

THE ROOT SYSTEM DEVELOPMENT AND REPARTITION INTO THE SOIL OF APPLE TREES IN THE FRUIT NURSERY

DEZVOLTAREA ȘI REPARTIZAREA SISTEMULUI RADICULAR ÎN SOL LA POMII DE MĂR ÎN PEPINIERA POMICOLĂ

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Abstract. *In 2006 in the enterprise „Fruit Nurseries” were made studies on the root system development and repartition into the soil of the „knip-baum” apple trees in the first and second field of the nursery. As a object of study served the varieties Golden Reinders, Jonagored and Idared, bench grafted on M 9 rootstock. As a result of the investigations made, the root system development of the apple trees grown in the second field increased with 1,44 and 3,33, unlike the length and weight of the bench grafted roots in the first field of the fruit nursery. The greatest number of roots of the apple trees in the fruit nursery was distributed in 0-20 cm layer soil.*

Rezumat. *În anul 2006 în întreprinderea „Fruit Nurseries” au fost studiate dezvoltarea și repartizarea în sol a sistemului radicular la pomii de măr de tipul „knip-baum” în câmpul întâi și doi al pepinierei pomicole. Ca obiect de cercetare au servit soiurile Golden Reinders, Jonagored și Idared altoite la masă pe portaltoiul M 9. În urma investigațiilor efectuate, dezvoltarea sistemului radicular la pomii de măr în câmpul doi s-a majorat cu 1,44 și 3,33 ori față de lungimea și masa rădăcinilor altoirilor la masă în câmpul întâi al pepinierei. Cele mai multe rădăcini la pomii de măr în pepinieră au fost repartizate în stratul 0-20 cm de sol.*

The root system in the apple tree plantations was widely studied and it mustn't be excluded the fact that an early fructification depends on apple trees development in the fruit nursery, including the roots that were insufficiently studied (3, 6).

For agrotechnical systems elaboration and implementation of working and keeping the soil in good conditions in the fruit nursery, it is necessary to know about the root quantity and repartition in vertical and horizontal position in the soil layers (1, 2).

The rootstock vigor, the biological features of the soil, the type of soil and meteorological conditions in the period of vegetation, influence on the root system extension and repartition in the soil of apple trees from the fruit nursery (4).

Production of crowned apple trees according to “knip-baum” type reduces the technological cycle for one year; the crown is formed from sylleptic shoots, whose quantity and length depend on the biological features of the soil. This

crowning accelerated development leads to some modifications in the root system that require some additional investigations in order to obtain planting material for the technology improvement meant to obtain planting material that can produce fruits in the second year after plantation in the orchard.

MATERIAL AND METHOD

The investigations were made at the firm "Fruit Nurseries" and had as study the development and repartition in the soil of the root system of apple trees in the first and second field of the fruit nursery. The first field was planted with bench graftings, in the second field the trees were crowned according to "knip-baum" type. As object of study served Golden Delicious Reinders, Jonagored and Idared varieties, bench grafted on M 9 rootstock. The distance of plantation is 90x35 cm.

Root system development and repartition were studied according to the method of monolith and profile in vertical and horizontal position at the end of 2006. The size of monoliths is 20 cm; the thickness is to 40 cm depth and 22 cm width to the middle of the distance between rows.

RESULTS AND DISCUSSIONS

Our investigations didn't have the aim to study the constructions and functions of the apple tree roots, and they were more limited and directed to the root development and repartition into the soil, according to the hereditary capacities of the soil.

According to the varieties under the study, the root system development of the apple trees bench grafted at the end of the first period of vegetation, (table 1) in the first field of the fruit nursery is more emphasized at Jonagold variety with a super average growing vigour, where it was registered a length of 43,09 m/tree than 41,35 m/tree of Idared variety and 40,76 m/tree of Golden Reinders. Roots weight is greater for Idared variety apple trees (9,79 g/tree), that have less fibre roots than Jonagored variety apple trees.

Table 1

Root system development of apple trees in the first field of the fruit nursery, depending on the variety

Variety	Root weight, g/tree			Root length, m/tree		
	diameter		sum	diameter		sum
	< 3 mm	> 3 mm		< 3 mm	> 3 mm	
Golden Reinders	7,66	0,77	8,43	40,70	0,06	40,76
Jonagored	9,00	0,73	9,73	43,01	0,08	43,09
Idared	9,07	0,72	9,79	41,29	0,07	41,36

In the second field, at the end of the period of vegetation, root system development at "knip-baum" crowned apple trees (table 2), according to the varieties under the study, increased with 1,44 and 3,33 times than the root length and weight of bench graftings in the first field of the fruit nursery.

The maximum share of these main indicators was registered at the variety Jonagored, where their value increased with about 6-10% in comparison with Golden Reinders and 8-11% with Idared.

