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THE INFLUENCE OF GERBA 4LG ON BRANCHING OF ONE-YEAR-OLD APPLE NURSERY TREES

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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. Planting of rootstocks was carried out in the spring of 2015. To determine the influence of the variety and of different intervention techniques on the degree of emission of the anticipated shoots 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.

INTRODUCTION

The main characteristics of a modern apple plantation are: the implementation of state-of-the-art varieties and high-performance rootstocks, the use of branched planting material with high biological values, which, along with advanced technologies, ensure early entry of fruit trees and a high, constant productivity of qualitative fruits (Babuc et al. 2013, Cimpoieş 2012). If it is planned to form the crown from shoots anticipated on apple trees in the second field of the nursery, a decisive role is played by the hereditary ability of varieties to issue such shoots (Basak & Sozcek 1986, Peşteanu & Bostan 2019a). Topping of apical leaves and the spraying, in the nursery, of the apex of the trees during the vegetation period with various growth regulators increases the emission of the anticipated shoots and the differentiation of the fruit buds since the second field of the tree school of the fruit nurseries. These branches allow increasing the productivity from the first years after planting the trees in the orchard (Gastol et al. 2012, Hrotkó et al. 1996). The products used to form lateral shoots in the crown apple trees in many countries are: Promalin, Paturyl 10 WSC, Arbolin 36 SL, Arbolin Extra, Gerba 4LG etc. (Caglar & Ilgin 2009, Gastol et al. 2012, Peşteanu & Bostan 2019b, Wertheim & Estabrooks 1994). The aim of this study was to evaluate the behavior of four new apple varieties on the emission of the anticipated shoots at the base of the crown in trees in field II of the nursery, in the base of topping apical leaves in combination with spraying with Gerba 4LG growth regulator.

MATERIAL AND METHODS

The planting of rootstocks M 9 in the fruit nursery field I was carried out in the spring of 2015, in open wells with the help of the hydraulic drill. The grafting method used in field I of the nursery was chip budding. Planting distance - 80x35 cm. In order to determine the influence of the variety and of different intervention techniques on the degree of emission of the anticipated shoots, was organized an experience with the following gradation of factors:

Factor A - variety: A_1 - Golden Delicious Reinders (control); A_2 - Red Velox; A_3 - Gala Buckeye; A_4 - Red Jonaprince.

Factor V - the technique of crown formation in field II of the tree nursery: V_1 - free eyelid growth (control); V_2 - by topping the apical leaves in the apex area once when the oculus is 65-70 cm high, combined with the application of two treatments with the Gerba 4LG growth regulator (4.0% BA) at a dose of 25 ml/liter of water, per the upper part of the plant. The first application was made immediately after the topping of the apical leaves, and the second - at an interval of 5-7 days.

The research was carried out according to recommended methods for conducting field experiments in the orchard nursery. Each variant of the experiments included 4 repetitions of 20 plants. The main results obtained were statistically processed by the method of dispersive analysis.

RESULTS AND DISCUSSIONS

The smallest diameter in the rootstock area was recorded for the Red Velox variety - 14.4 mm, while for the Golden Reinders, Gala Buckeye and Red Jonaprince varieties the index in question was higher and ranged from 16.0 mm to 16.6 mm (tab. 1).

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

Studying the development of the trunk diameter below the first branch of the crown, we notice that, in the control variant, higher values were registered for the Golden Reinders variety - 14.7 mm, then, decreasing, the Gala Buckeye varieties were placed - 13,1 mm and Red Jonaprince - 12.6 mm. The Red Velox variety did not form early branches in the control variant.

Interventions performed on the apex also influenced the subsequent development of apple trees. The highest values of the average diameter below the first branch of the crown were recorded in the version where the apical leaves were topping and the Gerba 4LG growth regulator was applied at a dose of 25 ml/liter of water - from 13.1 mm to 17.0 mm. In the given variant, lower values of the index under study were registered for the Red Velox variety - 13.1 mm, and higher for the Golden Reinders variety - 17.0 mm. Gala Buckeye and Red Jonaprince varieties recorded average values of 15.7 mm and 15.0 mm, respectively.

