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USEFULNESS OF FIVE SOUR CHERRY CULTIVARS GRAFTED ON TWO DIFFERENT ROOTSTOCKS FOR COMMERCIAL ORCHARD

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ABSTRACT. Growth and yielding of ‘Łutówka’ as a control cultivar and four new cultivars of sour cherry trees on two rootstocks were observed in the years of 1997-2002. The growth of all new sour cherry tree cultivars was stronger than the growth of ‘Łutówka’. All examined cultivars grew much stronger on F 12/1 rootstock comparing to Mazzard seedling. A total crop of fruit was evaluated for all cultivars in the five following years. The crop of ‘Lucyna’ on both rootstocks was higher than the crop of ‘Łutówka’, but CEC was about twice lower. ‘Dradem’ had the biggest average mass of one fruit and ‘Sabina’ the smallest. The fruit of ‘Dradem’ and ‘Lucyna’ were the tastiest.

Key words: sour cherry, cultivars, rootstock, growth, yielding

Introduction

Poland is one of the main producers of sour cherry fruit in the world. The production of the fruit of this species amounted to 130 000 tons on average in the last years (Kubiak 2000). It is commonly known that genetic factors, among others the rootstock, affect the growth (Ugolik and Holubowicz 1990, Jadczyk 1994, Hrotkó and Simon 1996, Hrotkó et al. 1996), and yielding of sour cherry trees (Schmidt et al. 1983, Ludders 1986, Tylus et al. 1986, Jadczyk et al. 1992, Jadczyk 1994, Anderson et al. 1996, Hrotkó et al. 1996). In Poland there are very few cultivars of sour cherry trees that are important in the orchard production. In 1997 only few new ones were written into the Register of Varieties. The experiment was carried out in Agricultural Experimental Station in Baranowo to check their usefulness for a commercial production under Wielkopolska region’s conditions.

Material and methods

The experiments were carried out in 1997-2002. The trees were planted in spring of 1997 in a 4×2 m spacing. The experiment was executed in the system of complete random blocks, in four repetitions. Each cultivar was represented by 40 trees growing on two rootstocks: Mazzard seedling and F 12/1. Beside 'Łutówka', a control cultivar, four new cultivars of cherry trees were planted: 'Diament', 'Dradem', 'Lucyna' and 'Sabina'. 'Diament' cultivar was selected from the seedlings obtained from a hybridization of 'Northstar' and 'Łutówka' cultivars and it is recognized to early cultivars. It ripens about 10 days later than 'Northstar'. 'Dradem' cultivar is a hybrid of 'Łutówka' and 'Northstar'. Its fruits ripen later than the fruits of 'Diament' approximating time to 'Łutówka'. The last two cultivars: 'Lucyna' and 'Sabina' come from a hybridization of 'Łutówka' and 'Shirpotreb'. The first one ripens about 10 days earlier than 'Łutówka'. The second is an early cultivar ripening directly before 'Northstar'. Fructification of the trees was being evaluated in the five following years, starting from the second year after planting the trees into the ground. The fruits collected from every tree were weighed and then on the basis of a randomly checked samples a mass of 100 fruits was determined. The colour of the juice and the taste of fruits were defined in a four-grade scale:

5 – very good, a full bouquet of taste with an appropriate balance of sugars and acids, definitely dessert fruits,

4 – good, sweet-sour fruits, tasty,

3 – satisfactory, sour fruits,

2 – unsatisfactory, fruits too sour, bitter and tasteless.

In autumn of 2002, after the end of vegetation, a determination of circumferences of tree trunks at the level of 30 cm above the ground was executed. On the basis of these measurements a trunk cross-sectional area of the trees of particular cultivar was calculated. The results were confronted with the crop and the cropping efficiency coefficient was calculated (kg/cm^2). The significance of differences in a two-factor variance analysis (rootstocks, cultivars) was evaluated in Duncan test on the probability level $\alpha = 0.05$.

Abbreviations:

CEC – cropping efficiency coefficient,

TCSA – trunk cross-sectional area.

Results

The intensity of growth of the examined trees, expressed by TCSA was very differentiated (Table 1). In the sixth year from the year of planting, this parameter fluctuated in the range from 45.4 to 92.2 cm^2 on Mazzard seedling rootstock and from 48.5 to 104.9 cm^2 on F 12/1. The growth of every cultivar was better when they were growing on F 12/1 rootstock. Independently from the rootstock, the trees of all new cultivars were growing better than the trees of 'Łutówka'. Among all evaluated sour cherry trees the trees of 'Lucyna' on both rootstocks, were growing significantly stronger. The trees of 'Sabina' were growing significantly weaker. A medium power of growth characterized the trees of 'Dradem' and 'Diament', but the trees of 'Diament' on Mazzard seedling were growing definitely weaker. Their intensity of growth did not differ from the trees of 'Łutówka' on F 12/1 rootstock.

