

INFLUENCE OF ROOTSTOCK ON GROWTH AND DEVELOPMENT OF IDARED AND GALA MUST VARIETIES OF TREES IN THE NURSERY

INFLUENȚA PORTALTOIULUI ASUPRA CREȘTERII ȘI DEZVOLTĂRII POMILOR SOIURILOR IDARED ȘI GALA MUST ÎN PEPINIERĂ

PEȘTEANU A., GUDUMAC E., BOSTAN M.

State Agrarian University of Moldova,
Chisinau, Republic of Moldova

Abstract. *Investigations were conducted in 2008-2009 in Nursery Fruit Company „Codru-ST” Ltd., which is located in the centre of Moldova. As biological material were used apple varieties Idared and Gala Must and were bench-grafted on rootstocks M 9, 62-396, M 26, M 7 and MM 106. Planting distance was 90x35 cm. On the basis of the research made it was found that growth and development of apple trees in the first field and the second field of the nursery varies according to variety-rootstock combination and the evidence obtained corresponds to the current standard of the Republic of Moldova.*

Key words: fruit nursery, apple varieties, rootstock, variety-rootstock combination, bench-graft, planting material

Rezumat. *Cercetările au fost efectuate în anii 2008-2009 în pepiniera pomicolă a companiei SRL „Codru-ST”, ce este amplasată în zona de centru a Republicii Moldova. Ca material biologic au fost folosite soiurile de măr: Idared și Gala Must altoite la masă pe portaltoi M 9, 62-396, M 26, M 7 și MM 106. Distanța de plantare a fost 90x35 cm. În baza cercetărilor efectuate s-a constatat că creșterea și dezvoltarea pomilor de măr în câmpul întâi și doi al pepinierii variază în funcție de combinația soi-portaltoi și indicii obținuți corespund standardului în vigoare al Republicii Moldova.*

Cuvinte cheie: pepinieră pomicolă, soiuri de măr, portaltoi, combinații soi-portaltoi, altoiri la masă, material săditor

INTRODUCTION

One of the main apple crop increased, including the Republic of Moldova, is the establishment and efficacious exploitation of intensive and superintensive orchards, used the grafted trees by small and medium vigor rootstocks led by well-structured system of crown, which can ensure the early economical fructification once two-three year after planting in the orchards (Babuc V., Rapcea M., 2002).

Two-year-old trees with one-year-old crowns are perfectly suited to the needs of modern 21st century fruit production because they start bearing early and produce higher yields, especially in the first two years after planting (Gudumac E., Peșteanu A., Gudumac Olga, 2007; Mika A., Buler Z. and Krawiec A., 2003; Bielicki P., Czynczyk A., 1999).

Of recent research (Gudumac E., 2008), on crown structure in second field of the nursery (of apple trees grafted by M 9 rootstock) was elaborated a mixed method which consists in the formation of base of crown by four normal (grown from last year buds), well-developed longer than 60 cm branches, and to the shoot axis extension two-three early branches obtained of early buds.

It is very important number, distribution uniformity and length of the shoots on the central axis bazitonic strict compliance with the principle, which are largely determined by biological features of varieties.

Varieties grafted on different rootstocks show major changes to growth vigor, to ability of sprout issue, including the sylleptic shoots, to economical fructification etc., which determine the habitus of trees. For these requirements it is necessary to develop and practice the formation methods of the crown, suitable with features of variety-rootstock associations, beginning in the nursery where are the formation of tree crown bases.

MATERIAL AND METHOD

The research was carried out during 2008-2009 in the fruit nursery of company „Codru-ST” Ltd., which is located in the central area of Moldova. As biological material were used the apple varieties: Idared (control) - homologated variety in Republic of Moldova and Gala Must – perspective variety, the bench-grafted rootstocks M 9, 62-396, M 26, M 7 and MM 106.

The bench grafting was performed in March, using the perfected copulation method with detached branch. Grafting site was tied with porous polyethylene tape designed specifically for graft and graft was paraffined. The grafted marcotes were stratified by placing them upright in containers, so that the basal layers (20-25 cm) to be placed in a layer of wet sand. The stratification temperature in the refrigerator was

+2...+4°C. To produce grafted trees were used well-developed layers of 10 mm diameter and graft branches with higher biological values.

