

THE EFFECT OF BIOREGULATOR GERBA 4LG TREATMENT ON LATERAL SHOOT FORMATION IN MAIDEN APPLE TREE

EFECTUL TRATĂRII CU REGULATORUL DE CREȘTERE GERBA 4LGLA OBȚINEREA LĂSTARILOR LATERALI ÎN PEPINIERĂ LA POMII DE MĂR

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Abstract. *The object of the research was apple varieties Golden Delicious Reinders, Red Velox, Gala Buckeye and Red Jonaprince, grafted on M 9. The grafting method was chip budding. Planting distance was 80x35 cm. In order to intensify the formation of the anticipated shoots in the area of the crown formation, various technological processes were used: 1. Free eyelid growth (control); 2. Topping of apical leaves was combined with two treatments with Gerba 4LG at a dose of 25 ml/liter of water. It was established that the most reasonable garnishing of the crown formation with anticipated shoots at all studied varieties was obtained by topping the apical leaves in the apex area once when the graft reaches 65-70 cm height combined with twice the sprinkling Gerba 4LG at 25 ml/liter of water. The first treatment was done after breaking the apical leaves and the next at 5-7 days.*

Key words: Apple, lateral shoots, growth regulator, quality.

Rezumat. *Obiectul cercetărilor a fost soiurile de măr Golden Delicious Reinders, Red Velox, Gala Buckeye și Red Jonaprince, altoite pe M 9. Metoda de altoire folosită ocularea în placaj. Distanța de plantare – 80x35 cm. Pentru intensificarea gradului de formare a lăstarilor anticipați s-au utilizat diverse procedee tehnologice: 1. Creștere liberă a oculantului (martor); 2. Ruperea frunzelor apicale din zona apexului combinată cu două tratamente cu regulatorul de creștere Gerba 4LG în doza de 25 ml/litri de apă. S-a stabilit, că cea mai rațională garnisire a zonei de formare a coroanei cu lăstari anticipați la toate soiurile luate în studiu sa obținut la ruperea frunzelor apicale din zona apexului o singură dată când oculantul atinge 65 - 70 cm înălțime combinată cu stropirea de două ori cu regulatorul de creștere Gerba 4LG în doza de 25 ml/litri de apă. Primul tratament de efectuat după ruperea frunzelor apicale, iar următorul la interval de 5-7 zile.*

Cuvinte cheie: Măr, lăstari laterali, regulator de creștere, calitate.

INTRODUCTION

The formation of the crown of trees in the nursery from normal and anticipated shoots is the technological operation by which the height of the trunk is defined and the shape after which the tree will be conducted in the orchard

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(Babuc, 2012; Babuc *et al.*, 2013; Cimpoieș, 2012).

If it is planned to form the crown from anticipated shoots to apple trees in field II of the nursery, a decisive role plays the hereditary capacity of the varieties to issue such shoots (Basak and Sozcek, 1986; Gudumac, 2008).

Many fruit growers in crown formation in apple trees also use other preparations like: Paturyl 10 WSC, Arbolin 36 SL, Gerba 4LG etc. (Cağlar and Iğın, 2009; Gastol *et al.*, 2012; Hrotkó *et al.*, 1996; Wertheim and Estabrooks, 1994).

In order to increase the degree of emission of the anticipated shoots at the base of the apple trees crown in the second field of the nursery and to provide branched trees it was proposed to study how it will influence on the mentioned index the topping of the apical leaves combined with the treatment with the Gerba 4LG product whose active ingredient is a cytokinin.

MATERIAL AND METHOD

The research was carried out in the fruit nursery of the company "Vagadis" LTD. The trees of the Golden Delicious Reinders, Red Velox, Gala Buckeye and Red Jonaprince were grafted onto the M 9 rootstock.

The planting of the rootstocks in field I was carried out in spring 2015. The grafting method used in field one of the apple nursery was the chip budding. Planting distance - 80x35 cm.

In order to determine the influence of different intervention techniques on the degree of issuance of the anticipated shoots, two variants have been established: V_1 - by free growth of the eyepiece (control); V_2 – topping one-time of the apical leaves in the apex area when the eyepiece was 65 - 70 cm high combined with the application of two treatments with Gerba 4LG in the dose of 25 ml/liters of water on the top of the plant. The first application was made immediately after the apical leaves were broken, and the next one at 5-7 days.

