

THE EFFECT OF ROOTSTOCK ON THE GROWTH AND YIELDING OF CULTIVAR ‘KORDIA’ SWEET CHERRY TREES

Stanisław Wociór

Agricultural University in Lublin

Abstract. The studies conducted in the years 2004–2006 in a production orchard in the habitat conditions of the Sandomierska Upland showed that the trees budded on the seedlings of wild cherry grew more strongly than on Colt rootstock. No significant differences were observed between the rootstocks as for the trunk thickness and the crown size of young trees planted in 2001. In the group of trees planted in 1996, which were in the period of full fruiting, the crowns of trees budded on wild cherry were significantly bigger than on Colt rootstock. No significant differences were found out in the yielding of trees on wild cherry and Colt rootstock. Considerable differences in the yielding between the studied years in the group of young trees with systematic increase was effected by increase of crown. ‘Kordia’ cv. is a valuable cultivar for Sandomierska Upland. It begins late the fruiting period (the first commercial yield in the fifth year after planting); however, it gives attractive fruits and high productivity of trees.

Key words: sweet cherry, rootstock, yielding, growth

INTRODUCTION

Sweet cherry is an excellent dessert fruit. The popularity of the cultivation of this species is increasingly growing, both in Poland and whole world [Makosz 2007].

The shortcomings of sweet cherry that are commonly known in science [Kemp and Wertheim 1996, Callsen 1998, Grzyb et al., 1998, Grzyb 1999, Rozpara 2000, Battistini and Battistini 2005, Stehr 2005] and in practice include very strong growth of the trees, failure in fructification and considerable sensitivity to frost.

Perry et al. [1996], Wertheim et al. [1998] and Webster [1998] believe that the worldwide program of estimating rootstocks under cherries will bring more information on the usefulness in the planting practice of the accessible and the new breeding material in different environmental conditions.

Corresponding author – Adres do korespondencji: Stanisław Wociór, Department of Seed Production and Nurseries, Agricultural University in Lublin, 58 Leszczyńskiego Street, 20-068 Lublin, e-mail: stanislaw.wocior@ar.lublin.pl

The purpose of the present studies was to estimate the growth and yielding of trees 'Kordia' cv. on two rootstocks in the area of the Sandomierska Upland.

MATERIAL AND METHODS

The studies were conducted in the years 2004-2006 in a productive orchard belonging to Kazimierz Trzeźniewski and situated in Strączkowo of Samborzec commune. The experimental material included the sweet cherry trees of 'Kordia' cv. budded on a vegetative rootstock Colt and the seedlings of wild cherry. The trees were planted at the spacing of 5×3 m on grey brown podzolic soil belonging to III valuation class with pollinator cv. 'Regina'. The experiment was done in the same orchard and established in a scheme of completely randomized blocks. It included 4 combinations in 5 replications. The combinations were the trees grafted on Colt rootstock and on wild cherry planted in the spring of 1996 and 2001. The repetitions were the plots where 3 trees grew on each.

The following measurements and observations were performed in the experiment.

In spring and autumn of the years 2004–2006 the trunk diameters were measured at the height of 30 cm above the ground. The diameter and height of the crowns were measured at the above mentioned dates. In the period of three years the yield from each tree was weighed. The fruit mass and the number of fruits cracking in the period of ripening was estimated on the basis of a sample of 100 fruits. The area of the cross-section of the trunks, the cubic content of the crowns ($\pi r^2 h \times 3^{-1}$), the productivity of the trees and crowns as well as the mean fruitmass and percentage of fruit of lowered quality due to the cracking of the pericarp were calculated on the basis of the above mentioned measurements.

The results were statistically analyzed using variance analysis and Tukey's confidence intervals at the significance level of 5%.

RESULTS AND DISCUSSION

In the conditions of the Sandomierska Upland the trees budded on the seedlings of wild cherry grew more strongly than those on Colt vegetative rootstock.

In the case of trees planted in 2001 and in 1996, the studies found out no significant differences between the rootstocks. The wild cherry trees had thicker trunks than those planted on Colt rootstock. Throughout the period of studies the crowns of this group of trees budded on wild cherry were bigger than on Colt rootstock but only from trees planted in 1996 this differences were significant. Similar results were obtained by Stehr [2005]. Battistini and Battistini [2005] achieved greater strength of the trees' growth on rootstock SL 64 as compared to Colt. On the other hand, Perry et al. [1996] found out considerably stronger growth of trees on Colt rootstock in comparison to wild cherry.

Table 1 and 2 presents the percentage of increasing dimensions of trees in the period of three years. It was shown that in the case of young trees the increase of the trunk thickness and the crown dimensions in the period of three years was about twice as big as in older trees.

