

SŁAWOMIR ŚWIERCZYŃSKI, ALEKSANDER STACHOWIAK

## **EVALUATION OF A NURSERY USEFULNESS OF NEW ROOTSTOCK FOR ‘DELIKATES’ AND ‘ELSTAR’ APPLE CULTIVARS**

*From Department of Seed Science and Nursery Production  
The August Cieszkowski Agricultural University of Poznań*

**ABSTRACT.** In the nursery new rootstock for maiden apple tree was compared with standard rootstocks: M-9, P-2, M-26. The number of the obtained maiden apple trees of ‘Delikates’ on new rootstock was higher than on P-2 and M-9 rootstocks but lower than on M-26. There were no differences in this parameter between the examined rootstocks in case of ‘Elstar’ cultivar. The height of maiden apple trees of ‘Delikates’ and ‘Elstar’ on new rootstock was similar to the height on M-9. Maiden apple trees on new rootstock were significantly thicker than the ones obtained on other rootstocks. The average sum of the length of long shoots and their number on one maiden tree for the new observed rootstock was radically bigger than on M-9 and M-26 rootstocks. The consistency of the maiden apple trees with the Polish Rules did not differ significantly for all examined rootstocks.

**Key word:** new rootstock, maiden apple trees, efficiency, growth

### **Introduction**

Scientific research in the field of orchard nursery focus mainly on the search for new rootstocks that reduce the growth of the trees. The quality of the maiden trees obtained in a nursery is also a very serious problem. Such trees should have a formed crown, consisting of regularly placed 4-6 lateral shoots. The rootstock and the grafted cultivar, depending on their growth power, influence branching of the maiden trees. For intensive orchards, dwarf rootstocks giving the trees a weaker growth, are preferable. Maiden trees on weaker growing rootstocks generally ramify worse (**Jaumień et al. 1992, Słowiński and Sadowski 1996**).

In the experiment an introductory evaluation of a nursery usefulness of not yet examined rootstock for apple trees, was executed. The new rootstock obtained in Baranowo comes from a hybridization of ‘Antonówka’ cultivar and B-9 rootstock.

## Materials and methods

Experimental vegetable material constituted: P-2, M-9, M-26 rootstocks and new rootstock as well as scions of 'Delikates' and 'Elstar' apple tree cultivars. The experiment was executed in the system of complete random blocks, with four repetitions. In each of them 50 of the mentioned rootstocks were planted in spring. In the last decade of July they were budded with two apple tree cultivars. One-year-old maiden apple trees were obtained in two production cycles in the years of 1999-2002. For each combination observations and measures were made on 15 maiden trees growing in turn in rows. The number of obtained maiden trees was found in comparison with the number of the budded rootstocks. The height and the thickness of the trees was evaluated on the level of 30 cm above the ground. The length and number of lateral shoots longer than 20 cm was also determined. On the basis of these growth parameters of maiden trees their consistency with the Polish Rules PN-R-67010 was established. The statistical analysis of the obtained data was carried out with the help of STAT program, using Duncan test, at the probability level  $\alpha = 0.05$ .

## Results

New rootstock for apple was characterized by an average number of the obtained maiden apple trees of 'Delikates' cultivar in the nursery, significantly smaller compared with the results obtained on P-2 and M-9 rootstocks and bigger than the ones for M-26 (Table 1).

The height of maiden apple trees of 'Delikates' cultivar on new rootstock was similar to the height on M-9 but weaker than the growth on P-2 and M-26 rootstocks (Table 2). Maiden apple trees on new rootstock were thicker than the ones obtained on other rootstocks, which did not differ significantly (Table 2). The most ramified trees of 'Delikates' cultivar were obtained on the newly examined rootstock, which had on average 3.5 long shoots on one maiden tree. Weaker ramified trees were found on M-26 rootstock. The trees on P-2 and on M-9 were weakly ramified and no significant differences were detected between them (Table 2). The number of long shoots directly affected the sum of the length of long shoots. New rootstock had the biggest sum of the length of long shoots for one tree. This length was significantly bigger from the obtained on the other rootstocks, from which M-26 rootstock had significantly better ramified maiden trees comparing with the other two (Table 2).

One-year-old maiden apple trees of 'Delikates' cultivar produced on different rootstocks did not differ radically as far as their consistency with the Polish Rules is concerned (Table 1).

Maiden apple trees of 'Elstar' cultivar was observed on the same rootstocks as 'Delikates' cultivar, apart from P-2 rootstock. The efficiency of maiden apple trees in the nursery did not differ radically in the range of the three examined rootstocks (Table 1).

