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GROWTH OF SIX SWEET CHERRY CULTIVARS ON COLT AND ON MAZZARD SEEDLING (*PRUNUS AVIUM* L.) ROOTSTOCKS IN A NURSERY

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ABSTRACT. Sweet cherry cultivars 'Burlat', 'Hardy Giant', 'Kordia', ' Lapins', 'Sumit' and 'Techlovan' were budded on Colt and Mazzard seedling using T budding method. Maiden sweet cherry trees grew stronger on Colt rootstock than on Mazzard seedling. The growth of maiden sweet cherry trees was also influenced by a cultivar. Maiden sweet cherry trees produced on Colt rootstock created more lateral shoots than on Mazzard seedling.

Key words: maiden sweet cherry trees, cultivars, rootstocks, growth, efficiency, compatibility

Introduction

In many countries very intensive studies are carried out on rootstocks weakening the power of growth of sweet cherry trees (**Pannell** et **al.** 1983, **Kloutvor** 1987, **Ystaas** 1990, **Sitarek** 1999). It is connected with a possibility of planting more trees of this species on one unit of the ground in an orchard. Late entry of these trees into a fructification period, which considerably lengthens the investment period, poses a problem. Acquisition of trees with a considerable number of fruit bearing shoots, keeping a medium growth in a nursery, is a requirement of intensification of the cultivation of this species (**Stachowiak** and **Świerczyński** 2001).

In the studies carried out the researchers compared the power of growth, ramification, efficiency and quality of six maiden sweet cherry trees on Colt and Mazzard seedling.

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Material and methods

The studies were carried out in 2001-2003 in two nursery cycles. The initial plant material for the experiment were Colt and Mazzard seedling and buds of the following sweet cherry trees cultivars: 'Burlat', 'Hardy Giant', 'Kordia', 'Lapins', 'Sumit' and 'Techlovan'. The experiment was carried out in a form of random complete blocks with four repetitions. In every block there were 12 combinations, each with 25 trees. In spring 2001 and 2002 the rootstocks were planted in a nursery in 90 × 30 cm spacing. T-budding method was applied in the first ten days of August. In the second year of the nursery, in early spring, all rootstocks were pruned just above the buds put on them, leading the maiden sweet cherry trees without a plug. In autumn, before digging the trees out, the following observations and measurements were made:

– height (cm)
– trunk diameter, measured on the level of 30 cm above the ground (mm)
– number of long shoots and their length (cm)

For the above mentioned measurements and observations 15 trees were taken randomly from each combination. Both: percentage of the obtained maiden trees (compared to the number of the budded rootstocks) and their compatibility with standard PN--R-67010 were also calculated. The results were worked out statistically with the use of two factor variance analysis (rootstocks, cultivars) applying Duncan test for a confidence level $\alpha = 0.05$.

Results

The thickness of the maiden sweet cherry trees of different sweet cherry cultivars was influenced by the applied rootstocks. The trees of 'Burlat', 'Hardy Giant', 'Kordia' and 'Sumit' budded on Colt rootstock had a bigger diameter and their values varied significantly from the similar ones but obtained on Mazzard seedling (Table 1). The thickness of the maiden trees of 'Lapins' and 'Techlovan' cultivars did not differ significantly as far as the rootstock was concerned. Analyzing the mean for the examined feather of rootstocks it was proved that the trees budded on Colt were significantly thicker than the trees budded on Mazzard seedling (Table 1). Independently of the applied rootstocks the maiden sweet cherry trees of 'Hardy Giant' and 'Sumit' cultivars were the thickest and their digital values varied significantly from the other cultivars.

A similar dependence was found for the height of the trees (Table 2). The results of the height of 'Burlat', 'Hardy Giant' and 'Kordia' were much better on Colt than on Mazzard seedling. But the trees of 'Techlovan' cultivar had a significantly bigger value of this trait on Mazzard seedling. The data connected with the height of the maiden trees of 'Lapins' and 'Sumit' did not differ as far as the applied was concerned. On the basis of the mean values for the rootstocks it was found out that the trees produced on Colt rootstock were significantly higher than the trees produced on Mazzard seedling. Maiden trees of 'Hardy Giant' cultivar were the highest of all studied cultivars.