Table 1. Influence of rootstocks on growth of the sweet cherry cv. 'Kordia' in different age of the trees in 2003–2006

Tabela 1. Wpływ podkładek na wzrost czereśni odmiany 'Kordia' w różnym wieku drzew w latach 2003–2006

Combinations Kombinacje	Trunk cross section area in cm ² Powierzchnia przekroju poprzecznego pnia w cm ²			Increased of TCSA in % Wzrost PPPP w %
	2004	2005	2006	2006/2004
	1. 'Kordia' on Colt Trees planted in 2001	22.6b	31.6b	38.5b
2. 'Kordia' on Mazzard Seedling Trees planted in 2001	25.6b	36.6b	51.8b	202
3. 'Kordia' on Colt Trees planted in 1996	186.9a	206.0a	225.3a	120
4. 'Kordia' on Mazzard Seedling Trees planted in 1996	194.2a	214.2a	229.5a	118

Table 2. Influence of rootstock on size of crown of the sweet cherry cv. 'Kordia' in different age of the trees in 2004–2006

Tabela 2. Wpływ podkładek na wielkość koron czereśni odmiany 'Kordia' w 2004–2006

Combinations Kombinacje	Volume of crown in m ³ Objętość korony w m ³			Increased crown in % Powiększenie koron w %
	2004	2005	2006	2006/2004
	1. 'Kordia' on Colt Trees planted in 2001	1.3c	3.2c	4.8c
2. 'Kordia' on Mazzard Seedling Trees planted in 2001	1.5c	3.6c	5.2c	347
3. 'Kordia' on Colt Trees planted in 1996	9.1b	15.4b	17.0b	187
4. 'Kordia' on Mazzard Seedling Trees planted in 1996	10.6a	17.1a	18.4a	174

The studies on the size of the yield from a tree did not show any significant differences between the rootstocks for any age group.

'Kordia' cv. trees started the fructification period late on both rootstocks. Practically, the first commercial yield of about 5 kg from a tree was gathered only in the fifth year after planting. In the case of trees planted in 2001 the yield significantly increased in each year. In the group of older trees differences between the years were not significant. Depended of the age of trees it was harvested 4 to 25.3 tons of fruits from 1 ha of orchard. Fruit mass ranged from 8.0–8.8 g. Fruits harvested from older trees were smoler, but no significant differences were found between the rootstocks or the age groups.

The accessible literature provides differentiated results of estimating the effect of Colt rootstock on sweet cherry yielding. Grzyb et al. [1998] report that 'Burlat' cv. gave more abundant yields on Colt rootstock as compared to wild cherry, while 'Büttnera Czerwona' yielded worse in identical conditions on Colt rootstock. In the conditions of

North Germany the yielding of 'Regina' cv. on Colt rootstock was much worse than on the cherry seedlings. In the conditions of the Sandomierska Upland the studies found out no significant differentiation of the yield of 'Kordia' between the rootstocks either in young trees or in those that were at full fructification.

Table 3. Influence of rootsock on yielding of the sweet cherry cv. 'Kordia' in different age of the trees in 2004–2006

Tabela 3. Wpływ podkładek na plonowanie drzew czereśni odmiany 'Kordia' w latach 2004–2006

Combinations Kombinacje	Yield from tree in kg Plon z drzewa w kg				Mean yield from 1 ha in t Średni plon z 1 ha w t	Mean fruit mass in g Średnia masa owoców w g
	2004	2005	2006	\bar{x}		
1. 'Kordia' on Colt Trees planted in 2001	2.5b	5.5b	10.4b	6.1	4	8.6a
2. 'Kordia' on Mazzard Seedling Trees planted in 2001	2.4b	5.7b	10.1b	6.1	4	8.8a
3. 'Kordia' on Colt Trees planted in 1996	40.3a	37.8a	36.1a	38.1	25.3	8.0a
4. 'Kordia' on Mazzard Seedling Trees planted in 1996	34.4a	34.2a	34.4a	34.3	22.8	8.2a

Table 4. Influence of rootsock on productivity of the sweet cherry cv. 'Kordia' in 2004–2006

Tabela 4. Wpływ podkładek na produktywność drzew czereśni odmiany 'Kordia' w latach 2004–2006

Combinations Kombinacje	Productivity of the tree in $\text{kg}\times\text{cm}^{-2}$ Produktywność drzew w $\text{kg}\times\text{cm}^{-2}$				Productivity of the crown in $\text{kg}\times\text{m}^{-3}$ Produktywność koron w $\text{kg}\times\text{m}^{-3}$			
	2004	2005	2006	\bar{x}	2004	2005	2006	\bar{x}
1. 'Kordia' on Colt Trees planted in 2001	0.11c	0.17a	0.27a	0.18	1.4b	1.7ab	2.2a	1.9
2. 'Kordia' on Mazzard Seedling Trees planted in 2001	0.09c	0.16a	0.14b	0.15	1.6b	1.6b	1.9a	1.7
3. 'Kordia' on Colt Trees planted in 1996	0.22a	0.18a	0.16b	0.19	4.4a	2.4a	2.1a	3
4. 'Kordia' on Mazzard Seedling Trees planted in 1996	0.18b	0.16a	0.15b	0.16	3.2a	2.0ab	1.9a	2.4

Productivity of trees and crowns on Colt rootstock was slightly bigger than on wild cherry. Significant differences between the rootstocks were shown for young trees only in the 2006 year and for older one in 2004. In the case of young trees a growing tendency was observed for productivity. The productivity of trees and crowns in an older orchard growing nearby in the same habitat conditions showed a decreasing tendency.