The height of the trees on new rootstock was not significantly smaller from the one obtained on semi-dwarf M-26 and not significantly bigger from the one noted on a dwarf rootstock M-9 (Table 3). Similarly as for the 'Delikates' cultivar radically the thickest maiden trees of 'Elstar' cultivar were obtained on new rootstock. The thickness

**Table 1**  
**Efficiency and compatible of maiden apple trees with Polish Standard PN-R-67010**  
**Wydajność i zgodność z Polską Normą PN-R-67010 okulantów jabłoni**

Cultivar Odmiana	Rootstock Podkładka	Percentage of obtained maiden apple trees Procent otrzymanych okulantów	Percentage of maiden apple trees compatible with Polish Standard PN-R-67010 Procent okulantów zgodnych z Polską Normą PN-R-67010
Delikates*	M-26	76.0 a**	88.8 a
	P-2	90.0 c	82.1 a
	M-9	88.0 c	82.4 a
	new rootstock nowa podkładka	83.0 b	84.0 a
Elstar	M-26	75.3 a	94.8 a
	M-9	70.4 a	94.0 a
	new rootstock nowa podkładka	75.1 a	93.6 a

\*Analyses of variability were calculated separately for each cultivar.

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

\*Dla każdej odmiany wykonano oddzielną analizę zmienności.

\*\*Średnie oznaczone tymi samymi literami nie różnią się między sobą istotnie na poziomie  $\alpha = 0,05$ .

**Table 2**  
**Growth and feathering of 'Delikates' maiden apple trees**  
**Wzrost i rozgałęzianie się okulantów jabłoni odmiany 'Delikates'**

Rootstock Podkładka	Height Wysokość (cm)	Thickness Grubość (mm)	Number of long shoots Liczba długopędów	Length of long shoots Długość długopędów (cm)
M-26	119.3 c*	11.6 a	2.1 b	60.9 b
P-2	115.9 bc	11.3 a	0.7 a	14.5 a
M-9	110.6 ab	11.2 a	0.4 a	10.6 a
New rootstock Nowa podkładka	106.3 a	14.2 b	3.5 c	93.5 c

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

\*Średnie oznaczone tymi samymi literami nie różnią się między sobą istotnie na poziomie  $\alpha = 0,05$ .

Table 3

**Growth and feathering of 'Elstar' maiden apple trees**  
**Wzrost i rozgałęzianie się okulantów jabłoni odmiany 'Elstar'**

Rootstock Podkładka	Height Wysokość (cm)	Thickness Grubość (mm)	Number of long shoots Liczba długopędów	Length of long shoots Długość długopędów (cm)
M-26	147.7 b*	12.5 a	2.5 a	91.0 a
M-9	134.8 a	11.7 a	2.3 a	53.6 a
New rootstock Nowa podkładka	144.0 ab	14.6 b	4.7 b	226.1 b

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

\*Średnie oznaczone tymi samymi literami nie różnią się między sobą istotnie na poziomie  $\alpha = 0,05$ .

of the trees on the two remaining rootstocks M-9 and M-26 did not differ significantly (Table 3). The average number of long shoots on one maiden tree for the newly observed rootstock was radically bigger from the one noted on M-9 and M-26 rootstocks, which did not differ significantly (Table 3). Also the newly examined rootstock had radically the biggest sum of the length of the long shoots for one maiden tree. From the remaining rootstocks not significantly longer long shoots had the stronger growing M-26 rootstock (Table 3).

One-year-old maiden apple trees of 'Elstar' cultivar, obtained on three different rootstocks, in more than 90% met the requirements of the minimum height and thickness intended in the Polish Rules. The consistency of the maiden apple trees with the rules did not differ significantly depending on the rootstock on which they were produced (Table 1).

## Discussion

Results obtained in the experiment confirmed the usefulness for production of trees cultivar 'Delikates' two rootstocks P-2 and M-9. The newly examined rootstock turned out to be not much worse, as far as the efficiency in the nursery is concerned. Its efficiency was high and amounted to 83%. The less useful rootstock for 'Delikates' cultivar was M-26, because of the smallest efficiency of maiden apple trees in the nursery. Taking this factor into consideration, one cannot observe the same preferences for 'Elstar' cultivar for which both M-26 and new rootstocks gave the biggest efficiency of maiden apple trees in the nursery. Less effective was M-9. A very similar number of the obtained maiden apple trees of 'Elstar' cultivar on M-9 (73.1%) and on M-26 (74.5%) was obtained by **Porębski** (1997).

The height of 'Delikates' maiden apple trees shows the weakening of the power of growth of this cultivar by using the new rootstock. From the examined, trees the shortest maiden trees were obtained on this rootstock. A similar reduction of the height of

