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# CERCETĂRI PRIVIND INTERACȚIUNEA SOI-PORTALTOI ÎN PEPINIERĂ LA SPECIILE CIREȘ, PIERSIC-NECTARIN ȘI CAIS

# RESEARCHES REGARDING VARIETY- ROOTSTOCK INTERACTION IN THE NURSERY FOR SWEET CHERRY, PEACH-NECTARINE AND APRICOT

Mazilu Crăişor, Nicolae Silvia, Duţu Ion
Research Institute for Fruit Growing Pitești, Romania

**Abstract**

**The researches were carried out at RIFG Piteşti Maracineni, aiming to study in the nursery field behavior of varieties homologated in Romania or introduced from the European Union, grafted on Romanian rootstocks. For sweet cherry seven varieties ('Kordia', 'Skeena', 'Ferrovia', 'Ponoare', 'Spectral', 'Sublim', 'Tentant') were grafted on three vegetative rootstocks ('IP-C4', 'IP-C5', 'IP-C7'). For peach-nectarine ten varieties ('Florin', 'Purpuriu', 'Creola', 'Costin', 'Liana', 'Anemona', 'Monica', 'Catherine', 'Mimi', 'Filip'), were grafted on two rootstocks ('Adaptabil', vegetative and 'Mirobolan C5' - generative), and ten apricot varieties ('Euxin', 'Histria', 'Tudor', 'Traian', 'Danubiu', 'Orizont', 'Ceres', 'Cristal', 'Auraş', 'Fortuna') were grafted on two rootstocks ('Apricor' - vegetative and 'Mirobolan dwarf' - generative). The following indicators were studied: vigor (height, diameter), number of shoots emitted, number of preformed buds fructification, grafting compatibility (Herrero method) according to the rootstocks association, and standard tree yield / ha. Regarding the average effect of the rootstock on the production of standard trees/ha, IP-C7 is found the best in the cherry species (42 678 pcs.), 'Adaptabil' in the peach-nectarine species (56,460 pcs.) and 'Apricor' to the apricot species (52,137 pcs.).**

**Cuvinte cheie:** portaltoi, cireș, piersic-nectarin și cais, vigoare, compatibilitate, producție de pomi standard la ha
**Key words:** sweet cherry, peach and apricot rootstocks, vigor, compatibility, standard production / ha

## 1. Introduction

The main biological and cultural characteristics characterizing a rootstock are the vigor it imparts to the grafted varieties, the variety-rootstock interaction, and the adaptability to the pedoclimatic conditions, the propagation capacity, the rooting and uniformity of the grafted trees. In the case of grafting several different varieties of vigor on the same rootstock, the vigor of the combinations follows that of the variety, and in the case of grafting one variety on several different rootstocks, the vigor of the combination is given by the rootstock. The quality of the planting material is very important because it depends by the grip on planting, the growth of the trees in the first years, the entrance to the fruit and the quality of the harvest. This is given by the height and diameter of the trees, the number of shoots grown in the nursery, the number of preformed buds and the development of the root system. The dynamics of the breeding research required the study of varieties interaction with Romanian rootstocks in the nursery.

## 2. Material and methods

The main objective of the researches was to study the interaction of the cultivar-rootstock (nursery field II), of some new cherry, peach-nectarine and apricot varieties introduced in the EU, or homologated in Romania, grafted on autochthones rootstocks. Biological material studied: cherry cultivars 'Kordia', 'Skeena', 'Ponoare', 'Ferrovia', 'Spectral', 'Sublim', 'Tentant', grafted on vegetative rootstocks 'IP-C4', 'IP-C5', 'IP-C7'; peach-nectarine cultivars: 'Florin', 'Purpuriu', 'Creola', 'Costin', 'Liana', 'Anemona', 'Monica', 'Catherine', 'Mimi' and 'Filip' grafted on 'Adaptabil' (vegetative) and 'Mirobolan C5' (generative) rootstocks; the apricot cultivars 'Euxin', 'Histria', 'Tudor', 'Traian', 'Danubiu', 'Orizont', 'Ceres', 'Cristal', 'Auras', 'Fortuna' grafted on 'Apricor' (vegetative) and 'Mirobolan dwarf' (generative). The researches were held at RIFG Piteşti Maracineni.

In the field I of the nursery planting distance was 90 x 15 cm. Grafting was realized in the second half of the August by chip budding method. Field maintenance (I and II) was carried out according to the nursery technology.

The researches carried out in field II of the nursery were: the vigor of the cultivar-rootstock associations expressed by the tree diameter (mm) at 30cm above the grafting point and the height of the trees (cm); number of anticipated shoots / tree; number of preformed fruit buds / tree; average yield of

standard trees grafted per hectare by rootstock; grafting compatibility of some cultivar-rootstock associations.

The experience was bifactorial type, factor A - rootstock with 2-3 graduations and factor B-variety with 7-10 graduations depending on the species. Data processing was done through the SPSS program, the Duncan test.

