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THE EFFECT OF ROOTSTOCKS ON THE GROWTH AND YIELDING OF SOUR CHERRY CV. 'ŁUTÓWKA'

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Summary

The strength of growth of 'Łutówka' trees was related to the soil quality and the rootstock. Measurements of the tree trunks and the crown size showed that on fertile soil the trees grafted on Mahaleb cherry grew worse, forming by 12% thinner trunks and by over 20% (significantly) smaller crowns as compared to Mazzard cherry trees. On poor sandy-loamy soil the crowns of trees grafted on Mahaleb were significantly, more than 40% bigger than those on Mazzard cherry. No significant differences in the yielding and productivity of trees grafted on Mahaleb and Mazzard cherry trees were found on grey brown podzolic soil. The experiment conducted on sandy-loamy soil pointed to significant differences in the yielding and productivity between 'Łutówka' trees grafted on the studied rootstocks. The trees grafted on Mahaleb cherry in both studied years were characterized by significantly greater productivity than on the other rootstocks. Significantly higher yields were gathered from the trees on Mahaleb cherry than on vegetative rootstocks, and by 70% higher than on Mazzard cherry. P-HL A rootstock is of little use in the planting of 'Łutówka', which grown poorly on light soils. Besides poor growth and yielding, in longer dry periods the studies found the appearance of chlorosis of magnesium on older leaves, and even wilting of the leaves.

Key words: sour cherry, rootstocks, soil, growth, yielding

INTORODUCTION

Poland is the biggest producer of sour cherry fruit in the European Union (Makosz, 2006).

High yields and success in developing the fruit production were affected by the proper choice of cultivars, improvement of the production technology and intensification of production objects performed through increased density of planting (Grzyb and Gronek, 1991; Rozpara, 1995; Krawiec, 2000; Mika et al. 2000; Horotko, 2005).

Despite numerous papers estimating the production value of rootstocks (Funk, 1969; Grzyb at al. 1987, Grzyb and Kolbusz, 1989, Ugolik et al. 1993; Selwa et al. 1994; Perry et al. 1996; Dencker and Toldam-Andersen, 2005; Nyeki and Szabo, 2005), there is still lack of information on the choice of rootstocks in different habitat conditions.

The purpose of the studies was to estimate the usefulness of rootstocks in different habitat conditions.

MATERIALS AND METHODS

The studies were conducted in the years 2004-2006 in two production orchards. The orchard belonging to Mr Trześniewski at Strączkowo in Samborzec commune was planted on grey-brown podzolic soil of II valuation class. The experiment in the orchard belonging to Mr Henryk Warsiński at Janów of Ożarów commune was set up on sandy loamy soil included in IVb valuation class (I class – the best soil, V class – the poorest soil).

The experimental material were the trees of 'Łutówka'.

The experiment was established in a scheme of random blocks. They included 2 or 5 combinations in 5 replications. The replications were the plots where 3 trees grew on each. The experimental combinations at Strączków were 'Łutówka' trees grafted on Mahaleb cherry and Mazzard cherry planted in 2001. On the other hand, the trees of 'Łutówka' grafted on the seedlings of Mahaleb and Mazzard cherry and on vegetative rootstocks Colt and P-HL A and F 12/1 were planted in Janów in 2001.

In both experiments the trunk diameter was measured at the height of 30 cm, and the width and height of the tree crowns were measured. The yield from each tree was weighed. The area of the cross-section of the trunks, the cubic content of the crowns and the productivity of trees and crowns were calculated on the basis of these studies.

Results of studies were statistically analyzed using variance analysis and Tukey's confidence intervals.

RESULTS AND DISCUSSION

In the case of the orchard on grey–brown podzolic soil 'Łutówka' trees grafted on Mazzard cherry formed thicker trunks and bigger crowns than on Mahaleb cherry. Significant differences between rootstocks were shown only for the size of the crown. Similar results were obtained by Tylus et al. (1986) and Selwa et al. (1994).

Table 1
Influence of rootstocks and kind of soil on growth of the trees of sour cherry cultivar 'Łutówka' in 2004-2006.

