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# ESTIMATION OF GROWTH, EFFICIENCY AND QUALITY OF MAIDEN PEACH TREES DEPENDING ON ROOTSTOCKS AND CULTIVARS

**Summary.** Maiden peach trees of 'Harbinger', 'Iskra' and 'Reliance' cultivars grew significantly weaker on *Prunus besseyi* rootstock than on Hui-hun-tao seedling. Better efficiency and quality of maiden peach trees was obtained on Hui-hun-tao rootstock than on *Prunus besseyi*.

**Key words:** maiden peach trees, rootstocks, cultivars, growth, efficiency, quality

## Introduction

Poorly growing rootstocks are necessary in the progressive intensification of orchard production, which is obtained mainly by increasing the number of trees on a unit of a surface. So far, rootstocks applied for peach trees have been exclusively seedlings with a relatively high power of growth. In this situation numerous studies aiming at finding new rootstocks for this species (LAYNE 1980, ROM 1983, ELFVING and TEHRANI 1984, FERREE and SCHMID 1988, MAĆKOWIAK and STACHOWIAK 1994, ŚWIERCZYŃSKI and STACHOWIAK 1997) were carried out.

The purpose of these studies was a verification of the usefulness of two rootstocks and three cultivars for the production of one-year-old maiden peach trees in nursery.

## Material and methods

The studies were carried out in years 2003-2006. The nursery experiments were set up in randomized block design with four replications, with 25 rootstocks per plot. The seedlings of peach (*Prunus kansuensis* Rehd.) of Hui-hun-tao type, and *P. besseyi* Bailey rootstock, coming from a vegetative propagation by stooling, were budded with three cultivars of peach: 'Harbinger', 'Iskra' and 'Reliance'.

In the third decade of October the following observations and measurements of maiden peach trees were executed: number of obtained maiden trees compared with the number of budded rootstocks (given in per cents), height of maiden trees (cm), thickness (mm) – measured 30 cm above the ground, number of lateral shoots and their average length (cm) as well as number of roots. On the basis of the obtained results, percentage of maiden peach trees meeting the requirements of the Polish Norm PN-R--67010 was defined.

The results of the studies were statistically elaborated using two-factor variance analysis. Significance of differences among combinations was evaluated on the basis of confidence intervals calculated from Duncan's test for a confidence level $\alpha = 0.05$. The results presented in tables are mean values of the three series.

## Results

The percentage of the obtained maiden peach trees compared with the number of the budded rootstocks varied, depending on the applied rootstock and cultivar (Table 1). Significantly bigger percentage of trees was obtained on Hui-hun-tao rootstock compared with *P. besseyi.* Independently from a rootstock the biggest number of maiden trees was observed for 'Harbinger' cultivar, the least for 'Iskra'.

Table 1. The percentage of obtained maiden peach trees depending on rootstock and cultivar (three years mean)
Tabela 1. Procent otrzymanych okulantów brzoskwini w zależności od podkładki i odmiany (średnia z trzech lat)

| Rootstock | Cultivars | | | Mean value for rootstock |
|---|---|---|---|---|
| | 'Harbinger' | 'Iskra' | 'Reliance' | |
| Hui-hun-tao | 81.0 b | 52.0 a | 72.4 b | 69.0 b |
| *Prunus besseyi* | 41.3 a | 45.3 a | 37.3 a | 41.3 a |
| Mean value for cultivar | 62.2 b | 48.7 a | 55.1 ab | |

Means followed by the same letters are not significant at the level of $\alpha = 0.05$.

The height and the thickness of maiden peach depend on applied rootstock (Tables 2, 3). Significantly better results of these features were found for Hui-hun-tao rootstock compared with *P. besseyi*. The cultivars did not differentiate the results of the height and thickness of maiden peach trees.

The mean value of lateral shoots length and their number was significantly varied by the applied rootstock (Tables 4, 5). The trees on Hui-hun-tao rootstock were characterized by a bigger length and number of lateral shoots, compared with those growing on *P. besseyi.* A budded cultivar did not have any impact on the discussed parameters of the tree growth.

Table 2. Height of maiden peach trees depending on rootstock and cultivar (three years mean) (cm)
Tabela 2. Wysokość okulantów brzoskwini w zależności od podkładki i odmiany (średnia z trzech lat) (cm)

| Rootstock | Cultivars | | | Mean value for rootstock |
|---|---|---|---|---|
| | 'Harbinger' | 'Iskra' | 'Reliance' | |
| Hui-hun-tao | 203.9 b | 185.3 ab | 188.8 ab | 192.7 b |
| *Prunus besseyi* | 155.0 a | 162.3 a | 152.1 a | 156.5 a |
| Mean value for cultivar | 179.4 a | 173.8 a | 170.4 a | |

Explanation as in Table 1.

Table 3. Thickness of maiden peach trees depending on rootstock and cultivars (three years mean) (mm)
Tabela 3. Grubość okulantów brzoskwini w zależności od podkładki i odmiany (średnia z trzech lat) (mm)

| Rootstock | Cultivars | | | Mean value for rootstock |
|---|---|---|---|---|
| | 'Harbinger' | 'Iskra' | 'Reliance' | |
| Hui-hun-tao | 27.6 c | 27.4 bc | 26.8 abc | 27.3 b |
| *Prunus besseyi* | 24.8 abc | 21.3 ab | 20.6 a | 22.4 a |
| Mean value for cultivar | 26.2 a | 24.4 a | 23.7 a | |

Explanation as in Table 1.