The researches were carried out according to recommended methods for conducting field experiments in the nursery.

The main results obtained were statistically processed by the method of dispersion analysis.

RESULTS AND DISCUSSIONS

Lower diameter values in the rootstock area were recorded in trees of the Red Velox variety - 14.4 mm, while in the Golden Reinders, Gala Buckeye and Red Jonaprince varieties, the index in question was higher and varied from 16, 0 mm to 16.6 mm (tab. 1).

In case of formation of the crown by topping the apical leaves and treating with the growth regulator Gerba 4LG in the dose of 25 ml/liter of water, the index in the case increased by 5.4 - 15.9%. Higher values of the index were recorded at the Golden Reinders (18.6 mm) and Buckeye Gala (18.0 mm).

Higher values of the average diameter below the first branch of the crown were recorded in the variant when the apical leaf was broken and treated with the Gerba 4LG growth regulator in the dose 25 ml/liter of water, where it constituted from 13.1 mm up to 17.0 mm.

Table 1

Diameter in different areas of the tree depending on the biological particularities of the variety and the method of crown formation, mm

The crown formation	In the rootstock area	Under the crown	Above the last branch of the crown
Red Velox variety			
V ₁	14.4	-	-
V ₂	16.7	13.1	9.1
Golden Reinders variety			
V ₁	16.2	14.7	12.6
V ₂	18.6	17.0	10.8
Gala Buckeye variety			
V ₁	16.0	13.1	11.8
V ₂	18.0	15.7	10.9
Red Jonaprince variety			
V ₁	16.6	12.6	11.4
V ₂	17.5	15.0	8.7

Lower values of the index in the study on different areas of the tree were recorded above the last branch in the crown, which was in direct correlation with the biological particularities of the variety. Lower values on the studied variants were recorded in the Red Jonaprince variety 8.7 - 11.4 mm, in the Gala Buckeye variety constituted 10.9 - 11.8 mm, and in the Golden Reinders variety 10.8 - 12.9 mm.

Table 2

The height of crown structure according to the method used in crown formation, cm

The crown formation	The tree height	The height of the trunk	The length of the crown formation area	The length of the arrow
Red Velox variety				
V ₁	149	-	-	149
V ₂	135	55	13	67
LSD 0.05	5.7	-	-	3.1
Golden Reinders variety				
V ₁	169	59	6	104
V ₂	150	55	26	69
LSD 0.05	6.9	2.6	0.43	2.8
Gala Buckeye variety				
V ₁	184	58	10	116
V ₂	150	55	29	75
LSD 0.05	7.2	2.7	0.46	3.7
Red Jonaprince variety				
V ₁	172	59	13	100
V ₂	151	60	37	54
LSD 0.05	6.5	2.9	0.56	2.9

The difference between the lower and upper diameter of the crown area in

the Golden Reinders variety was 6.2 mm, in the Gala Buckeye variety 4.8 mm, in the Red Jonaprince 6.3 mm variety, and in the Red Velox variety 4.0 mm.

The investigations carried out on the height of the trees according to the biological particularities of the variety, show us that, on the index in the study, the biological peculiarities of the variety influence. A lower value in the control variant of the height of the trees was recorded in the Red Velox variety - 149 cm. Further growing is the Golden Reinders variety - 169 cm, the Red Jonaprince variety - 172 cm and the Gala Buckeye variety - 184 cm (tab. 2).

In variant V₂, where the apical leaf break was performed plus the treatment with the growth regulator Gerba 4LG in the dose 25 ml/liter of water, there was a decrease of the index in the study by 10.4 - 22.6% compared to the control variant. The largest difference was recorded in the Gala Buckeye variety, which is characterized by a greater growth force.

Higher values of the extension pod were recorded in the Red Velox variety 149 cm, and in the Gala Buckeye variety 116 cm. In the Red Jonaprince and Golden Reinders varieties, the index was 100 cm and 104 cm respectively.

The lowest values for the varieties studied were recorded in variant V₂, where the apical leaf was topping and treated with the Gerba 4LG growth regulator. In the case of the Red Jonaprince variety, the index was 54 cm, the Red Velox variety - 67 cm, the Golden Reinders variety - 69 cm, and the Gala Buckeye variety - 76 cm.