Rootstocks	Trunk cross section area in cm^2						
	Sandy loamy soil			Grey-brown podzolie soil			
	2004	2005	Percent to Mazzard	2004	2005	2006	Percent to Mazzard
1. Mazzard	29.4 ab	39.7 ab	100	29.0	43.3	54.6	100
2. Mahaleb	29.3 ab	36.4 b	92	27.9	37.4	48.3	88
3. PHL–A	17.5 c	27.3 c	69	–	–	–	–
4. F 12/1	25.2 b	40.2 ab	101	–	–	–	–
5. Colt	32.7 a	43.1 a	109	–	–	–	–
LSD p=0.05	7.2	6.5	–	ns	ns	ns	–

Measurements of the trees growing on sandy loamy soil did not show any significant differences in the trunk thickness between the trees grafted on the above mentioned two rootstocks, but the tree crowns on Mahaleb cherry were significantly, by 41% bigger than on Mazzard cherry. In the discussed habitat conditions the trees grafted on P-HL A grew significantly worse. The trees grafted on Colt rootstock grew more strongly than on the seedlings of Mazzard cherry. 'Łutówka' on F 12/1 vegetative rootstock did not significantly differ with the trunk thickness and the crown volume from the trees on Mazzard cherry. This confirms the observations made by Rozpara (1995).

Table 2
Influence of rootstocks on size of crown of sour cherry cultivar 'Łutówka' in 2004-2006.

Rootstocks	Volume of the crowns in m^3				
	Sandy loamy soil		Grey-brown podzolie soil		
	2005	Percent to Mazzard	2004	2005	2006
1. Mazzard	2.51 b	100	1.4a	2.2 a	3.5 a
2. Mahaleb	3.54 a	141	1.1b	1.6 b	2.8 b
3. PHL A	1.23 c	49	–	–	–
4. F 12/1	1.97 bc	78	–	–	–
5. Colt	2.86 ab	114	–	–	–
LSD p=0.05	0.9	–	0.2	0.3	0.5

The accessible literature does not provide any data on the effect of P-HL rootstock on the growth of sour cherry trees. Perry et al. (1996), conducting studies on sandy-loamy soil, pointed to a much stronger growth of 'Montmorency' cv. cherry on Colt rootstock as compared to Mazzard and Mahaleb cherry trees.

Table 3
Influence of rootstocks on yielding of sour cherry cultivar 'Łutówka'.

Rootstocks	Yield from tree in kg								
	Sandy loamy soil				Grey-brown podzolie soil				
	2004	2005	$\bar{x}$	% to Mazzard	2004	2005	2006	$\bar{x}$	% to Mazzard
1. Mazzard	10.6 b	3.7 ab	7.1	100					
2. Mahaleb	18.2 a	6.0 a	12.1	170	3.0	7.7	15.0	8.6	100
3. PHL A	5.3 c	1.7 b	3.5	49					
4. F 12/1	8.7 bc	2.3 b	5.5	78	3.0	7.1	12.8	7.6	89
5. Colt	9.1 bc	3.1 b	6.1	86					
LSD p=0.05	4.8	2.8	–	–	ns	ns	ns	–	–

Trees on Mazzard cherry on fertile soil gave a yield on average by 10% higher than on Mahaleb. No significant differences between the rootstocks were shown in particular years. Fruiting of the trees grafted on Mahaleb cherry planted on poorer soil was by about 70% higher than on Mazzard cherry. In 2004 the differences between these rootstocks were significant. 'Łutówka' trees grafted on vegetative rootstocks yielded worse than on the seedlings. The differences between the yielding of trees on Mahaleb cherry and the three studied vegetative rootstocks proved to be significant.

Different views were found in the literature on the subject about the effect of Mahaleb and Mazzard cherry trees on the yielding of sour cherries. Ugolik et al. (1993) and Perry et al. (1996) found out, like in the present studies conducted on poor soil, much better yielding of trees on Mahaleb as compared to Mazzard cherry. On the other hand, Tylus et al. (1996); Grzyb and Gronek (1991); Selwa et al. (1994) and Grzyb et al. (1987) obtained much better yields on Mazzard cherry than on Mahaleb. A similar tendency was observed in the present studies conducted in the orchard on fertile soil.

Rozpara (1995) reports a differentiated scheme of yields in the experiments comparing the fruiting of sour cherry on F 12/1 rootstock and on the seedlings of Mazzard cherry in different habitat conditions. In Albigowa and Sinołęka the trees of 'Łutówka' yielded a little better on the seedlings, like in the present experiment, while in Przybroda slightly higher yields were obtained on F 12/1.