maiden apple trees on the new rootstock was not found for the second apple tree cultivar 'Elstar'. The maiden apple trees of this cultivar on new rootstock had the middle height among the dwarf rootstock M-9 and semi-dwarf one M-26. The difference may come from the different power of growth of the apple tree cultivars examined in the experiment. The growth, especially of stronger growing cultivars, can be not lessened enough on new rootstock. The second parameter investigated in the experiment, the parameter of growth of maiden apple trees, confirms this thesis. Significantly the thickest maiden apple trees of the both examined apple tree cultivars were obtained on the new rootstock. The growth of maiden apple trees of 'Delikates' cultivar, stronger on P-2 rootstock than on M-9 confirms the classification of the power of growth of the rootstocks worked out by **Jakubowski** (1998). The diameter of the maiden apple trees of 'Elstar' cultivar on M-9 rootstock, obtained in the experiment, was similar to the one observed by **Śłowiński** and **Sadowski** (2001). These authors obtained yet the maiden apple trees higher by 15 cm on average. It can result from the different soil conditions. The power of growth on the individual rootstocks directly influenced the number and the length of long shoots calculated for one maiden apple tree. On the basis of their work other authors came to the same conclusion (**Jaumień et al.** 1992, **Śłowiński** and **Sadowski** 1996). They found out a convergence of a stronger growth on particular rootstocks with an inclination to ramification of the maiden apple trees, especially for the cultivars that ramify easily in a nursery. For 'Delikates' and 'Elstar' cultivars a bigger number of lateral shoots and their total length was noted on the rootstocks that give a stronger growth to maiden apple trees in a nursery. New rootstock was characterized by a significantly bigger number of long shoots for both examined cultivars and their total length. Similarly the trees of 'Delikates' cultivar obtained on M-26 rootstock were better ramified than the trees obtained on P-2 and M-9. An exception were the maiden apple trees of 'Elstar' cultivar, not differing much in the ramification degree on M-9 and M-26 rootstocks. It should be emphasized that new rootstock significantly stimulated the ramification of maiden apple trees of 'Delikates' and 'Elstar' cultivars. This fact is very important as far as the care for a better quality of one-year-old maiden apple trees. But a little weak point of this rootstock is too big power of growth of maiden apple trees growing on it. Of course it requires more studies on this rootstock both in a nursery and in an orchard. The rootstocks did not have a significant influence on the consistency of the obtained maiden apple trees with the Polish Rules requirements. Proportionally a bigger consistency of maiden apple trees with the Rules was noted for 'Elstar' cultivar, which connects with their more intensive growth.

## Conclusions

1. The efficiency of maiden apple trees on new rootstock for 'Delikates' was smaller than on P-2 and M-9 but bigger than on M-26. In case of 'Elstar' the significant difference were not observed.
2. The maiden apple trees of 'Delikates' and 'Elstar' on new rootstock were thicker than on other rootstocks but their height did not differ significantly.
3. The ramifying of maiden apple trees on new rootstock was the best.
4. The consistency of the maiden apple trees with the Polish Rules PN-R-67010 did not differ significantly for all examined rootstocks.

### References

- Jakubowski T.** (1998): Klasyfikacja siły wzrostu podkładek jabłoni. XXXVII Ogólnopolska naukowa konferencja sadownicza, ISiK Skierniewice, 25-27 sierpnia, sesja posterowa: 502-509.
- Jaumiń F., Czarnecki B., Mirtut T., Poniedziałek W.** (1992): Very similar effects of a mixture of GA3 and BA(6-benzylaminopurine) and of GA3+7 and BA on branching of some apple cultivars in nursery. *Acta Hort.* 329: 35-42.
- PN-R-67010. Wymagania jakościowe sadowniczego materiału szkółkarskiego. Dz.U. nr 108, poz. 1184, zał. nr 7, cz. 8.
- Porębski S.** (1997): Wpływ podkładki i terminu okulizacji na wzrost okulantów *Szkółkarstwo* 1: 12-14.
- Słowiński A., Sadowski A.** (1996): Wzrost i rozgałęzianie się drzewek trzech odmian jabłoni w szkółce w zależności od użytej podkładki. II Ogólnopolskie Sympozjum pt. „Nowe rośliny i technologie w ogrodnictwie”, AR Poznań, 17-19 września, Tom I: 262-265.
- Słowiński A., Sadowski A.** (2001): Performance of maidens and trees on M-9 subclones in the nursery and in the orchard. *Folia Hort.* 13/2: 41-46.

### OCENA PRZYDATNOŚCI SZKÓLKARSKIEJ NOWEJ PODKŁADKI POD ODMIANY JABŁONI ‘DELIKATES’ I ‘ELSTAR’

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

Celem pracy było stwierdzenie przydatności nowej podkładki do produkcji w szkółce okulantów jabłoni odmian ‘Delikates’ i ‘Elstar’. Nową podkładkę porównano z podkładkami: M-9, M-26 i P-2 dla odmiany ‘Delikates’ oraz M-9 i M-26 dla odmiany ‘Elstar’. Wydajność okulantów jabłoni odmiany ‘Delikates’ na nowej podkładce była istotnie mniejsza niż na podkładkach P-2 i M-9 oraz większa niż na podkładce M-26, natomiast u odmiany ‘Elstar’ wydajność ta była podobna na wszystkich rozpatrywanych podkładkach. Okulanty jabłoni odmiany ‘Delikates’ i ‘Elstar’ otrzymane na nowej podkładce miały podobną wysokość do wysokości stwierdzonej na podkładce M-9. Jednoroczne drzewka obu odmian na nowej podkładce były grubsze i istotnie lepiej rozgałęzione niż na pozostałych podkładkach. Zastosowane podkładki nie różnicowały istotnie zgodności otrzymanych w szkółce okulantów z normą PN-R-67010.