The first field of tree nursery was established in the second half of April, with bench grafts. Distance of planting grafted plants was 90x35 cm. The aerial part was palisated on a stick of bamboo.

In the second field of nursery, early spring annual stems have been shortened to a height of 75-80 cm above the grafting site. During the vegetation was carried trunk release, being left only 4-5 shoots to form the crown base. To obtain sylleptic shoots on the central axle, when they reached the length of 15-20 cm, it was made the remove of apical leaves without hurting the point of growth. This operation is repeated every 5-7 days for 5-6 times. To stimulate the strong development of shoots are made more frequent irrigation and fertilization based on macro-and micronutrients.

The usual black soil, the content of humus is 2,6%, that is maintained as cultivated field, irrigation is made by sprinkling keeping the soil wet at 75-80% from the capacity of field.

The aim of the investigations is to determine the influence of rootstock on the degree of attachment, growth and development of apple trees, obtained by bench grafting of fruit growing nursery.

The number of repetition in each variant is four. The number of trees in each repetition is 20. The researches were made in field and laboratory conditions according to the required methods for doing experiments with fruit growing plants. The main results obtained were statistically processed.

RESULTS AND DISCUSSIONS

In the investigations it was found that attachment, growth and development of apple trees in the nursery first and second field depend on fruit variety-rootstock combination.

The degree of striking and growth starting of the bench-grafted plants and planted in the first field (fig. 1), is between the limits: 95,6-97,5% at Idared variety and 96,9-99,2% at Gala Must variety. Depending on the rootstocks studied, the highest values of this index were recorded for the Gala Must and Idared varieties were grafted on rootstock MM 106.

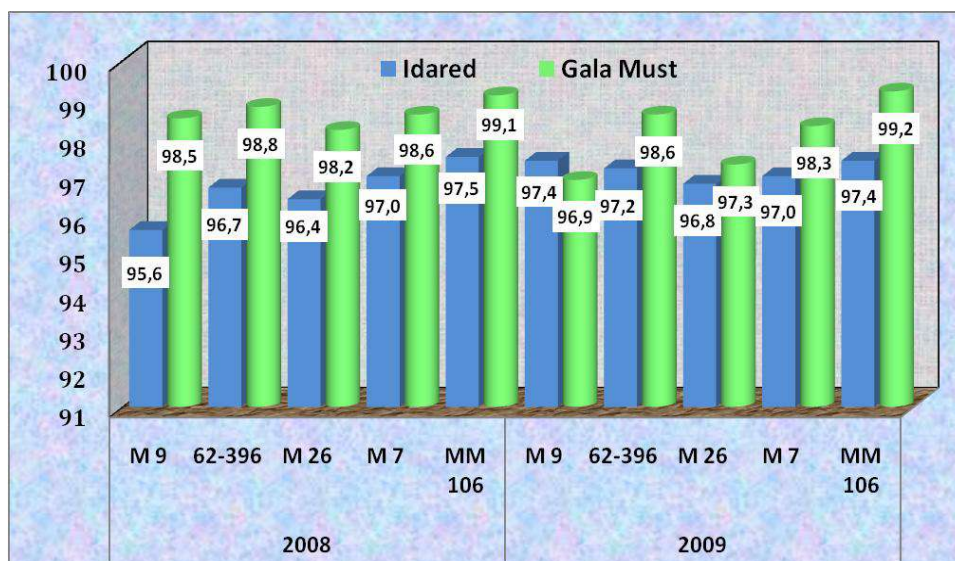


Fig. 1. The degree of striking bench graftings planted in the second field of the fruit nursery, %.