Table 4. Average of lateral shoots length of maiden peach trees depending on rootstock and cultivar (three years mean) (cm)
Tabela 4. Średnia długość pędów bocznych okulantów brzoskwini w zależności od podkładki i odmiany (średnia z trzech lat) (cm)

| Rootstock | Cultivars | | | Mean value for rootstock |
|---|---|---|---|---|
| | 'Harbinger' | 'Iskra' | 'Reliance' | |
| Hui-hun-tao | 53.9 bc | 58.7 c | 50.4 bc | 54.3 b |
| *Prunus besseyi* | 49.8 b | 39.8 a | 46.9 ab | 45.5 a |
| Mean value for cultivar | 51.8 a | 49.3 a | 48.7 a | |

Explanation as in Table 1.

Maiden peach trees growing on Hui-hun-tao seedling had much more roots than those growing on *P. besseyi* (Table 6). The number of roots did not depend on the budded cultivar of peach.

Table 5. Number of lateral shoots of maiden peach trees depending on rootstock and cultivar (three years mean)
Tabela 5. Liczba pędów bocznych okulantów brzoskwini w zależności od podkładki i odmiany (średnia z trzech lat)

| Rootstock | Cultivars | | | Mean value for rootstock |
|---|---|---|---|---|
| | 'Harbinger' | 'Iskra' | 'Reliance' | |
| Hui-hun-tao | 39.1 c | 35.3 bc | 37.0 c | 37.1 b |
| *Prunus besseyi* | 25.0 a | 30.0 ab | 26.5 a | 27.2 a |
| Mean value for cultivar | 32.0 a | 32.7 a | 31.8 a | |

Explanation as in Table 1.

Table 6. Number of roots of maiden peach trees depending on rootstock and cultivar (three years mean)
Tabela 6. Liczba korzeni okulantów brzoskwini w zależności od podkładki i odmiany (średnia z trzech lat)

| Rootstock | Cultivars | | | Mean value for rootstock |
|---|---|---|---|---|
| | 'Harbinger' | 'Iskra' | 'Reliance' | |
| Hui-hun-tao | 22.0 b | 20.0 b | 22.7 b | 21.6 b |
| *Prunus besseyi* | 15.2 a | 14.0 a | 15.0 a | 14.7 a |
| Mean value for cultivar | 18.6 a | 17.0 a | 18.8 a | |

Explanation as in Table 1.

Significantly bigger percentage of trees consistent with the Polish Norm PN-R--67010, was obtained on Hui-hun-tao rootstock compared with *P. besseyi* (Table 7). Parameters of growth of trees 'Harbinger' and 'Reliance' cultivars were more consistent with the norm than those of 'Iskra'.

Table 7. The percentage of maiden peach trees that meet the requirements of Polish Norm PN-R--67010 depending on rootstock and cultivar (three years mean)
Tabela 7. Procent okulantów brzoskwini spełniających wymagania Polskiej Normy PN-R-67010 w zależności od podkładki i odmiany (średnia z trzech lat)

| Rootstock | Cultivars | | | Mean value for rootstock |
|---|---|---|---|---|
| | 'Harbinger' | 'Iskra' | 'Reliance' | |
| Hui-hun-tao | 91.2 d | 75.9 c | 87.1 d | 84.7 b |
| *Prunus besseyi* | 62.5 b | 48.5 a | 74.3 c | 61.8 a |
| Mean value for cultivar | 76.8 b | 62.2 a | 80.7 b | |

Explanation as in Table 1.

## Discussion

In the present experiment the smallest number of maiden peach trees was obtained on *P. besseyi*. This fact can indicate a physiological incompatible between the rootstock and the examined cultivars of peach or a smaller frost-resistance of the buds put on the rootstock. Among the examined cultivars, 'Iskra', which may be more prone to frost, was found to be the worst as far as this feature is concerned.

*Prunus besseyi* is considered to be a rootstock that weakens the growth of peach trees that are budded on it (LAYNE 1980, ROM 1983, ELFVING and TEHRANI 1984, FERREE and SCHMID 1988, MAĆKOWIAK and STACHOWIAK 1994, ŚWIERCZYŃSKI and STACHOWIAK 1997). It was also confirmed by the present studies, as the maiden peach trees were growing poorer on *P. besseyi* than on Hui-hun-tao seedling. This regularity considered all the examined parameters of the tree growth.

The power of growth of one-year-old maiden peach trees depended on the rootstock had an important impact on the percentage of trees meeting the requirements of Polish Norm PN-R-67010. The trees obtained on *P. besseyi* rootstock grew much weaker and therefore much smaller percentage of these trees was consistent with the Polish Norm.

## Conclusions

1. *Prunus besseyi* rootstock limited the power of growth of maiden peach trees of the three examined peach trees cultivars compared with Hui-hun-tao seedling.

2. Better efficiency and quality of the maiden peach trees was obtained on Hui-hun-tao rootstock.

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# OCENA WZROSTU, WYDAJNOŚCI I JAKOŚCI OKULANTÓW BRZOSKWINI W ZALEŻNOŚCI OD PODKŁADKI I ODMIANY

**Streszczenie.** W latach 2003-2006 na podkładkach Hui-hun-tao (*Prunus kansuensis* Rehd.) i wisience Besseya (*Prunus besseyi* Bailey) produkowano w szkółce okulanty brzoskwini odmian: 'Harbinger', 'Iskra' i 'Reliance'. Na podkładce Hui-hun-tao otrzymano większą liczbę drzewek niż na *P. besseyi*. Okulanty na podkładce *P. besseyi* rosły słabiej niż na siewce Hui-hun-tao, stąd mniej okulantów brzoskwini na podkładce *P. besseyi* spełniało wymagania Polskiej Normy PN--R-67010.

**Słowa kluczowe:** okulanty brzoskwini, podkładki, odmiany, wzrost, wydajność, jakość

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