The assessment of the degree of compatibility or incompatibility given by the integrity, continuity and functionality of the tissues was determined by the Herrero method after the trees were cut into the grafting point:

Class A - perfect union, imperceptible welding line;
Class B - the union has wood distortions and involution cambial;
Class C - partial discontinuous bark union;
Class D –union with discontinuous wood as bark;
Class E - union with a high degree of discontinuity in wood.
The yield of standard trees per hectare was determined by rootstocks.

## 3. Results and discussions

In sweet cherry species, the 'IP-C7' rootstock prints a significantly lower vigor compared to the other rootstocks, 'IP-C4' and 'IP-C5' (Fig. 1, 2), in majority of grafted varieties. Additionally, varieties grafted on 'IP-C7' rootstock give more number of anticipated shoots (except for 'Sublim', 'Tentant' varieties) and preformed bud shoots (Fig. 3, 4). The mean effect of rootstocks on studied cherry varieties is summarized in Table 1.

In the peach-nectarine species the vigor of the studied associations is not significantly influenced by the rootstocks, but only in some cases ('Costin', 'Liana', 'Anemona' varieties: Fig. 5, 6).The varieties grafted on the 'Adaptabil' rootstock have the higher capacity to emit anticipated shoots, and the formation of fruit buds is generally influenced by the variety (Fig.7,8). There were no significant differences in the mean rootstock effect on the studied varieties, except for the indicator expressing the ability of the variety to deliver anticipated shoots (Table 2).

In the apricot, the vigor of varieties grafted on the generative rootstock 'Mirobolan dwarf' is generally smaller than those grafted on 'Apricor' vegetative rootstock, the differences being insignificant. However, in the 'Fortuna' variety, the height, diameter and number of preformed buds have significantly lower values on 'Apricor' rootstock than on 'Mirobolan dwarf' (Fig. 9, 10). Regarding the ability of varieties to produce anticipated shoots, it is not significantly influenced by rootstocks (Fig.11). Varieties grafted on 'Apricor' rootstock show a much number of preformed buds (Fig. 12). From table 3 (average rootstock effect on grafted apricot varieties), there are significant differences in the tree diameter indicators and the number of preformed buds, the values being higher for 'Apricor' rootstocks.

Affinity or compatibility is a specific of grafted plants. There is a lot of definitions in the literature that have the same essence, but with nuances of distinction, being anatomical, physiological and biochemical similarity between varieties and rootstocks, which ensure good grafting, normal growth and development of the trees in nursery and to the final place in the orchard. Although research on compatibility or incompatibility is extremely numerous in the world, no author has been able to delimit precisely, and to what extent, the effects of compatibility and where incompatibility (nursery) begins.

As a result of the researches carried out at the grafting point, a certain variety of rootstock associations studied, the grafting compatibility class was established according to the Herrero method. Thus, in the sweet cherry species the variety – rootstocks associations: 'Skeena / IP-C4', 'Ponoare / IP-C4', 'Skeena / IP-C5', 'Ferrovia / IP-C5', 'Ponoare / IP-C5', 'Tentant / IP-C5' have good compatibility when grafted and 'Ferrovia / IP-C4' does not have compatibility. For the peach-nectarine species all studied varieties grafted on the two rootstocks ('Adaptabil', 'Mirobolan C5') have a good grafting compatibility. Of the studied apricot varieties, 'Histria' and 'Traian' have good grafting compatibility with the two rootstocks ('Apricor' and 'Mirobolan dwarf'), while the 'Tudor' and 'Fortuna' varieties are not compatible with the 'Mirobolan dwarf' rootstock (tab. 4).

The production of standard trees on the surface unit is influenced by rootstocks. Thus, in the cherry the highest values were registered to the varieties grafted on 'IP-C7' rootstock (43,612pcs.); peach-nectarine varieties on 'Adaptabil' rootstock (56,460 pcs.) and apricot varieties on 'Apricor' rootstock (52,137 pcs.) (Table 5).

## 4. Conclusions

In the cherry species, the 'IP-C7' rootstock is used to impose a lower vigor on grafted varieties, a higher number of anticipated shoots, and the production of standard trees/ha higher than the other rootstocks ('IP-C4', 'IP-C5'). Preformed fruit buds only appear on varieties grafted on this rootstock. The

variety association 'Ferrovia / IP-C4' rootstock shows graft incompatibility and is not recommended to be multiplied in the nursery.

In the peach-nectarine species, standard tree production/ha for varieties grafted on 'Adaptabil' rootstock is 34.4% higher than the same varieties grafted on 'Mirobolan C5'. All studied varieties grafted on the two rootstocks have good grafting compatibility and are recommended to be multiplied in the nursery.

In apricot species, the rootstock does not significantly influence the ability of the varieties to produce anticipated shoots, but the varieties grafted on the 'Apricor' rootstock give a significantly more number of fruit buds than those grafted on the 'Mirobolan dwarf'. The production of standard trees/ha is 11.23% higher on 'Apricor' compared to the same varieties grafted on 'Mirobolan dwarf'. The 'Tudor' and 'Fortuna' varieties are incompatible with the 'Mirobolan dwarf' rootstock and are not recommended to be grafted into the nursery.

