, with the intensification of fruit tree production, demand for other types of production material has increased. There is increased interest in the technology and techniques of seedling production using the KNIP method. For this reason, we conducted a field research trial at the experimental didactic farm of the Faculty of Agriculture in Prishtina. The research materials consisted of two apple cultivars: Golden Delicious Clone B and Red Delicious, grafted with English grafting rootstocks M9 and MM106. For the experimental trials we used a randomised complete block design with replication. The research included 10 seedlings for each treatment of cultivar and rootstock. In such seedlings were investigated vegetative parameters of seedlings development: height of seedlings, length of the upper branches, trunk diameter, number of lateral branches, total length of lateral branches and branch angles. The obtained results were analysed using ANOVA and LSD tests, while the significances of the observed differences were determined at $P_{0.05}$ and $P_{0.01}$ probability levels using MINITAB-16© software. The results obtained from our research were highly significant among different treatments, cultivars and rootstocks.

Key words: Seedlings, cultivars, rootstocks, classification of seedlings

INTRODUCTION

Despite the favourable production conditions in Kosovo, production of planting material is still relatively low and doesn't meet the requirements of the internal market. In recent years, the production of seedlings has been intensifying with the increasing interest of farmers in new technologies for the production of seedlings. Development of fruit depends on the combination of the cultivars, rootstocks, and in particular, the quality of the seedlings.

Important parameters for the quality of seedlings are: root system development, seedling thickness and length, and also the number and length of laterals per seedlings. The development of lateral shoots is in direct correlation with the phenomenon of apical dominance (Martin 1987, Cline 1997, Wilson

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2000). In fact, this phenomenon has been known since long ago and is explained by the predominance of the vegetative part of the tip, which inhibits growth of buds in lateral positions. Research of seedling material production has been undertaken by many authors, such as: Volz (1994), Berg (2003), Čmelik (2005), Sylanaj (2008), etc.

This research focuses on the production of KNIP seedling material with laterals of the apple cultivars Golden Delicious Clone B and Red Delicious, grafted on M9 and MM106 rootstocks. Seedling branch was stimulated by cutting the leaves of the upper undeveloped part. Production of KNIP seedlings in our country is currently in the early steps of production.

MATERIAL AND METHODS

Research was conducted during the vegetation year 2011 in the testing field of the Faculty of Agriculture – Pristina in an area of 0.10 ha. Research materials consisted of two apple cultivars: Golden Delicious Clone B and Red Delicious, grafted with M9 and MM106 rootstocks, during the year 2010.

The land where the seedlings were planted was of good quality with an average depth up to 60 cm: humus 3.87%, N 0.22%, 6.97 mg% P2O5, 19.2 mg of K2O% and the pH value in water was 6.8, whereas KCl was 5.8.

Experimental trials took the form of random complete block design with four replications (RCBD). The research included 10 seedlings for each treatment of cultivars and rootstocks. The distance used for planting the seedlings was 100 x 35 cm.

Seedlings were cut at 75 cm height and lateral buds, which are young sprouts, were left. Undeveloped leaves of the sprouts peaks that reached a length of over 15 cm were removed by hand, so as to enable the apical dominance of buds for seedling branching. Emerged sprouts below 60 cm were removed by hand when they reached 6–7 cm length. At the end of vegetation, the following seedling parameters were measured:

-Height of seedlings (HS)
-Length of the terminal shoot (LTS)
-Trunk diameter (TD)
-Number of lateral branches (NLB)
-Total length of lateral branches (TLB)
-Crotch angle (BA)
-Seedling diameter 10 cm above the grafting

The obtained results were analysed using ANOVA and LSD tests for treatments and investigated parameters. The observed differences were determined at $P_{0.05}$ and $P_{0.01}$ probability levels, using MINITAB-16© software.

RESULTS AND DISCUSSION

Results of the research on KNIP seedling development are presented in Table 1. Based on overall analysis, it could be concluded that the seedlings grafted on MM106 rootstock are the more developed of the two investigated cultivars of apple. The seedlings with the greatest lengths were: Golden Delicious Clone B (162.93 cm) and Red Delicious (134.92 cm).

Differences between the lengths of the grafted seedlings in different rootstocks were significantly high. The seedlings grafted on M9 were of a smaller length than those of rootstock MM106. The greatest lengths for seedling apple cultivars was Golden Delicious Clone B (118.19 cm), while the Red Delicious cultivar had a smaller length (116.59 cm).

Differences between the grafted apple cultivars on M9 rootstock were not significant. These results coincide approximately with the results of several authors who have dealt with this problem (e.g., Čmelik et al. 2005, Sylanaj et al. 2008).

The length of the laterals was greater for the apple cultivars grafted on MM106 rootstock compared to M9. The greatest length was achieved by the Golden Delicious Clone B cultivar grafted on M9 (66.21 cm), whereas the Red Delicious cultivar grafted on rootstock M9 had a smaller length (50.08 cm). Differences between the cultivars and rootstocks were significantly high.

