

THE INFLUENCE OF THE ROOTSTOCK AND CERTAIN TECHNOLOGICAL ELEMENTS ON THE PRODUCTION OF BRANCHED APPLE TREES MATERIAL

INFLUENȚA PORTALTOIULUI ȘI UNOR ELEMENTE TEHNOLOGICE LA PRODUCEREA MATERIALULUI SĂDITOR DE MĂR RAMIFICAT

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Abstract. The object of the research was apple trees of the Gold Chief Gold Pink variety, grafted onto M26 and G202 rootstocks. The grafting method in field I was Chip beading grafting, with a planting distance of 80x35 cm. To intensify the formation of anticipated shoots, various technological procedures were used: V1. Free growth of tree (c); V2. Breaking of apical leaves + Treatment with Gerba 4 LG, 30 ml/l water; V3. Treatment with Gerba 4 LG, 30 + 30 ml/l water; V4. Breaking of apical leaves + Treatment with Progerbalin LG, 30 ml/l water; V5. Treatment with Progerbalin LG, 30 + 30 ml/l water. It was established that the trees on the G202 rootstock had greater development than those on the M26 biotype. On both rootstocks, a higher degree of branching was obtained in the variants treated with Progerbalin (11-14 pieces) compared to Gerba 4LG (7-12 pieces). A higher number of branches on the M26 rootstock was obtained in variant V4 (12 pcs.), and on the G202 biotype in variant V5 (14 pcs.).

Key words: Apple, rootstock, growth regulator, branches.

Rezumat. Obiect al cercetărilor au fost pomii de măr din soiul Gold Chief Gold Pink, altoiți pe portaltoaiile M26 și G202. Metoda de altoire în câmpul I a fost ocularea în placaj, iar distanța de plantare 80x35 cm. Pentru intensificarea gradului de formare a lăstarilor anticipați sa intervenit cu diverse procedee tehnologice: V1. Creștere liberă a pomului (m); V2. Ruperea frunzelor apicale + tratarea cu Gerba 4 LG, 30 ml/l apă; V3. Tratarea cu Gerba 4 LG, 30 + 30 ml/l apă; V4. Ruperea frunzelor apicale + Tratarea cu Progerbalin LG, 30 ml/l apă; V5. Tratarea cu Progerbalin LG, 30 + 30 ml/l apă. S-a stabilit că pomii pe portaltoiul G202 au avut dezvoltare mai mare ca cei de pe biotipul M26. Pe ambele portaltoaii, grad mai mare de ramificare s-a obținut în cadrul variantelor tratate cu produsul Progerbalin (11-14 buc.) comparativ cu Gerba 4LG (7-12 buc.). Număr mai mare de ramuri în cadrul portaltoiului M26 s-a obținut în varianta V4 (12 buc.), iar pe biotipul G202 în varianta V5 (14 buc.).

Cuvinte cheie: Măr, portaltoi, regulator de creștere, ramuri.

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INTRODUCTION

The change in the apple market requires fruit producers to replace orchards with an outdated assortment with new intensive plantations, rootstocks of low and sub-average vigour, promising varieties, with early entry into fruiting, harvests of 50-60 t/ha and quality requested by consumers [Peșteanu, 2024].

The production of apple planting material must focus on implementing technologies that allow the tree canopy to be shaped in the nursery from anticipated shoots so that, after planting in the orchard, it can be garnished with a fruiting microstructure [Babuc et al., 2013; Peșteanu, 2020; Peșteanu, 2024].

Currently, apple tree producers, in order to form anticipated shoots in the crown formation area, use various technical methods such as: breaking the apical leaves, pinching the herbaceous tip of the oculant or spraying the apex with growth regulators [Gaberi et al., 2022; Gastol et al., 2012; Peșteanu and Bostan, 2019].

At the moment, the most used by apple tree producers is the product Promalin [Peșteanu and Bostan, 2019]. Also, other growth regulators such as: Arbolin 36 SL, Arbolin Extra, Gerba 4LG, Paturyl 10 WSC, Progerbalin, LG, etc. have a positive effect on obtaining lateral branches during crown formation in apple trees [Caglar and Ilgin, 2009, Gaberi et al., 2022; Gastol et al., 2012; Peșteanu and Bostan, 2019].

In order to study the degree of emission of anticipated shoots in the crown formation area of apple trees in field II of the fruit nursery, it was proposed to use various techniques of influence on the apex of the trees, such as breaking the apical leaves and treating with the products Gerba 4LG and Progerbalin, LG.

MATERIAL AND METHOD

The research was conducted in the period 2021-2022 in the fruit nursery of the enterprise SRL "Vitis Cojușna". The object of research was the apple trees of the Gold Chief Gold Pink variety, grafted on the M26 and G202 rootstocks.