## 5. Acknowledgements

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***Tables and Figures***

**Table 1. The average effect of rootstocks on studied sweet cherry varieties**

| Rootstock | Tree diameter (mm) | Tree height (cm) | Anticipated shoots/tree (pcs.) | Preformed buds/tree (pcs.) |
|---|---|---|---|---|
| IP-C4 | 16,52a | 179,11a | 0,43b | 0b |
| IP-C5 | 15,61a | 169,94a | 0,81b | 0b |
| IP-C7 | 13,1b | 137,1b | 1,63a | 2,13a |

**Table 2. The average effect of rootstocks on studied peach and nectarine varieties**

| Rootstock | Tree diameter (mm) | Tree height (cm) | Anticipated shoots/tree (pcs.) | Preformed buds/tree (pcs.) |
|---|---|---|---|---|
| Adaptabil | 15.92 a | 157.7 a | 20.68 a | 58.66 a |
| Mirobolan C5 | 15.22 a | 164.22 a | 17.47 b | 52.48 a |

**Table 3. The average effect of rootstocks on studied apricot varieties**

| Rootstock | Tree diameter (mm) | Tree height (cm) | Anticipated shoots/tree (pcs.) | Preformed buds/tree (pcs.) |
|---|---|---|---|---|
| Apricor | 18,04 a | 184,54 a | 9,29 a | 32,94 a |
| Mirobolan dwarf | 16,22 b | 175,99 a | 8,52 a | 25,78 b |

**Table 4. Grafting compatibility of some rootstock associations in cherry, peach-nectarine, apricot**

| Species | Rootstock | Variety | Compatibility class | Observation |
|---|---|---|---|---|
| Sweet cherry | IP-C4 | Skeena | A | good compatibility |
| | | Ferrovia | C-D | incompatibility |
| | | Ponoare | A | good compatibility |
| | IP-C5 | Kordia | A-B | acceptable compatibility |
| | | Skeena | A | good compatibility |
| | | Ferrovia | A | good compatibility |
| | | Ponoare | A | good compatibility |
| | | Spectral | A-B | acceptable compatibility |
| | | Tentant | A | good compatibility |
| Peach-nectarin | Adaptabil | Florin | A | good compatibility |
| | | Purpuriu | A | good compatibility |
| | | Creola | A | good compatibility |
| | | Liana | A | good compatibility |
| | | Anemona | A | good compatibility |
| | | Monica | A | good compatibility |
| | | Catherine | A | good compatibility |
| | | Mimi | A | good compatibility |
| | | Filip | A | good compatibility |
| | Mirobolan C5 | Florin | A | good compatibility |
| | | Purpuriu | A | good compatibility |
| | | Costin | A | good compatibility |
| | | Liana | A | good compatibility |
| | | Catherine | A | good compatibility |
| | | Mimi | A | good compatibility |
| | | Filip | A | good compatibility |
| Apricot | Apricor | Histria | A | good compatibility |
| | | Traian | A | good compatibility |
| | Mirobolan dwarf | Histria | A | good compatibility |
| | | Tudor | C-D | incompatibility |
| | | Traian | A | good compatibility |
| | | Danubiu | A-B | acceptable compatibility |
| | | Cristal | A-B | acceptable compatibility |
| | | Fortuna | C-D | incompatibility |

**Table 5. Production of standard trees per hectare for sweet cherry, peach and nectarine species and apricot depending on rootstocks**

| Species | Rootstock | Production/ha (trees) |
|---|---|---|
| Sweet cherry | IP-C4 | 40 473 |
| | IP-C5 | 30 947 |
| | IP-C7 | 43 612 |
| Peach-nectarine | Adaptabil | 56 460 |
| | Mirobolan C5 | 42 000 |
| Apricot | Apricor | 52 137 |
| | Mirobolan dwarf | 46 873 |