In the case of trees grafted on P-HL A in summer the studies observed considerable intensification of the symptoms of chlorosis of magnesium leading to premature falling of the leaves from the lower part of one-year-old shoots.

Table 4
Influence of rootstocks on efficiency of sour cherry cultivar 'Łutówka'.

Rootstocks	Efficiency of trees in kg×cm^2				
	Sandy loamy soil		Grey-brown podzolie soil		
	2004	2005	2004	2005	2006
1. Mazzard	0.36 b	0.09 b	0.01	0.18	0.27
2. Mahaleb	0.62 a	0.16 a	0.01	0.19	0.26
3. PHL A	0.30 b	0.06 b			
4. F 12/1	0.34 b	0.06 b			
5. Colt	0.28 b	0.07 b			
LSD p=0,05	0.12	0.04	ns	ns	ns

No significant differences in the productivity of trees grafted on the seedlings of Mahaleb and Mazzard cherry trees were observed in the orchard growing on fertile soil. On the other hand, significantly greater productivity of the trees grafted on Mahaleb was observed as compared to the other rootstocks.

The present studies will be continued with the aim of studying the planting at full fruiting.

CONCLUSIONS

1. The strength of growth of 'Łutówka' trees was related to the soil quality and the rootstock. Measurements of the tree trunks and the crown size showed that on fertile soil the trees grafted on Mahaleb cherry grew worse, forming by 12% thinner trunks and by over 20% (significantly) smaller crowns as compared to Mazzard cherry trees. On poor sandy-loamy soil the crowns of trees grafted on Mahaleb were significantly, more than 40% bigger than those on Mazzard cherry.
2. Trees of P-HL A on sandy-loamy soil grew significantly worse as compared to the trees on the seedlings and Colt rootstock.
3. No significant differences in the yielding and productivity of trees grafted on Mahaleb and Mazzard cherry trees were found on grey–brown podzolic soil.
4. The experiment conducted on sandy-loamy soil pointed to significant differences in the yielding and productivity between 'Łutówka' trees grafted on the studied rootstocks. The trees grafted on Mahaleb cherry in both studied years were characterized by significantly greater productivity than on the other rootstocks. Significantly higher yields were gathered from the trees on mahaleb cherry than on vegetative rootstocks, and by 70% higher than on Mazzard cherry.
5. P-HL A rootstock is of little use in the planting of 'Łutówka' cv., which grown poorly on light soils. Besides poor growth and yielding, in longer dry periods the studies found the appearance of chlorosis of magnesium on older leaves, and even wilting of the leaves.

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Wpływ podkładek na wzrost i plonowanie wiśni odmiany 'Łutówka'

Streszczenie

Siła wzrostu drzew Łutówki zależała od jakości gleby i podkładki. Pomiary grubości pni i wielkości koron wykazały, że na żyznej glebie drzewa okulizowane na antypce rosły słabiej tworząc o 12% cieńsze pnie i o ponad 20% (istotnie) mniejsze korony niż na czereśni ptasiej. Na słabej glebie piaszczysto-gliniastej korony drzew okulizowanych na antypce były istotnie, o ponad 40% większe niż na czereśni ptasiej. Na glebie płowej nie stwierdzono istotnych różnic plonowania i produktywności drzew okulizowanych na czereśni ptasiej i antypce. W doświadczeniu wykonanym na glebie piaszczysto-gliniastej wykazano istotne różnice plonowania i produktywności między drzewami Łutówki, okulizowanymi na badanych podkładkach. Drzewa okulizowane na antypce w obydwu

latach badań charakteryzowały się istotnie wyższą produktywnością niż na pozostałych podkładkach. Z drzew na antypce zebrano istotnie wyższe plony niż na podkładkach wegetatywnych a także o 70% wyższe niż na czereśni ptasiej. Podkładka P-HL A jest mało przydatna do nasadzeń słaborosnącej odmiany Łutówka na glebach lekkich. Oprócz słabego wzrostu i plonowania drzew stwierdzono pojawianie się w dłuższych okresach suszy chlorozy magnezowej na starszych liściach a nawet więdnięcia liści.