Table 1

The growth and yield of five sour cherry cultivars on two rootstocks
Wzrost i plonowanie pięciu odmian wiśni na dwóch podkładkach

Cultivar Odmiana	Rootstock Podkładka	Trunk cross-section area in 2002 Powierzchnia przekroju poprzecznego pnia w 2002 roku (cm ²)	Total crop in 1998-2002 (kg/tree) Suma plonów w latach 1998-2002 (kg/drzewo)	Productivity Współczynnik plenności (kg/cm ²)
Łutówka	<i>Prunus avium</i>	45.4 a*	44.8 a	0.99 d
	F 12/1	48.5 ab	49.1 abc	1.01 d
Diament	<i>Prunus avium</i>	54.6 b	50.3 abcd	0.92 cd
	F 12/1	63.3 c	55.8 cd	0.88 cd
Dradem	<i>Prunus avium</i>	62.4 c	47.4 ab	0.77 bc
	F 12/1	64.9 c	50.8 abcd	0.79 bc
Lucyna	<i>Prunus avium</i>	92.2 f	54.1 bcd	0.58 a
	F 12/1	104.9 g	56.3 d	0.53 a
Sabina	<i>Prunus avium</i>	73.3 d	50.6 abcd	0.69 ab
	F 12/1	80.0 e	53.8 bcd	0.67 ab

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

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

Total crop of particular cultivars in 1998-2002 is shown in Table 1. Comparing to 'Łutówka', a significantly bigger total crop from a tree on the same rootstocks was obtained from 'Lucyna'. Yielding of the other cultivars, which were the subject of the studies, did not differ significantly from 'Łutówka' in the range of the same rootstocks. The applied rootstocks did not affect the yielding of the examined cultivars.

The CEC of the individual cultivar, expressed by the crop counted over a 1 cm² of the surface of the TCSE did not differ significantly, as far as the applied rootstock is concerned (Table 1). None of the new sour cherry tree cultivar exceeded 'Łutówka' in this coefficient, for which the average value from the two rootstocks, amounted to 1.0 kg/cm².

The biggest average mass of one fruit was obtained for 'Dradem' and 'Diament' (Table 2). Among the examined cultivar, 'Lucyna' cultivar fruit had mass the same as 'Łutówka' fruit, 'Sabina' fruit mass was the smallest.

The best taste characterized the fruits of 'Dradem' and 'Lucyna'. The fruits of 'Diament' and 'Sabina' were worse in taste, but the worst taste characterized 'Łutówka' (Table 2).

Table 2

The characteristic of fruits
Charakterystyka owoców

Cultivar Odmiana	Average weight of one fruit Średnia masa jednego owocu (g)	Flavour of fruits Smak owoców (2-5)	Colour of juice fruits Zabarwienie soku owoców
Łutówka	5.2	3	ciemnoczerwony dark-red
Diament	6.2	4	czerwony red
Dradem	6.4	5	jasnoczerwony light-red
Lucyna	5.2	5	ciemnoczerwony dark-red
Sabina	5.0	4	ciemnoczerwony dark-red

Juice colour from ‘Lucyna’ and ‘Sabina’ fruits was similar to ‘Łutówka’ fruit juice. ‘Diament’ juice was lighter than the one from ‘Łutówka’ but ‘Dradem’ was described as a typical “glass” with light-red colour (Table 2).

Discussion

The results of growth of the trees of ‘Diament’ and ‘Dradem’ cultivars, expressed by TCSCA, correspond to the data published by **Maćkowiak** (1995). In the discussed experiment the strongest growing cultivar on both rootstocks were ‘Lucyna’ and ‘Sabina’. It is consistent with a pomological description of these cultivars made by **Grzyb** and **Rozpara** (1998), who characterized them as a strong growing ones. The trees of ‘Lucyna’ and ‘Sabina’, because of their strong power of growth, should be planted in a bigger spacing than ‘Łutówka’. The control cultivar, which was growing the weakest in comparison with all examined sour cherry trees cultivar, grew stronger on F 12/1 rootstock. Similarly, a stronger growth of ‘Łutówka’ on F 12/1 rootstock was obtained by **Borkowska** (1998) in the seventh year after planting. A quite opposite result was obtained by **Ugolik** and **Holubowicz** (1988, 1989). In their experiments they found that a bigger TCSCA characterized the trees of ‘Łutówka’ on Mazzard seedling.