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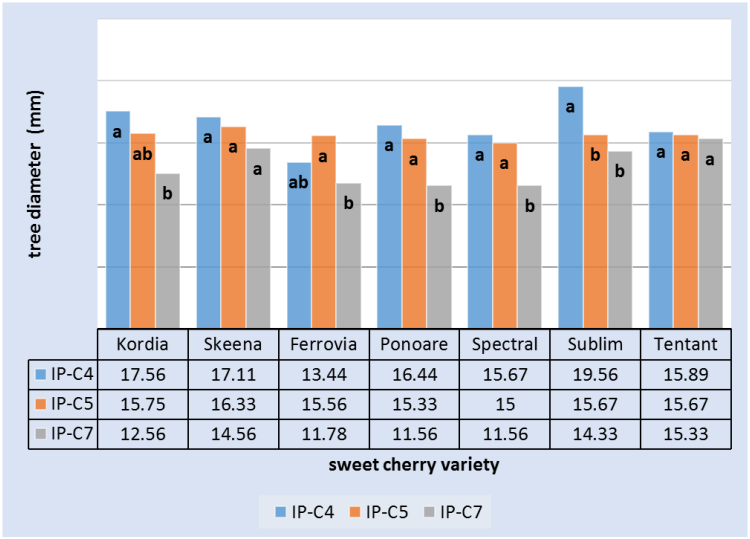
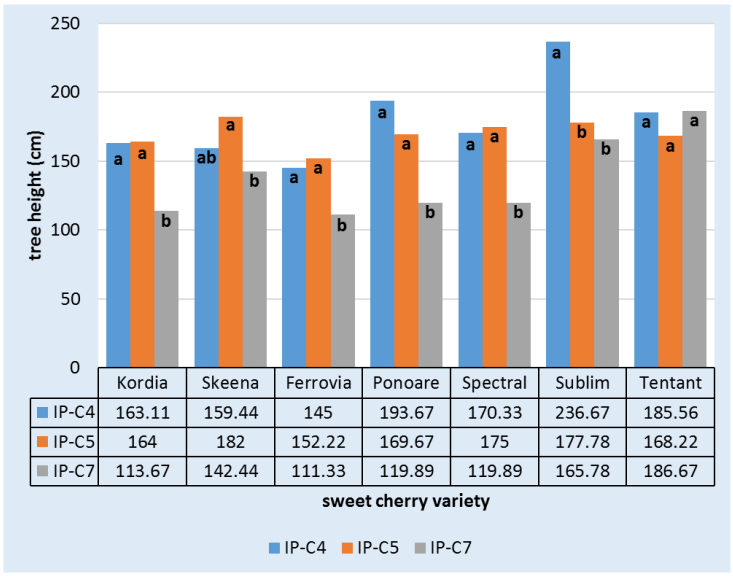


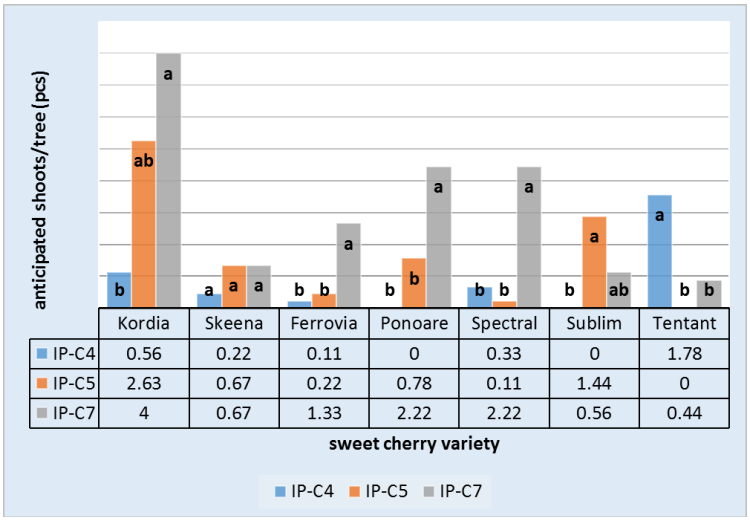

| | Kordia | Skeena | Ferrovia | Ponoare | Spectral | Sublim | Tentant |
|---|---|---|---|---|---|---|---|
| IP-C4 | 17.56 | 17.11 | 13.44 | 16.44 | 15.67 | 19.56 | 15.89 |
| IP-C5 | 15.75 | 16.33 | 15.56 | 15.33 | 15 | 15.67 | 15.67 |
| IP-C7 | 12.56 | 14.56 | 11.78 | 11.56 | 11.56 | 14.33 | 15.33 |

**Fig. 1. Influence of the rootstock on the tree diameter of the grafted sweet cherry variety**




| | Kordia | Skeena | Ferrovia | Ponoare | Spectral | Sublim | Tentant |
|---|---|---|---|---|---|---|---|
| IP-C4 | 163.11 | 159.44 | 145 | 193.67 | 170.33 | 236.67 | 185.56 |
| IP-C5 | 164 | 182 | 152.22 | 169.67 | 175 | 177.78 | 168.22 |
| IP-C7 | 113.67 | 142.44 | 111.33 | 119.89 | 119.89 | 165.78 | 186.67 |

**Fig. 2. The influence of the rootstock on the height of the sweet cherry tree**




| | Kordia | Skeena | Ferrovia | Ponoare | Spectral | Sublim | Tentant |
|---|---|---|---|---|---|---|---|
| IP-C4 | 0.56 | 0.22 | 0.11 | 0 | 0.33 | 0 | 1.78 |
| IP-C5 | 2.63 | 0.67 | 0.22 | 0.78 | 0.11 | 1.44 | 0 |
| IP-C7 | 4 | 0.67 | 1.33 | 2.22 | 2.22 | 0.56 | 0.44 |