Table 1

The thickness of maiden sweet cherry trees (mm)
Grubość okulantów czereśni (mm)

Rootstock Podkładka	Cultivar Odmiana						Mean value for rootstock Średnia dla podkładki
	Burlat	Hardy Giant	Kordia	Lapins	Sumit	Techlovan	
Mazzard seedling Czereśnia ptasia	15.0 b*	17.8 d	13.0 a	15.7 bc	18.4 d	17.1 cd	16.2 a
Colt	18.3 d	20.8 e	16.6 bcd	17.1 bcd	21.1 e	15.6 bc	18.2 b
Mean value for cultivar Średnia dla odmiany	16.7 b	19.3 c	14.8 a	16.4 b	19.8 c	16.4 b	

*Means followed by the same letters are not significant at the level of α = 0.05.
*Średnie oznaczone tą samą literą nie różnią się między sobą na poziomie α = 0,05.

Table 2

The height of maiden sweet cherry trees (cm)
Wysokość okulantów czereśni (cm)

Rootstock Podkładka	Cultivar Odmiana						Mean value for rootstock Średnia dla podkładki
	Burlat	Hardy Giant	Kordia	Lapins	Sumit	Techlovan	
Mazzard seedling Czereśnia ptasia	149,1 ab*	178,6 d	128,9 a	152,6 bc	172,0 cd	175,0 cd	159,4 a
Colt	174,3 cd	225,4 e	180,6 d	138,6 ab	185,4 d	130,8 ab	172,5 b
Mean value for cultivar Średnia dla odmiany	161,7 a	202,0 c	154,7 a	145,6 a	178,7 b	152,9 a	

*Means followed by the same letters are not significant at the level of α = 0.05.
*Średnie oznaczone tą samą literą nie różnią się między sobą na poziomie α = 0,05.

It was observed that Colt rootstock had a tangibly positive influence on a number of long shoots of maiden sweet cherry trees. It was particularly visible for the trees of 'Hardy Giant', 'Kordia', 'Lapins' and 'Sumit' cultivars, which results were better on Colt rootstock (Table 3).

Table 3

The number of long shoots per one maiden sweet cherry trees
Liczba długopędów na jednym okulancie czereśni

Rootstock Podkładka	Cultivar Odmiana						Mean value for rootstock Średnia dla podkładki
	Burlat	Hardy Giant	Kordia	Lapins	Sumit	Techlovan	
Mazzard seedling Czereśnia ptasia	1,6 bc*	2,9 de	1,9 cd	0,3 a	1,3 ab	3,1 de	1,9 a
Colt	2,5 cde	5,5 f	3,7 e	2,3 bcd	2,9 de	2,8 cde	3,3 b
Mean value for cultivar Średnia dla odmiany	2,0 ab	4,2 d	2,8 bc	1,3 a	2,1 b	2,9 c	

*Means followed by the same letters are not significant at the level of $\alpha = 0.05$.
*Średnie oznaczone tą samą literą nie różnią się między sobą na poziomie $\alpha = 0,05$.

Only for maiden trees of 'Techlovan' cultivar such dependence was not found. The results of the number of long shoots for 'Burlat' cultivar did not differ significantly with the applied rootstock. Significantly better mean value of this trait for all cultivars was obtained on Colt rootstock. The biggest number of long shoots was observed for maiden sweet cherry trees of 'Hardy Giant' and the smallest one for 'Lapins' (Table 3).

The applied rootstocks did not differ significantly the results of the average length of long shoots of maiden trees of individual cultivar. However the average value of this trait was much better for Colt than for Mazzard seedling (Table 4). Studying the influence of the cultivar itself on the length of long shoots it was found that maiden trees of 'Hardy Giant' and 'Sumit' obtained the best and a very similar result, which was, however, much different only for 'Kordia' and 'Lapins' cultivars.