Table 1

The diameter in different areas of the tree according to the biological peculiarities of the variety and the method of crown formation, mm

Crown type	In the rootstock area	Under the crown	Above the last branch of the crown
Golden Reinders variety (c)			
V_1(c)	16.2	14.7	12.6

V_2	18.6	17.0	10.8
Red Velox variety			
V_1(c)	14.4	-	-
V_2	16.7	13.1	9.1
Gala Buckeye variety			
V_1(c)	16.0	13.1	11.8
V_2	18.0	15.7	10.9
Red Jonaprince variety			
V_1(c)	16.6	12.6	11.4
V_2	17.5	15.0	8.7

Lower values of the index under study on various areas of the tree were recorded in the case of intervention above the last branch of the crown, the results being in direct correlation with the biological characteristics of the variety. Lower values were recorded for the Red Jonaprince variety 8.7 - 11.4 mm, for the Gala Buckeye variety 10.9-11.8 mm, and for the Golden Reinders - 10.8-12.9 mm.

For the Red Velox variety, in the control variant, no measurements were made on the diameter of the shaft because no anticipated shoots were formed in this case. Higher values of the diameter of the central axis above the crowning area were recorded in the variant with topping the apical leaves and the treatment with the Gerba 4LG growth regulator was applied. The difference between the lower and upper diameter of the crown area was 6.2 mm for the Golden Reinders variety, 4.8 mm for the Gala Buckeye variety, 6.3 mm for the Red Jonaprince variety and 4.0 mm for the Red Velox variety.

The data obtained regarding the height of the trees show that the index in question is influenced by the biological peculiarities of the variety. In the control variant, lower values of tree height were recorded for the Red Velox variety - 149 cm. Next, in growth, there is the Golden Reinders variety - 169 cm, the Red Jonaprince variety - 172 cm and the Gala Buckeye variety - 184 cm (tab. 2).

Apart from the biological peculiarities of the variety, the height of the trees also depends on the way of intervening on their formation. In all the varieties studied, the highest height of the trees was recorded in the control variant, where it varied from 149 cm to 184 cm.

In variant V_2, where the apical leaves were broken plus the treatment with the growth regulator Gerba 4LG in a dose of 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. A larger difference was found in the Gala Buckeye variety, which is characterized by a higher growth force.

In all the varieties that formed lateral branches in the control variant (Golden Reinders, Gala Buckeye, Red Jonaprince), the height of the trunk in the nursery did not undergo essential changes and varied from 58 to 59 cm. In the version with topping of the apical leaves plus the treatment with the Gerba 4LG growth regulator in a dose of 25 ml/liter of water, the first branches at the bottom for the Golden Reinders, Red Velox and Gala Buckeye varieties start at a height of 55 cm, and for the Red Jonaprince variety - from 60 cm.

Table 2

The crown structure by height according to the method used for its formation, cm

Crown type	The tree height	The trunck height	The length of the crown formation area	The length of the arrow
Golden Reinders variety (c)				
V_1(c)	169	59	6	104
V_2	150	55	26	69
LDS 0,05	6.9	2.6	0.43	2.8
Red Velox variety				
V_1(c)	149	-	-	149
V_2	135	55	13	67
LDS 0,05	5.7	-	-	3.1
Gala Buckeye variety				
V_1(c)	184	58	10	116
V_2	150	55	29	75
LDS 0,05	7.2	2.7	0.46	3.7
Red Jonaprince variety				
V_1(c)	172	59	13	100
V_2	151	60	37	54
LDS 0,05	6.5	2.9	0.56	2.9

An obvious legitimacy on the influence of the method of crown formation was registered within the length of the crown formation area. Lower values of this area were observed in the control variant, where the index under study in the varieties Golden Reinders, Gala Buckeye and Red Jonaprince was 6-13 cm. These values depended directly on the degree of emission of the anticipated shoots of the studied varieties.