**Fig. 3. The influence of the rootstock on the capacity of sweet cherry varieties to produce anticipated shoots**

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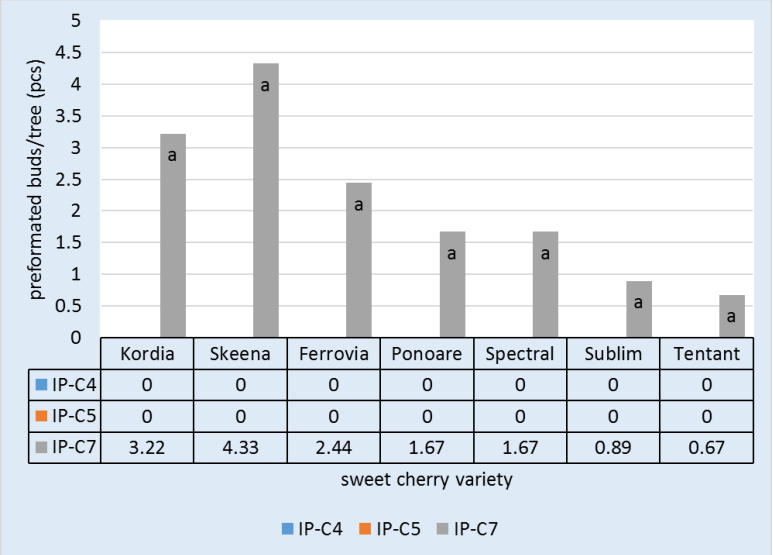
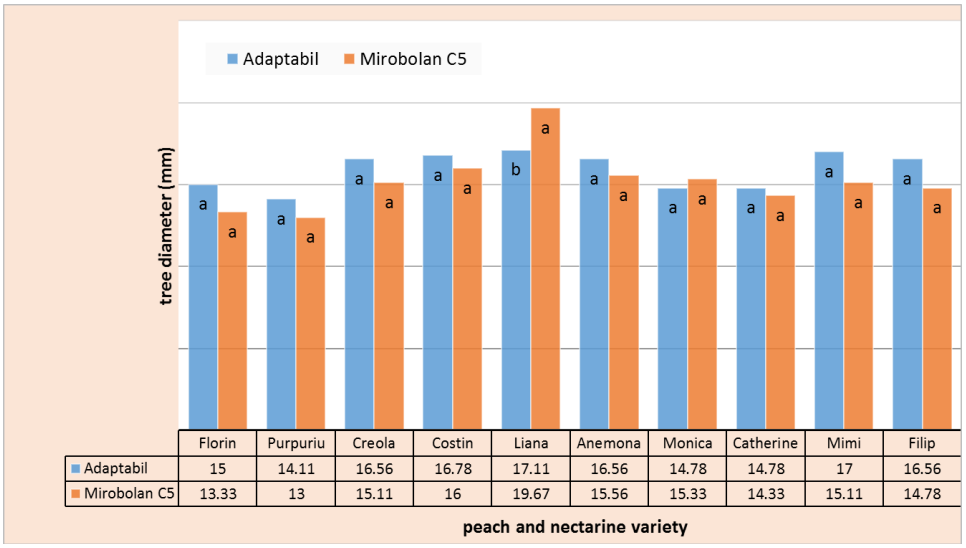


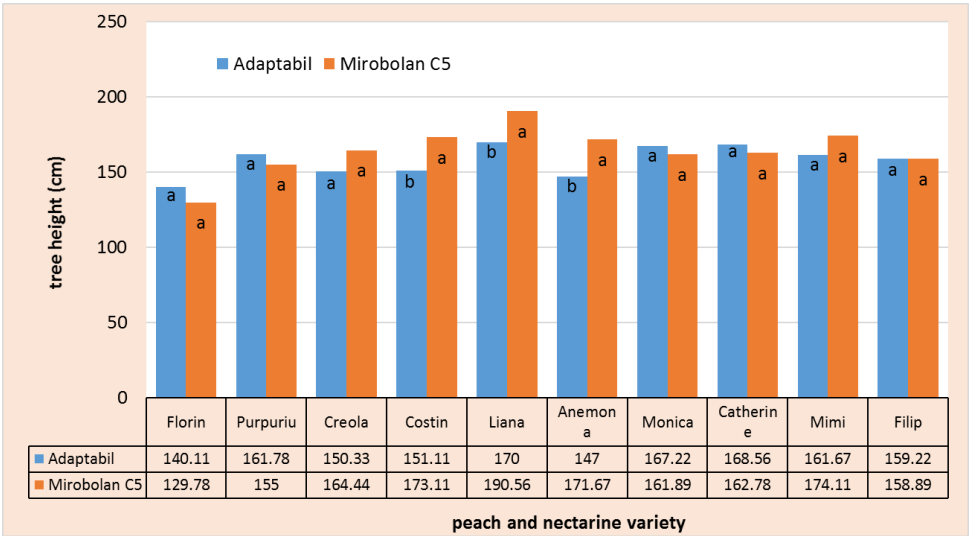

| | Kordia | Skeena | Ferrovia | Ponoare | Spectral | Sublim | Tentant |
|---|---|---|---|---|---|---|---|
| IP-C4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| IP-C5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| IP-C7 | 3.22 | 4.33 | 2.44 | 1.67 | 1.67 | 0.89 | 0.67 |