The number of laterals is a very important factor in the production of KNIP seedlings. The highest number of laterals was on the Golden Delicious Clone B cultivar grafted on M9 (8:00), while the Red Delicious cultivar grafted on M9 had the lowest number (4:40). These differences were significant.

Table 1. Effect of treatments on the performance of KNIP apple nursery trees.

Cultivar	Rootstocks	Highest of seedling(cm)		Length of the terminal shoot cm		No of laterals per seedling		Length of lateral branch (cm)		Crotch angle(o)		Trunk diameter (mm)	
Golden Delicious	MM 106	162.93		66.21		7.13		43.70		63.93		16.9	
	M 9	118.19		55.67		8.00		30.00		65.73		16.7	
Red Delicious	MM 106	134.92		58.36		5.53		56.96		62.27		21.1	
	M 9	116.59		50.08		4.40		25.65		60.67		20.2	
LSD 0.05	Cultivar A	3.40	4.77	0.79	1.12	0.24	0.34	0.59	0.83	3.57	5.01	0.38	0.54
0.01	Rootstock B	2.78	3.40	1.54	2.11	0.30	0.41	0.33	0.45	2.89	3.97	0.57	0.78

The length of the laterals shows the growing strength of rootstock and cultivar of apple. The greatest length of the laterals was shown by the Red Delicious cultivar (56.96 cm) grafted on MM106, and the smallest length of laterals was shown by the Red Delicious cultivar (25.65cm) grafted on M9 rootstock. Differences between the cultivars and rootstocks were significantly high.

According to the data of authors Valz et al. (1994), KNIP seedlings must have at least five laterals with an average length of about 20 cm. Only the Red Delicious cultivar grafted on M9 rootstock had 4.40 laterals.

The crotch angle is important for the introduction of trees in early fruiting. The greatest crotch angle was found on the Golden Delicious Clone B cultivar grafted on M9 rootstock (65.75 0). The smallest crotch angle was found on the Red Delicious cultivar grafted on M9 rootstock (60.67 0). These results are approximately consistent with the results of Cmelik et al. (2005) for the Golden Delicious Clone B cultivar.

The trunk diameter of seedlings is a parameter on which seedling classification is based. The greater seedling diameter was achieved by the Red Delicious cultivar grafted on both rootstocks. The largest diameter was the Red Delicious cultivar grafted on MM106 rootstock (21.1 cm), while the smallest seedling diameter was from the Red Delicious cultivar grafted on M9 rootstock (16.7 mm). These differences were significant.

CONCLUSIONS

Based on the analysed parameters for production of KNIP seedling material by cutting of the leaves of the tip, the following can concluded:

Seedling length, the length of the laterals, lateral branch length and trunk diameter were within the standard for first-class seedlings. All investigated parameters were highest for the Golden Delicious Clone B cultivar, while the largest trunk diameter was achieved by the Red Delicious cultivar grafted on rootstock MM106 (21.1 mm).

The crotch angle was smallest for the Red Delicious cultivar grafted on M9 (60.67 0), and greatest for the Golden Delicious Clone B cultivar grafted on M9 (65.75 0).

According to all parameters investigated, KNIP seedlings have greater advantages in comparison with seedlings produced in the traditional manner.

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KVALITET SADNICA RAZLIČITIH KULTIVARA I PODLOGA JABUKA PROIZVEDENIH "KNIP" METODOM

SAŽETAK

Na Kosovu, proizvodnja sadnog materijala jabuka je do nedavno uglavom poticala iz jednog tradicionalnog izvora – jednogodišnjeg rasadnog materijala. Odnedavno, sa intenzifikacijom voćarske proizvodnje, povećana je potražnja za ostalim tipovima proizvodnog materijala. Raste interesovanje za tehnologije i tehnike proizvodnje sadnica KNIP metodom. Iz tog razloga, sproveli smo terensko istraživanje na oglednom gazdinstvu Poljoprivrednog fakulteta u Prištini. Ogledi materijal činila su dva kultivara jabuka: „Zlatni delišes" klon B i „Crveni delišes" kalemljen engleskim podlogama za kalemljenje M9 i MM106. Za oglede smo koristili šemu nasumičnog redosljeda sa replikacijom. Istraživanje je obuhvatilo 10 sadnica za svaki tretman kultivara i podloge. Na takvim sadnicama praćeni su vegetativni parametri razvoja sadnica: visina sadnica, dužina gornjih grana, prečnik stabla, broj bočnih grana, ukupna dužina bočnih grana i ugao grana. Dobijeni rezultati analizirani su ANOVA i LSD testovima, dok su značajnosti zapaženih razlika utvrđenje na nivou vjerovatnoće od p 0.05 i p 0.01, korišćenjem MINITAB-16© softvera. Rezultati dobijeni u našem istraživanju su bila visoko značajna u pogledu tretmana, kultivara i podloga.

Ključne riječi: sadnice, kultivari, podloge, klasifikacija sadnica