The planting of the rootstocks in field I was carried out in the spring of 2021, in mechanized open trenches. The rootstock was of the certified biological category, virus-free and imported from the Netherlands. The grafting method used in field I of the tree nursery was the chip budding. Planting distance 80x35 cm.

In order to establish the reaction of the variety/rootstock association to different intervention techniques on the tree apex to increase the degree of emission of anticipated shoots in field II of the tree nursery, the following variants were studied:

- V1. Free growth of the tree (m);
- V2. Breaking of apical leaves + Treatment with Gerba 4 LG, 30 ml/l water;
- V3. Treatment with Gerba 4 LG, 30 + 30 ml/l water;
- V4 Breaking of apical leaves + Treatment with Progerbalin LG, 30 ml/l water;
- V5. Treatment with Progerbalin LG, 30 + 30 ml/l water.

Breaking of apical leaves in the apex area (V2 and V4) was performed only once when the height of the plant was 65-70 cm. The first treatment with the growth regulator Gerba 4LG (V3) and Progerbalin LG (V5), at a dose of 30 ml/l water, on the top part of the plant was performed when the height of the plant was 65-70 cm. The next action on the apex area of the trees in the studied variants was carried out with the growth regulator Gerba 4LG (V2, V3) and Progerbalin LG (V4, V5), at a dose of 30 ml/liter of

water at an interval of 5-7 days from the first intervention.

The treatment was carried out using a sprayer.

The research was carried out according to the methods recommended for conducting experiments in field conditions in the fruit nursery. Each variant of the experiments included 4 repetitions of 20 plants in repetition.

The height of the trees, as well as the trunk, the length of the crown formation area and the extension shoot were measured in 10 evidence trees from each repetition at the end of the vegetation period.

The number and average length of annual branches were determined by the measurement method performed on all evidence trees at the end of the vegetation period.

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

RESULTS AND DISCUSSIONS

The development of apple trees in the second field of the nursery has a vast importance on the quality of the obtained planting material, as well as its behaviour after planting in the orchard.

The rootstock biotype influenced the indices taken into study, lower values being recorded in the rootstock M26 compared to the biotype G202, deviation being recorded only in the trunk height (tab.1).

Table 1

Crown structure by height of apple trees of the Gold Chief Gold Pink variety in field II of the nursery depending on the rootstock biotype and crown formation method, cm

Crown formation method	Tree height	Trunk height	Length of the crown formation area	Arrow length
M26 rootstock				
V-1 (m)	175	58	15	102
V-2	160	52	28	80
V-3	158	53	25	80
V-4	142	50	32	60
V-5	147	52	35	60
LDS 5%	5,6	2,5	1,0	2,6
G202 rootstock				
V-1 (m)	181	41	40	100
V-2	174	39	45	90
V-3	185	39	50	96
V-4	179	41	50	88
V-5	182	41	49	92
LDS 5%	6,8	1,9	1,6	3,2

If, within the variants studied, the height of trees on the M26 rootstock was 142-175 cm, the trunk 50-58 cm, the length of the crown formation zone 15-35 cm and the length of the arrow 60-102 cm. Then, the previously mentioned indicators on the G202 biotype were 174-185 cm, 39-41 cm, 40-50 cm and, respectively, 88-

100 cm.

The method of crown formation in trees grafted on the M26 rootstock had a greater interaction compared to the control variant, decreasing their height by 8.6-18.9%, and in the G202 biotype similar results were recorded as in the control variant, or insignificantly lower.

The trees on the M26 rootstock had a taller trunk in the control variant (58 cm), and in the case of the G202 biotype, no obvious gap was recorded.

A longer crown zone was recorded in trees on the M26 rootstock in variants V4 and V5 (32 and 35 cm), while for the G202 biotype, it was recorded in variants V3, V4, and V5 (50, 50, and 49 cm). This increase in crown zone length within the G202 biotype is explained by the higher degree of anticipated shoot formation and 10–12% greater vigour compared to the M26 rootstock.

A longer arrow length was recorded in the control variant on both rootstocks. While the average shoot length in the control treatment was 102 cm for the M26 rootstock, in the other variants where intervention was performed to shape the tree canopy, it ranged from 60 to 80 cm. The same trend, though with a smaller difference, was also observed in the G202 rootstock.

A higher number of early branches on trees of the Gold Chief Gold Pink variety in field II of the nursery was obtained in the G202 rootstock (7–14 per tree), compared to the M26 rootstock (3–12 per tree) (Tab. 2).