**Fig. 4. Number of fruit buds preformed on sweet cherry varieties depending on rootstock**



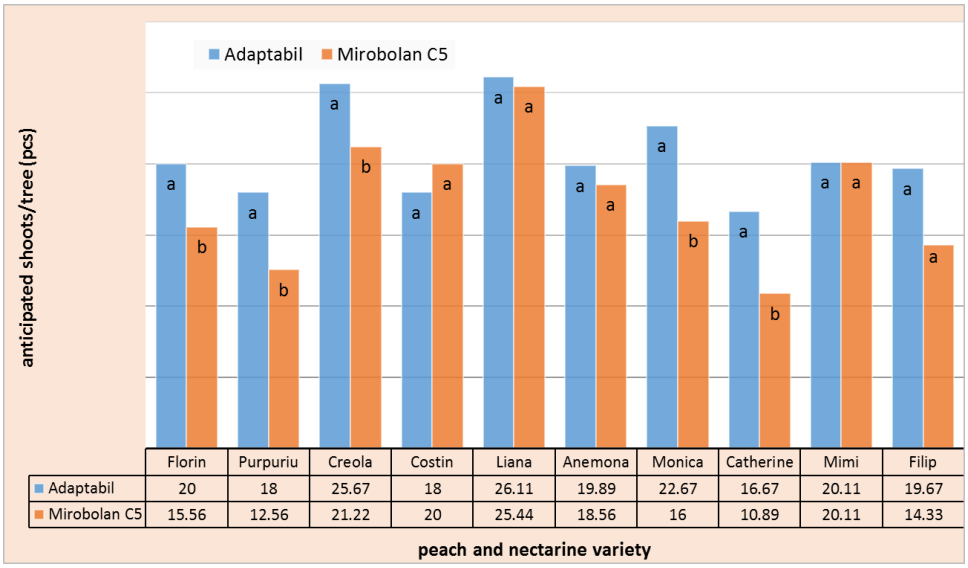

| | Florin | Purpuriu | Creola | Costin | Liana | Anemona | Monica | Catherine | Mimi | Filip |
|---|---|---|---|---|---|---|---|---|---|---|
| Adaptabil | 15 | 14.11 | 16.56 | 16.78 | 17.11 | 16.56 | 14.78 | 14.78 | 17 | 16.56 |
| Mirobolan C5 | 13.33 | 13 | 15.11 | 16 | 19.67 | 15.56 | 15.33 | 14.33 | 15.11 | 14.78 |

**Fig. 5. Influence of the rootstock on the tree diameter of the grafted peach and nectarine variety**



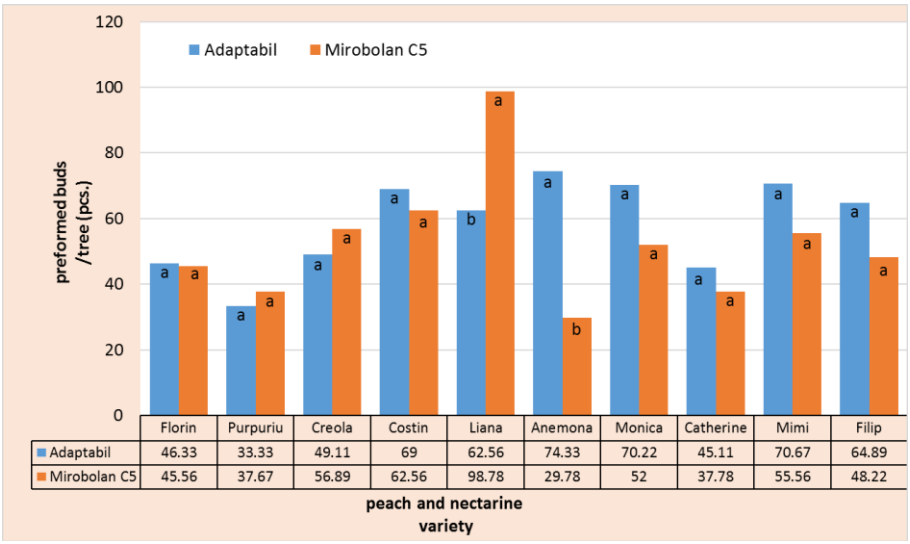

| | Florin | Purpuriu | Creola | Costin | Liana | Anemona | Monica | Catherine | Mimi | Filip |
|---|---|---|---|---|---|---|---|---|---|---|
| Adaptabil | 140.11 | 161.78 | 150.33 | 151.11 | 170 | 147 | 167.22 | 168.56 | 161.67 | 159.22 |
| Mirobolan C5 | 129.78 | 155 | 164.44 | 173.11 | 190.56 | 171.67 | 161.89 | 162.78 | 174.11 | 158.89 |