Table 2

**Root system development of apple trees in the second field of the fruit nursery,
depending on the variety**

Variety	Root weight, g/tree			Root length, m/tree		
	diameter		sum	diameter		sum
	< 3 mm	> 3 mm		< 3 mm	> 3 mm	
Golden Reinders	17,43	9,83	27,26	62,10	0,83	62,93
Jonagored	19,40	10,63	30,03	66,01	0,81	66,82
Idared	12,86	14,90	27,76	58,73	1,17	59,90

According to the roots type and thickness in the second field of the fruit nursery, at Golden Reinders and Jonagored varieties predominates the fibre roots mass with a diameter of less than 3 mm – 63,9-64,6%. For Idared predominates non significantly the root mass with a diameter greater than 3 mm, being 53,6%. For all the varieties under the research, the fibre roots length constitutes 98,0-98,7% of the total length.

Roots extension and repartition on soil profile according to length and weight in preponderantly determined by the genetic proprieties of M 9 rootstock, that has a relatively superficial (fasciculated) root system located in the fruit nursery, in the soil layer of 0-40 cm (2, 3).

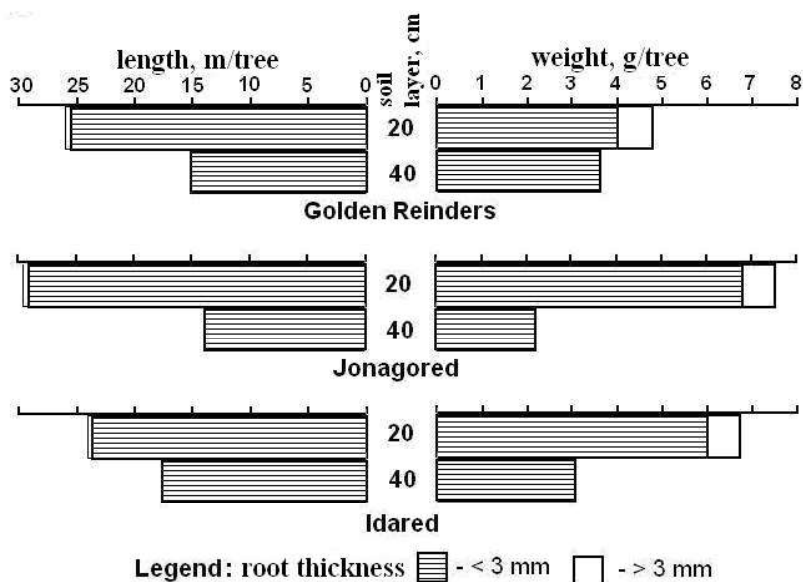


Fig. 1. Root system architectonics of apple trees in the first field of the fruit nursery, depending on variety.

Our investigations confirm that roots repartition into the soil at M 9 rootstock and apple tree, grafted on it, doesn't essentially differ according to the varieties taken into the study.

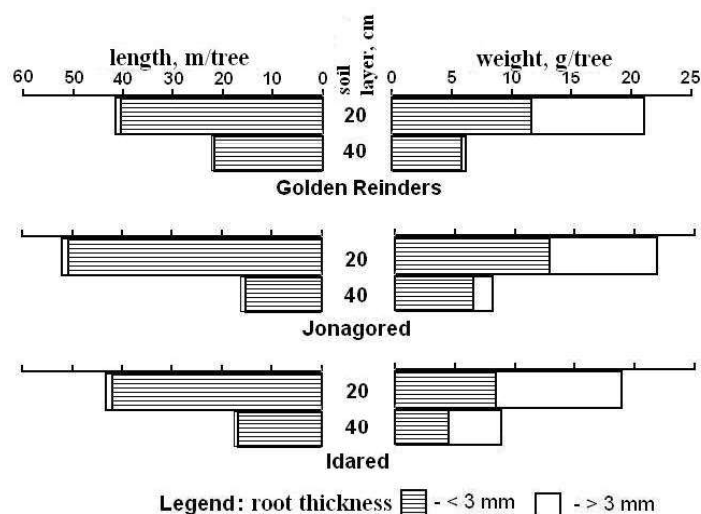


Fig. 2. Root system architectonics of apple trees in the second field of the fruit nursery, depending on variety.

At the end of vegetation period, in the first and second field of the fruit nursery (figure 1, 2), 52-75% of roots weight and total length is in 0-20 cm layer, and 25-48% in 20-40 cm layer.

CONCLUSIONS

The root system development of the apple trees grown in the second field increased with 1,44 and 3,33 unlike the length and weight of the bench grafted roots in the first field of the fruit nursery.

In the first and second field of the fruit nursery, the 52-75% of roots weight and total length is in 0-20 cm layer, and 25-48% in 20-40 cm layer.

The obtained results demonstrate that the parameters of the root system of the formed apple trees after the “knip-baum” type, register values that correspond to SM-155 (5) standard.

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