The CEC of ‘Diament’ obtained in the experiment, similar to ‘Łutówka’, contradicts the assertion of **Grzyb** and **Rozpara** (1998) about its average yielding. But the assertion of the above mentioned authors concerning ‘Dradem’ cultivar and characterizing it as a fruitful one, found its confirmation in this paper. In the discussed experiment these cultivars yielded on the level, which was not different from the control ‘Łutówka’ cultivar. Similar crops of the three discussed above cultivars, were obtained also by **Maćkowiak** (1995). Significantly bigger crop from ‘Łutówka’ cultivar was obtained from ‘Lucyna’. It confirms the opinion of **Grzyb** and **Rozpara** (1998), who recommend

this cultivar for commercial planting. 'Sabina' cultivar yielded on the same level than the control 'Łutówka', which makes the first one preferable for amateur cultivation because of the fruits that are very hard to tear off a stalk (**Grzyb** and **Rozpara** 1998). 'Łutówka' yielded a little bit better on F 12/1 rootstock. It is consistent with **Borkowska** observation (1998), who also obtained better fruitfulness of 'Łutówka' on this rootstock.

The highest CEC obtained by the control cultivar was mainly caused by a small TCSA of this cultivar. It did not differ significantly depending on the applied rootstock. It does not confirm **Borkowska's** experiment (1998), where a better TCSA was found for Mazzard seedling. 'Diament' cultivar budded on Mazzard seedling is suitable for intensive sour cherry trees orchards, because has high CEC. It should be planted in the same spacing as 'Łutówka'. 'Dradem' cultivar, which is characterized by CEC similar to the one of 'Diament', is also worth recommendation for cultivations, especially amateur ones. Taking into consideration the results of the obtained CEC of 'Sabina' and 'Lucyna' cultivars, really worse from 'Łutówka', they can't be recommended for intensive orchard.

In the discussed experiment the biggest average mass of one fruit was found for 'Dradem' cultivar. Also **Grzyb** and **Rozpara** (1998) characterized the fruits of this cultivar as big with an average mass 6-6.5 g. The mass was similar to the one found by **Maćkowiak** (1995). He obtained also a similar result of a one fruit mass for 'Diament' cultivar. The value noted for 'Lucyna' and 'Sabina' was a little bit bigger than the results obtained by **Grzyb** and **Rozpara** (1998). High estimation of the taste of 'Dradem' fruit pulp has confirmed the opinion of **Maćkowiak** (1995), who recognized this cultivar as an outstandingly dessert one. Because of its taste, it is suitable for amateur cultivation through the whole country. The colour of the juice from 'Dradem' fruits, obtained by the authors and by **Maćkowiak** (1995) enables to state that it is a typical "glass".

Conclusions

1. A new cultivar of 'Diament' sour cherry tree was characterized by a moderate growth, abundant yielding, high CEC – similar to 'Łutówka' and big fruits.
2. 'Dradem' cultivar is a typical "glass" with big, dessert fruits, medium intensity of growth and good yielding.
3. 'Lucyna' is a cultivar with a very big power of growth and abundant yielding – bigger than 'Łutówka', tasty fruits but a very low CEC.
4. The sour cherry trees of 'Sabina' cultivar were growing strongly, they yielded well and had an average CEC.

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PRZYDATNOŚĆ PIĘCIU ODMIAN WIŚNI ZASZCZEPIONYCH NA DWÓCH PODKŁADKACH DO PRODUKCJI TOWAROWEJ W SADZIE

Streszczenie

W latach 1997-2002 obserwowano wzrost i plonowanie drzew wiśni odmiany 'Łutówka' jako odmiany kontrolnej oraz czterech nowych odmian wiśni zaszczepionych na dwóch podkładkach. Wzrost drzew wszystkich nowych odmian wiśni był silniejszy niż odmiany 'Łutówka'. Wszystkie badane odmiany wiśni rosły silniej na podkładce F 12/1 niż na podkładce czereśni ptasiej. Sumaryczny plon odmiany 'Lucyna' na obu podkładkach był większy od plonu odmiany 'Łutówka', natomiast produktywność drzew odmiany 'Lucyna' była około dwukrotnie mniejsza od standardu. Odmiana 'Dradem' miała największą przeciętną masę jednego owocu, a odmiana 'Sabina' najmniejszą. Owoce odmiany 'Dradem' i 'Lucyna' były najsmaczniejsze.