**Fig.6. The influence of the rootstock on the height of the peach and nectarine tree**



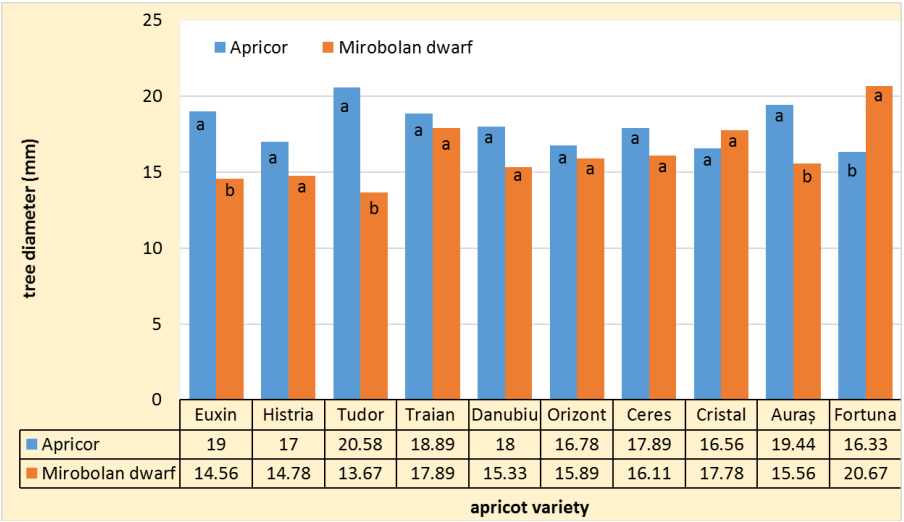

| | Florin | Purpuriu | Creola | Costin | Liana | Anemona | Monica | Catherine | Mimi | Filip |
|---|---|---|---|---|---|---|---|---|---|---|
| Adaptabil | 20 | 18 | 25.67 | 18 | 26.11 | 19.89 | 22.67 | 16.67 | 20.11 | 19.67 |
| Mirobolan C5 | 15.56 | 12.56 | 21.22 | 20 | 25.44 | 18.56 | 16 | 10.89 | 20.11 | 14.33 |

**Fig. 7. The influence of the rootstock on the capacity of peach and nectarine varieties to produce anticipated shoots**




| | Florin | Purpuriu | Creola | Costin | Liana | Anemona | Monica | Catherine | Mimi | Filip |
|---|---|---|---|---|---|---|---|---|---|---|
| Adaptabil | 46.33 | 33.33 | 49.11 | 69 | 62.56 | 74.33 | 70.22 | 45.11 | 70.67 | 64.89 |
| Mirobolan C5 | 45.56 | 37.67 | 56.89 | 62.56 | 98.78 | 29.78 | 52 | 37.78 | 55.56 | 48.22 |

**Fig. 8. Number of buds preformed on peach and nectarine varieties depending on rootstock**




| | Euxin | Histria | Tudor | Traian | Danubiu | Orizont | Ceres | Cristal | Auraş | Fortuna |
|---|---|---|---|---|---|---|---|---|---|---|
| Apricor | 19 | 17 | 20.58 | 18.89 | 18 | 16.78 | 17.89 | 16.56 | 19.44 | 16.33 |
| Mirobolan dwarf | 14.56 | 14.78 | 13.67 | 17.89 | 15.33 | 15.89 | 16.11 | 17.78 | 15.56 | 20.67 |

**Fig. 9. Influence of the rootstock on the tree diameter of the grafted apricot variety**

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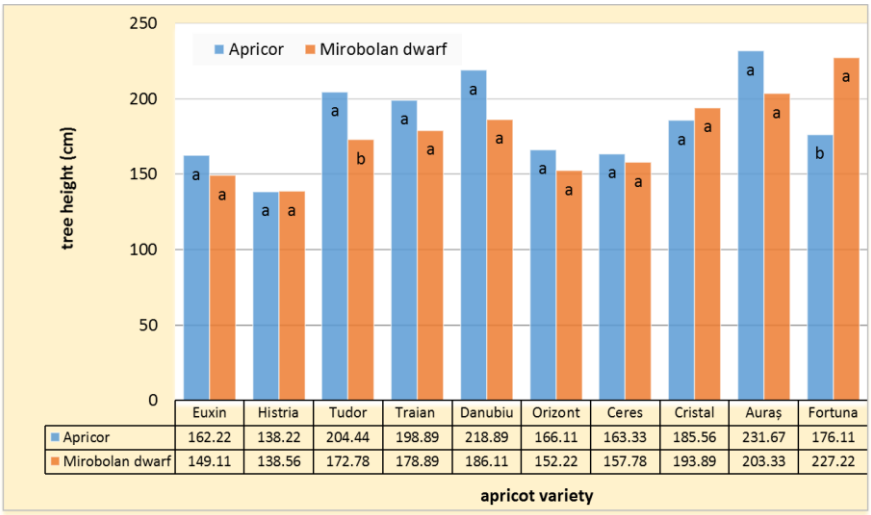
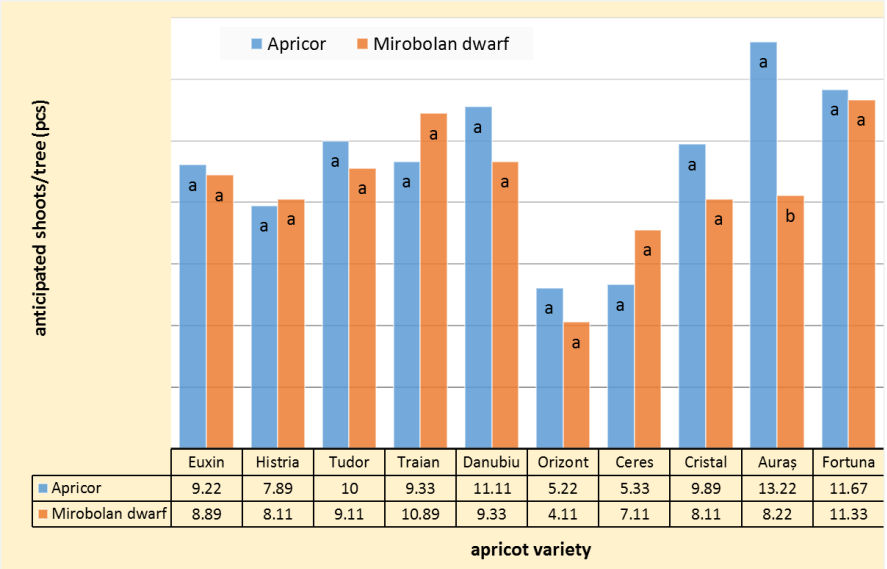