At the end of the first season, the highest values of graft height (tab. 1) were recorded in both years Gala Must varieties grafted on MM 106 rootstock, which has a medium force of growth and is 125-135 cm. At the Idared variety, the highest value of this index was recorded at the same event is 116-124 cm. With decreasing growth vigor of rootstocks studied, there is a decrease in the value of this index and is 109-111 cm at the Idared variety grafted on the rootstock M 9, respectively, 114-124 cm at the Gala Must variety grafted on the same rootstock. The graft diameter at 10 cm above the grafting site in the years 2008-2009, which are affected by increasing the vigor of the variety-rootstock combination was within 8,6 mm and 10,2 mm. Leaf area ranging from 0,21 m²/tree to 0,35 m²/tree according to growth vigor rootstock which has been used in the grafting.

At the end of the second growing season in nursery fruit growing (tab. 2) the height of apple trees is essentially influenced by variety-rootstock combination and is within the limits of 170,00-193,75 cm. The Idared variety

highest value of this index has been used for rootstock M 7, and the Gala Must variety – grafted on MM 106 rootstock of average vigor of growth. The lowest height of trees was in combination Idared/62-396 (182,50 cm) and Gala Must/M9 (170.00 cm).

Table 1

The main indicators of apple trees in the first field of the nursery depending on variety-rootstock combination

Rootstock	Varieties					
	Idared			Gala Must		
	graft height, cm	graft diameter,* mm	leaf surface, m ² /tree	graft height, cm	graft diameter,* mm	leaf surface, m ² /tree
2008 year						
M 9	111	8,6	0,23	124	8,9	0,27
62-396	115	8,7	0,26	126	9,0	0,30
M 26	117	8,9	0,27	128	9,6	0,28
M 7	118	9,0	0,27	131	10,0	0,30
MM 106	124	10,0	0,30	135	10,2	0,35
<i>DI_{0.05}</i>	2,86	-	0,04	1,98	-	0,03
2009 year						
M 9	109	8,7	0,21	114	9,4	0,21
62-396	114	8,8	0,23	116	9,8	0,25
M 26	114	9,2	0,24	117	9,8	0,27
M 7	115	9,5	0,25	120	10,0	0,28
MM 106	116	9,7	0,26	125	10,1	0,29
<i>DI_{0.05}</i>	3,01	-	0,03	2,75	-	0,03

*- 10 cm above the grafting site

Trunk diameter is an indicator that directly affects the establishment of quality nursery trees of the carried investigations out with different variety-rootstock combinations that index was 15,00-16,33 mm.

Table 2

The height, trunk diameter and leaf surface of apple trees in the second nursery field depending on the combination of fruit variety-rootstock

Rootstock	Varieties					
	Idared			Gala Must		
	tree height, cm	trunk diameter,* mm	leaf surface, m ² /tree	tree height, cm	trunk diameter,* mm	leaf surface, m ² /tree
M 9	186,25	15,50	0,71	170,00	15,00	0,82
62-396	182,50	15,68	0,81	176,50	16,33	0,83
M 26	190,00	16,33	0,89	191,25	15,65	0,92
M 7	192,00	16,30	0,81	186,25	16,33	0,94
MM 106	190,25	16,25	0,84	193,75	16,25	1,00
<i>DI_{0.05}</i>	4,77	-	0,04	4,32	-	0,04

*- 10 cm above the grafting site

Apple tree leaf surface is majored concomitantly with the increase of rootstock vigor of growth, from 0,71-0,82 m²/tree in the case when the varieties taken into the study were grafted on M 9 to 0,89 m²/tree in combination Idared/M 26 and, respectively, 1,00 m²/tree in the variant Gala Must/MM 106, or with 18-22%.

The number of normal branches on the crown base of the apple trees varieties taken into the study in the second field of the fruit nursery (tab. 3), is between the limits of 3,75-4,50 pcs/tree.

The branches average length from the base of the crown depend on the biological peculiarities of the varieties and rootstocks taken into the study, and also their number, thus in the second field of the fruit nursery the values of this indicator is between the limits of 67,24-86,50 cm.