Among all the studied sweet cherry cultivars significantly smaller percentage of maiden trees on Colt rootstock was obtained only for 'Burlat' and 'Lapins' (Table 5). The results for the other cultivars did not differ significantly as far as applied rootstock was concerned. Analyzing the average values for the rootstocks it was proved that significantly bigger percentage of trees was produced on Mazzard seedling. Independently of the rootstock the biggest efficiency of maiden trees was obtained for 'Lapins' cultivar, significantly different from 'Burlat' and 'Sumit' cultivars (Table 5).

The percentage of maiden sweet cherry trees that meet the requirements of Polish Standard PN-R-67010 (%) did not differ significantly as far as rootstocks and cultivars were concerned (Table 6). Only taking into consideration the influence of the cultivar itself a significant difference was observed between maiden trees of 'Sumit' and 'Kordia' (Table 6).

Table 4

An average of long shoots per one maiden sweet cherry trees (cm)
Średnia długość długopędów na jednym okulancie czereśni (cm)

Rootstock Podkładka	Cultivar Odmiana						Mean value for rootstock Średnia dla podkładki
	Burlat	Hardy Giant	Kordia	Lapins	Sumit	Techlovan	
Mazzard seedling Czereśnia ptasia	37,3 a*	51,5 abc	40,6 a	39,4 a	55,6 abc	52,9 abc	46,2 a
Colt	55,2 abc	63,8 c	49,7 abc	47,4 abc	59,3 bc	43,0 ab	53,1 b
Mean value for cultivar Średnia dla odmiany	46,3 ab	57,6 b	45,1 a	43,4 a	57,5 b	47,9 ab	

*Means followed by the same letters are not significant at the level of $\alpha = 0.05$.
*Średnie oznaczone tą samą literą nie różnią się między sobą na poziomie $\alpha = 0,05$.

Table 5

The percentage of obtained maiden sweet cherry trees
Procent uzyskanych okulantów czereśni

Rootstock Podkładka	Cultivar Odmiana						Mean value for rootstock Średnia dla podkładki
	Burlat	Hardy Giant	Kordia	Lapins	Sumit	Techlovan	
Mazzard seedling Czereśnia ptasia	83,2 bc*	84,2 bc	89,3 cd	90,8 d	83,6 bc	85,3 bcd	86,2 b
Colt	64,9 a	82,6 bc	83,9 bc	83,9 bc	80,8 b	80,9 b	79,8 a
Mean value for cultivar Średnia dla odmiany	74,6 a	83,4 bc	86,7 bc	87,5 c	82,2 b	83,2 bc	

*Means followed by the same letters are not significant at the level of $\alpha = 0.05$.
*Średnie oznaczone tą samą literą nie różnią się między sobą na poziomie $\alpha = 0,05$.

Table 6
The percentage of maiden sweet cherry trees that meet the requirements of Polish Standard PN-R-67010 (%)
Procent okulantów czereśni spełniających wymagania Polskiej Normy PN-R-67010 (%)

Rootstock Podkładka	Cultivar Odmiana						Mean value for rootstock Średnia dla podkładki
	Burlat	Hardy Giant	Kordia	Lapins	Sumit	Techlovan	
Mazzard seedling Czereśnia ptasia	99,4 abc	99,6 bc	90,8 a	98,2 abc	100,0 c	99,4 abc	98,8 a
Colt	99,7 bc	100,0 c	97,4 abc	99,2 abc	100,0 c	94,3 ab	99,2 a
Mean value for cultivar Średnia dla odmiany	99,5 bc	99,9 bc	94,6 a	98,8 abc	100,0 c	97,4 ab	

*Means followed by the same letters are not significant at the level of $\alpha = 0.05$.
*Średnie oznaczone tą samą literą nie różnią się między sobą na poziomie $\alpha = 0,05$.