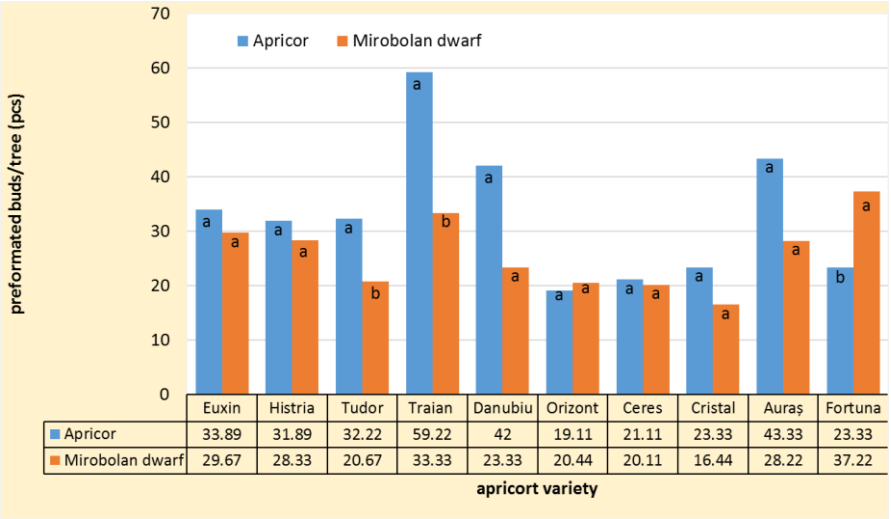

| | Euxin | Histria | Tudor | Traian | Danubiu | Orizont | Ceres | Cristal | Auraș | Fortuna |
|---|---|---|---|---|---|---|---|---|---|---|
| Apricor | 162.22 | 138.22 | 204.44 | 198.89 | 218.89 | 166.11 | 163.33 | 185.56 | 231.67 | 176.11 |
| Mirobolan dwarf | 149.11 | 138.56 | 172.78 | 178.89 | 186.11 | 152.22 | 157.78 | 193.89 | 203.33 | 227.22 |

**Fig. 10. The influence of the rootstock on the height of the apricot tree**




| | Euxin | Histria | Tudor | Traian | Danubiu | Orizont | Ceres | Cristal | Auraș | Fortuna |
|---|---|---|---|---|---|---|---|---|---|---|
| Apricor | 9.22 | 7.89 | 10 | 9.33 | 11.11 | 5.22 | 5.33 | 9.89 | 13.22 | 11.67 |
| Mirobolan dwarf | 8.89 | 8.11 | 9.11 | 10.89 | 9.33 | 4.11 | 7.11 | 8.11 | 8.22 | 11.33 |

**Fig. 11. The influence of the rootstock on the capacity of apricot varieties to produce anticipated shoots**




| | Euxin | Histria | Tudor | Traian | Danubiu | Orizont | Ceres | Cristal | Auraș | Fortuna |
|---|---|---|---|---|---|---|---|---|---|---|
| Apricor | 33.89 | 31.89 | 32.22 | 59.22 | 42 | 19.11 | 21.11 | 23.33 | 43.33 | 23.33 |
| Mirobolan dwarf | 29.67 | 28.33 | 20.67 | 33.33 | 23.33 | 20.44 | 20.11 | 16.44 | 28.22 | 37.22 |

**Fig.12. Number of fruit buds preformed on apricot varieties depending on rootstock**