In the case of the variant with the breaking of the apical leaves plus the treatment with the Gerba 4LG growth regulator in a dose of 25 ml/liter of water, the studied index increased significantly, constituting 13 cm for the Red Velox variety, 26 cm for the Golden Reinders variety, 29 cm for the Gala Buckeye variety and 37 cm for the Red Jonaprince variety.

The longest arrow length was recorded in the control variant. Higher values of this index were obtained for the Red Velox variety - 149 cm and for the Gala Buckeye variety - 116 cm. For the Red Jonaprince and Golden Reinders varieties, the given index was 100 cm and 104 cm, respectively.

The lowest values for the arrow length were recorded in the second variant, where topping the apical leaves and treated with the Gerba 4LG growth regulator. Here, the given index was 54 cm for the Red Jonaprince variety, 67 cm for the Red Velox variety, 69 cm for the Golden Reinders variety and 76 cm for the Gala Buckeye variety.

Like in the case of the other indices studied, the number of anticipated branches and their average and total length depend on the biological peculiarities of the variety and on the method of crown formation. In the control variant, no side shoots were obtained in the Red Velox variety in the crowning area (tab. 3). In the case of the second variant, the number of branches in the area of crown formation was 5.0 pcs/tree.

Table 3

The number of anticipated branches, their average and total length within the crown of apple trees in field II of the nursery according to the method of crown formation

Crown type	The number of anticipated branches, pcs/tree	The length of anticipated branches	
		Average, cm	Total , cm/tree
Golden Reinders variety (c)			
V_1(c)	1.8	56.0	101
V_2	8.0	46.9	375
LDS 0,05	0.28	2.6	12.4
Red Velox variety			
V_1(c)	-	-	-
V_2	5.0	52.4	262
LDS 0,05	-	-	-
Gala Buckeye variety			
V_1(c)	2.8	45.1	126
V_2	10.0	42.5	425
LDS 0,05	0.34	2.1	13.7
Red Jonaprince variety			
V_1(c)	3.3	49.4	153
V_2	12.0	45.3	544
LDS 0,05	0.45	2.6	17.9

In the trees of the Golden Reinders variety, the number of branches obtained was increasing compared to the Red Velox variety, constituting, on the variants under study, 1.8-8.0 pcs/tree. A smaller number of anticipated branches of this variety were recorded in the control variant, where no intervention was performed with the occultant - 1.8 pcs/tree. When the graft was topping the apical leaves and spraying the area with the Gerba 4LG growth regulator, the number of anticipated branches in the tree crown formation area increased to 8.0 pcs/tree.

In the Gala Buckeye and Red Jonaprince varieties, the number of anticipated branches obtained in the crown formation area increased compared to the previous varieties and amounted to 2.8-10.0 and 3.3-12.0 pcs/tree, respectively. A higher number of anticipated branches for the given varieties were registered in the second variant - 10-12 pcs/tree.

A shorter average length of the anticipated branches was obtained for the Gala Buckeye variety (42.5-45.1 cm). Next, 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.

Higher values of the average length of annual branches were recorded in the control variant (45.1-56.0 cm), where the number of anticipated branches was lower. In the variant which the topping of apical leaves and the treatment with the Gerba 4LG growth regulator, a decrease of the index in the study was registered by 5.8-6.5%.

In the Red Velox variety, no lateral branches were formed in the control variant. For trees of the Golden Reinders variety, the total length of the anticipated annual branches was 101 cm, for those of the Gala Buckeye variety - 126 cm, and for trees of the Red Jonaprince variety - 164 cm.

The picking of apical leaves plus treatment with Gerba 4LG growth regulator

at a dose of 25 ml/liter of water increased the total length of annual branches from 262 cm to 544 cm per tree, depending on the variety.

CONCLUSIONS

A more favorable balance between the growth indexes of the trees and the way the crown base is formed in field II of the nursery was registered in the variant where the apical leaves were topping only once and the Gerba 4LG growth regulator was applied.

For a more uniform garnish in the area of crown formation, it is recommended to break the apical leaves in combination with the double application of the product Gerba 4LG with a dose of 25 ml/liter of water. The first treatment was done after topping the apical leaves and the next at 5-7 days.

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