Table 2

Number of branches in the crown area, average and total length, their diameter, insertion angle in apple trees of the Gold Chief Gold Pink variety in field II of the nursery depending on the rootstock biotype and crown formation method, pcs/tree

Crown formation method	Number of branches, pcs/tree	Branch length		Average diameter of branches, mm	Insertion angle, °
		Average, cm	Total, m/tree		
M26 rootstock					
V-1 (m)	3	39.1	1.17	6.7	67.5
V-2	9	29.1	2.62	6.1	87.8
V-3	7	31.5	2.20	6.0	85.4
V-4	12	24.7	2.79	6.0	80.0
V-5	11	27.7	2.99	6.0	76.8
G202 rootstock					
V-1 (m)	7	15.4	1.08	5.8	78.5
V-2	9	24.0	2.15	5.8	90.0
V-3	10	22.8	2.28	5.6	82.0
V-4	12	28.2	3.38	5.4	83.5
V-5	14	28.8	4.03	5.9	75.7

A lower number of branches in the crown formation area was recorded in the control variant (3 pcs/tree). Depending on the crown formation method, within the M26 rootstock, higher values were recorded in the V4 (12 pcs/tree) and V5 (11 pcs/tree) variants. In the V2 and V3 variants, the studied index recorded average

values between the control variant and the V4 and V5 variants, constituting 9 and, respectively, 7 pcs/tree.

In the case of the G202 biotype, the number of lateral branches formed in the crown formation area in the control variant constituted 7 pcs/tree, 2.3 times higher than within the M26 biotype. Higher values of the studied index were recorded in the V4 (12 pcs/tree) and V5 (14 pcs/tree) variants, and in the V2 and V3 variants, they were average, constituting 9 and, respectively, 10 pcs/tree.

The length of anticipated branches produced in the crown formation area was directly correlated with their number obtained in field II of the nursery, the rootstock biotype and the crown formation method. A higher average length of anticipated branches was obtained in the control variant, the M26 rootstock (39.1 cm), compared to the G202 biotype (25.4 cm).

The intervention on the tree apex by different methods had different effects on the studied index, being correlated with the biotype of the rootstock and the number of branches formed in the crowning area. In the case of the M26 biotype, higher values of the studied index were recorded in variants V2 (29.1 cm) and V3 (31.5 cm) compared to variants V4 and V5, where it was 24.7 and, respectively, 27.7 cm.

In the case of the G202 biotype, an inverse pattern is observed compared to the M26 rootstock. Variants V2 and V3 recorded lower values (24.0 and, respectively, 22.8 cm), compared to variants V4 (28.2 cm) and V5 (28.8 cm).

The total length of the anticipated branches is directly correlated with their number and average length. If, in the case of the M26 rootstock, the variants where interventions were performed on the tree apex, the total length of annual branches ranged from 2.20 to 2.99 m/tree, then within the G202 biotype, the gap between the variants was much greater (2.15-4.03 m/tree). Higher values in the case of the M26 rootstock and the G202 biotype were obtained in the variants of treatment with Gerba 4 LG, 30 + 30 ml/l water (2.99 m/tree) and treatment with Progerbalin LG, 30 + 30 ml/l water (4.03 m/tree).

The average diameter of the anticipated branches in the area of insertion with the central axis within the M26 rootstock, on all variants studied, was insignificantly larger (6.0-6.7 mm) compared to the G202 biotype (5.4-5.9 mm). A larger average diameter of the anticipated branches was recorded within the M26 rootstock, the control variant (6.7 mm), where the number of branches in the crown formation area was the smallest (3 pcs/tree).

The insertion angle plays an important role in the garnishing of the anticipated branches obtained in field II of the nursery with a fruitful microstructure in the first year after planting in the orchard and in obtaining fruits as early as possible. A smaller insertion angle within both rootstock biotypes was obtained in the control variant, constituting 67.5° (M26) and 78.5° (G202).

Depending on the number of anticipated branches formed in apple trees on the axis in field II of the nursery, the insertion angle has different values and varies in the M26 biotype from 76.8° in variant V5, to 87.8° in variant V2. Variants V3

and V4 recorded average values, constituting 85.7⁰ and, respectively, 80.0⁰.

Within the G202 rootstock, the previously exposed law for the M26 biotype is valid. A higher insertion angle for the given biotype was recorded in the trees in variant 2 (90.0⁰). In variants V3 and V4, the studied index a recorded average values, constituting 82.0⁰ and, respectively, 83.5⁰. This insertion angle is considered the optimal value within the crown of apple trees to maintain that physiological balance between growth and fruiting.

CONCLUSIONS

The rootstock biotype and the intervention on the tree apex by different methods to obtain anticipated lateral branches in the crown formation area had different effects on the studied indicators.

Higher values of the number of branches in the crown formation area and the length of annual growths in the case of both rootstocks were obtained in variants V4, breaking the apical leaves + treatment with Progerbalin LG, 30 ml/l water and variant V5, treatment with the growth regulator Progerbalin LG in two doses 30 + 30 ml/l water. The first intervention to be performed when the trees are 65-70 cm tall, and the second 5-7 days after the previous one.

The insertion angle of anticipated branches in apple trees changes under the influence of the rootstock biotype and the method of intervention on the apex of the extension shoot.

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