Table 3

Number of normal branches, formed at the base of the crown, and sylleptic ones on the extension shoots and their average length at the apple trees in the second field of the fruit nursery in dependence on the combination variety rootstock.

root -stock	Varieties							
	Idared				Gala Must			
	normal branches		sylleptic shoots		normal branches		sylleptic shoots	
	number, pcs/tree	average length, cm	number, pcs/tree	average length, cm	number, pcs/tree	average length, cm	number, pcs/tree	average length, cm
M 9	4,00	67,24	4,25	34,38	4,50	80,00	3,50	23,00
62-396	3,75	72,50	1,75	37,16	4,50	73,13	4,00	30,75
M 26	4,00	80,30	3,00	32,50	4,25	78,78	4,75	33,39
M 7	4,00	83,44	4,00	37,96	4,25	86,50	7,25	28,00
MM 106	4,00	75,94	5,25	31,49	4,50	82,94	7,50	31,98
<i>DI_{0,05}</i>	-	5,09	-	1,68	-	2,72	-	3,76

The number of sylleptic shoots formed from early buds on the extension shoot of the axle, at the varieties taken into the study, depends greatly on the variety's capacity to emit sylleptic shoots, and the vigor of growth of the variety-rootstock combination researched, registering at the variety control (Idared) 1,75-5,25 pcs/tree, with an average length between 31,49 cm and 37,96 cm. The variety Gala Must, considered as a perspective variety for the Republic of Moldova has formed a big number of sylleptic shoots (3,50-7,50 pcs/tree) with their average length of 23,00-33,39 cm. If to compare the value of this index at the rootstocks under the study, then we can observe that the greatest number of sylleptic shoots was formed by both the varieties under the study on rootstock MM 106, which manifest a greater vigor of growth in comparison with other rootstocks.

On the basis of the researches made and according to present standards of the Republic of Moldova (***, SM 155:2003), it was found that the apple trees obtained on different variety-rootstock combinations in the second field of the fruit nursery correspond to first category quality.

CONCLUSIONS

1. The degree of striking and starting to grow of the bench-graftings is very big, being between the limits of 95,6-99,2%;

2. To the end of vegetation period, in the first field of the nursery, at all the rootstocks taken into the study, the height of the bench-grafted apple trees with the varieties Idared and Gala Must constitute 109-135 cm, the diameter at 10 cm above the place of grafting is 8,6-10,2 mm and, respectively, the leaf surface is 0,21-0,35 m²/tree;

3. Bioconstructive parameters of apple trees in the second field of the fruit nursery registered values that correspond to 1st category of quality according to the present standards on: height, trunk diameter, number of branches, as well as their average length;

4. The biological peculiarities of the combination variety-rootstock investigated influence apple trees growth and development in the nursery. For the apple tree superintensive system is recommended to use grafted apple trees on rootstocks M 9, 62-396 and M 26, and for the intensive system – more suitable are the rootstocks M 7 and MM 106;

5. The investigations made demonstrate that superior values of apple trees in the first and second fields of the fruit nursery were registered at the variety of perspective Gala Must, whose vigor of growth and capacity to emit sylleptic shoots is greater in comparison with the Idared variety, homologated in the Republic of Moldova.

REFERENCES

1. Babuc V., Rapcea M., 2002 - *Renovarea pomiculturii în baza realizărilor științifice*. Buletinul AȘM, științe biologice, chimice și agricole, Chișinău, Nr. 2 (287), p. 72-75.
2. Bielicki P., Czynczyk A., 1999 - *Jeszcze o drzewkach z jednoroczną koroną*. Hasło Ogrodnicze., 9, p. 22-24.
3. Gudumac E., 2008 - *Optimizarea creșterii și structurării coroanei în pepinieră a pomilor de măr altoiți pe M 9*. Sub conducerea prof. univ. Babuc V. Teză de doctor în agricultură, Chișinău, 137 p.
4. Gudumac E., Peșteanu A., Gudumac Olga, 2007 - *Crowned apple tree development in the nursery and their behaviour in the orchard in the first two years after plantation*. Bulletin of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca. Horticulture. Volume 64 (1-2), p. 162-167.
5. Mika A., Buler Z. and Krawiec A., 2003 - *Effects of various methods of pruning apple trees after planting*. Journal of Fruit and Ornamental Plant Research, vol. 11, p.33-43.
6. ***, SM 155:2003 – *Material săditor pomicol. Pomi altoiți de specii sămânțoase și sămburoase*. Condiții tehnice. Standard moldovenesc, 15 p.