In the years 2004–2006 the quantity of fruits cracking in the period of ripening ranged from 0.6 to 2.4%. No significant differences were found between the rootstocks or the age groups.

CONCLUSIONS

1. 'Kordia' cv. trees budded on wild cherry grew more strongly than on Colt rootstock. No significant differences between the rootstocks were shown for the trunk thickness or the volume of the crowns of young trees planted in 2001. In the group of trees planted in 1996, which were at full fructification the crowns of trees budded on wild cherry were significantly bigger than on Colt rootstock.

2. Young trees increased the trunk thickness and the crown size about twice as fast as those at full fruiting.

3. In the examined conditions no significant differences in the yielding of trees and the fruit mass on wild cherry and Colt rootstock were found out.

4. 'Kordia' cv. is a valuable cultivar for production planting in the Sandomierska Upland. It begins late the fruiting period (the first commercial yield in the fifth year after planting); however, it gives attractive fruits, resistant to bursting in the rain. 'Kordia' cv. yielded abundantly on both examined rootstocks. The trees on Colt rootstock characterized higher productivity than on sweet cherry.

REFERENCES

- Battistini A., Battistini G., 2005. Semi-Dwarfing Cherry rootstocks for dry condition. *Acta Hort.*, 667, 89–190.
- Callsen O., 1998. Recent developments in cherry rootstock research. *Acta Hort.*, 468, 219–227.
- Grzyb Z.S., 1999. Rola podkładki i wstawki w regulowaniu wzrostu i owocowania drzew czereśni. *Zesz. Nauk. AR Kraków*, 351, 66, 11–21.
- Grzyb Z.S., Sitarek M., Guzowska-Batko B., 2005. Results of sweet cherry rootstock trial in Northern Poland. *Acta Hort.*, 667, 207–210.
- Grzyb Z.S., Sitarek M., Lis J., 2000. Wzrost i owocowanie czereśni szczepionych na różnych podkładkach wegetatywnych. *Rocz. AR Poznań CCCXXIII, Ogrodnictwo*, 31, 51–56.
- Grzyb Z.S., Sitarek M., Omiecińska B., 1998. Growth and fruiting of sweet cherry cultivars on dwarfing and vigorous rootstocks. *Acta Hort.*, 468, 333–338.
- Kemp H., Wertheim S. J., 1996. First results of two international cherry. *Acta Hort.* 410, 167–176.
- Makosz E., 2007. Szanse rozwoju polskiego sadownictwa. *Plantpress Kraków*, 50–51.
- Perry R.L., Runkel J.L. and Longstroth M.A., 1996. The effects of rootstock on the performance of 'Hedelfingen' and 'Montmorency' cherry in Michigan, USA. *Proc. Intl. Cherry Sym. Acta Hort.*, 410, 257–263.
- Rozpara E., 2000. Czereśnia. *Zesz. Pomolog. Inst. Sadow. Kwiac. Skierniewice*.
- Stehr R., 2005. Experiences with dwarfing sweet cherry rootstocks in Northern Germany. *Acta Hort.*, 667, 173–177.
- Webster A.D., 1998. Strategies for controlling the size of sweet cherry trees. *Acta Hort.*, 468, 229–240.
- Wertheim S.J., Balkhoven J.M.T., Callsen O., Vercammen J., Ystaas J. and Vestreheim S., 1998. Results of two international cherry rootstock trials. *Acta Hort.* 468, 249–264.

WPŁYW PODKŁADKI NA WZROST I PLONOWANIE DRZEW CZEREŚNI ODMIANY 'KORDIA'

Streszczenie: Badania wykonane w latach 2004–2006 w sadzie produkcyjnym w warunkach siedliskowych Wyżyny Sandomierskiej wykazały, że drzewa okulizowane na siewkach czereśni ptasiej rosły silniej niż na podkładce Colt. Nie wykazano istotnych różnic między podkładkami dla grubości pni i objętości koron drzew młodych sadzonych w 2001 r. W grupie drzew sadzonych w 1996 r., będących w pełni owocowania korony drzew okulizowanych na czereśni ptasiej były istotnie większe niż na podkładce Colt. W badanych warunkach nie wykazano istotnych różnic plonowania drzew na czereśni ptasiej i podkładce Colt. Odmiana 'Kordia' jest bardzo wartościową odmianą do nasadzeń produkcyjnych na Wyżynie Sandomierskiej. Wchodzi ona dosyć późno w okres owocowania (pierwszy plon handlowy w 5 roku po posadzeniu), daje jednak atrakcyjne owoce, odporne na pęknięcie na deszczu. Odmiana 'Kordia' plonowała obficie na obydwu badanych podkładkach, wykazując wysoką produktywność drzew.

Słowa kluczowe: czereśnia, podkładka, plonowanie, wzrost

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