Table 3

Number of anticipated branches, average and summed length within the apple trees crown in field II of the apple nursery, depending on the method of crown formation

The crown formation	Number of anticipated branches, pcs/tree	The length of anticipated branches	
		Average, cm	Summed, cm/tree
Red Velox variety			
V ₁	-	-	-
V ₂	5.0	52.4	262
LSD 0.05	-	-	-
Golden Reinders variety			
V ₁	1.8	56.0	101
V ₂	8.0	46.9	375
LSD 0.05	0.28	2.6	12.4
Gala Buckeye variety			
V ₁	2.8	45.1	126
V ₂	10.0	42.5	425
LSD 0.05	0.34	2.1	13.7
Red Jonaprince variety			
V ₁	3.3	49.4	153
V ₂	12.0	45.3	544
LSD 0.05	0.45	2.6	17.9

The number of anticipated branches, their average and summed length, is influenced by the biological particularities of the variety and the method of crown

formation. In the control version, in the Red Velox variety, no lateral shoots were obtained in the crowning area (tab. 3). In the case of variant V_2 , when apart from a single break of the apical leaves there were also two treatments with the growth regulator Gerba 4LG, the number of branches in the area of crown formation constituted 5.0 pcs/tree.

In the trees of the Golden Reinders variety, the number of branches obtained was increasing, constituting on the study variants 1.8-8.0 pcs/tree. At the variety Gala Buckeye and Red Jonaprince, the number of anticipatory branches constituted respectively 2.8 - 10.0 and 3.3 - 12.0 pcs/tree.

The smaller average length of the anticipated branches was obtained at Gala Buckeye variety (42.5-45.1 cm). Further, the Red Jonaprince variety (44.0 - 49.4 cm), the Red Velox variety (52.4 cm) and the Golden Reinders variety (46.9 - 56.0 cm) are growing.

The topping of the apical leaves plus the treatment with the growth regulator Gerba 4LG in the dose 25 ml/liter of water increased the total length of the annual branches depending on the variety from 262 cm to 544 cm in the tree.

Analyzing the yield of trees in terms of the biological particularities of the variety we recorded, that during the researches mentioned index ranged from 32.4 thousand pcs/ha to 33.1 thousand pcs/ha. This insignificant difference is also argued by statistical values (tab. 4).

Table 4

The yield and quality of apple trees obtained by various methods of crown formation

The crown formation	Yield, thousands pcs/ha	Product quality, %	
		I	II
Red Velox variety			
V_1	32.8	-	100.0
V_2	32.6	89.7	10.3
LSD 0.05	1.51	-	-
Golden Reinders variety			
V_1	32.4	8.7	91.7
V_2	32.5	91.3	8.7
LSD 0.05	1.49	-	-
Gala Buckeye variety			
V_1	33.0	16.4	83.6
V_2	33.1	90.7	9.3
LSD 0.05	1.54	-	-
Red Jonaprince variety			
V_1	32.5	18.7	81.3
V_2	32.6	93.7	6.3
LSD 0.05	1.52	-	-

The lowest share of quality seeding material was registered in the Red Velox variety, and then the Golden Reinders variety, Gala Buckeye variety and Red Jonaprince variety are placed. Respectively, at the varieties under study in the

control variant or registered values of 0; 8.6; 16.4 and 18.7%. Following the application of augmentation techniques such as the degree of formation of the anticipated shoots to the varieties in question, the share of quality category I trees increases, to the disadvantage of quality category II trees.

The breaking of the apical leaves plus the treatment with the growth regulator Gerba 4LG in the dose 25 ml/liter of water increased the degree of branching, because in the case of growth it inhibits the formation of auxin and increases the degree of emission of the anticipated shoots. Basically in the respective variant at Gala Buckeye and Red Jonaprince varieties, the share of quality category I trees, constituted correspondingly 90.7% and 93.7%, and those of category II quality 9.3% and 6.3% . Within the varieties Red Velox and Golden Reinders there were no major deviations in the quality of the trees.

The biological particularities of the variety and the way the crown is formed has a direct tangency with the processes of plant development, which ultimately affects the quality of the trees obtained in field II of the fruit nursery.

CONCLUSIONS

1. The height of the graft growing in field II of the apple nursery is influenced by the biological particularities of the varieties and the way the crown is formed.

2. For a more uniform trimming in the crown formation area, the apical leaf break should be combined with two treatments with the Gerba 4LG growth regulator with a dose of 25 ml/liter of water 2 times.

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