Discussion

In the experiment a big efficiency of maiden sweet cherry trees was found out. It reflects the physiological compatibility of the budded cultivars with the rootstocks. An exception was cultivar 'Burlat' budded on the rootstock Colt, for which only 64.0% of maiden trees were obtained. Incompatibility of cultivar 'Burlat' with the rootstock Colt confirmed **Sitarek** (1998).

Carried measurements proved that maiden sweet cherry trees on Colt rootstock had bigger thickness comparing to the ones on Mazzard seedling. Only for the 'Techlovan' cultivar the result was opposite. A bigger thickening of maiden sweet cherry trees on Colt rootstock is supported by **Ystaas** (1990), who stated that Colt rootstock stimulated thickening of trees.

A similar dependence was found for the height of the studied trees. Maiden sweet cherry trees of 'Burlat', 'Hardy Giant', 'Kordia' and 'Sumit' cultivars growing on Colt rootstock were higher than the trees of the same cultivars on Mazzard seedling. The exceptions were 'Lapins' and 'Techlovan' cultivars, which grew stronger on Mazzard seedling. For the majority of cultivars the obtained results related to the thickness and height of maiden sweet cherry trees contradict those that were obtained by **Pannel** et **al.** (1983) and **Kloutvor** (1987). According to them the cultivars of sweet cherry trees growing on Colt rootstock showed 30-50% smaller power of growth comparing to those growing on F 12/1 rootstock. These differences may result from the observation of different sweet cherry trees cultivars on Colt rootstock in comparison with different control rootstocks.

The results of the number and length of long shoots show the advantage of the trees produced on Colt. This rootstock caused a growth of 2.5 to 5.5 long shoots on average whereas only 0.3 to 3.1 were found on Mazzard seedling. Similar results were obtained by **Świerczyński** (1996), but on completely different cultivars. Similarly to apple trees cultivars, which have different tendency to create lateral shoots sweet cherry trees can also tend to show differences in this area. A tendency to create a crown in a nursery is especially important for an earlier entry of the trees into a fructification period after being planted into the orchard. One-year maiden trees obtained on Colt rootstock generally have a well-formed crown of the future tree. It was also confirmed by **Pannel** et **al.** (1983) stating that Colt rootstock stimulated the creation of lateral shoots, which significantly accelerated fructification period. According to **Sitarek** (1999) big ramification angles between a leading shoot and lateral shoots on maiden trees growing on Colt rootstock make cutting and forming easier. An additional advantage of Colt rootstock is its easiness to propagate in a mother field through layers, which was confirmed by **Świerczyński** (1996). It enables a quick and cheep production of this rootstock. **Sitarek** (1999) also refuted charges of Colt's low frost resistance. These facts speak for a wider application of this rootstock in our country.

Conclusions

1. In a nursery Colt rootstock was characterized by a big efficiency of the maiden sweet cherry trees of the following cultivars: 'Hardy Giant', 'Kordia', 'Lapins', 'Sumit' and 'Techlovan', but on the average significantly lower than Mazzard seedling.

2. The trees on Colt rootstock had a better formed crown than on Mazzard seedling.

3. In a nursery maiden sweet cherry trees on Colt rootstock grew generally stronger than on Mazzard seedling but the power of growth depended also on cultivar.

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WZROST SZEŚCIU ODMIAN CZEREŚNI NA PODKŁADKACH COLT I CZEREŚNI PTASIEJ (*PRUNUS AVIUM* L.) W SZKÓŁCE

S t r e s z c z e n i e

Badania przeprowadzono w latach 2001-2003, w dwóch cyklach produkcji jednorocznych okulantów czereśni odmian: ‘Burlat’, ‘Hardy Giant’, ‘Kordia’, ‘Lapins’, ‘Sumit’ i ‘Techlovan’. Porównywano w nich wzrost, wydajność i jakość okulantów otrzymanych na dwóch podkładkach: czereśnia ptasia i Colt. Okulanty czereśni istotnie silniej rosły i rozgałęziały się na podkładce Colt. Procentowa liczba okulantów spełniających wymagania Polskiej Normy PN-R-67010 była podobna dla obu podkładek.