THE EFFECT OF THE 'NORTHSTAR' INTERSTEM ON THE GROWTH, YIELDING AND FRUIT QUALITY OF FIVE SWEET CHERRY CULTIVARS

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A B S T R A C T

The experiment was carried out during 1995-2003 on a grey-brown podzolic soil in the Experimental Orchard in Dąbrowice (central Poland). The influence of the 'Northstar' interstem on the growth, yielding and fruit quality of five sweet cherry cultivars: 'Burlat', 'Vega', 'Kordia', 'Büttner's Red' and 'Merton Premier' was investigated. Two lengths of the interstem, 50 and 70 cm, were compared. The dwarfing effects of the interstem were compared with the dwarfing effects of the 'P-HL A' rootstock. Trees of each cultivar grafted directly on *Prunus avium* L. seedlings without the interstem served as the control. It was found that the growth of all the trees with the 'Northstar' interstem was significantly weaker than that of the control trees. The use of the 'Northstar' interstem for sweet cherry trees induced early fruit bearing and increased the yields of all the cultivars except 'Burlat'. The trees of this cultivar grafted on the 'Northstar' interstem had the trunk cross-section area several times smaller than the control, yielded very poorly, produced small fruit and had yellow leaves each year. These results indicate acute symptoms of incompatibility between the 'Northstar' interstem and the cultivar 'Burlat'. However, 'Northstar' proved to be a good interstem for 'Vega', 'Kordia', 'Büttner's Red' and 'Merton Premier'.

Key words: seeet cherry rootstock, interstem, cultivar, tree growth, yield, fruit quality

INTRODUCTION

Weakly growing trees are still preferred for intensive sweet cherry production in Poland. In previously conducted research, it was observed that the 'P-HL A' rootstock significantly reduced tree growth of a number of sweet cherry cultivars and increased their productivity in comparison with Mazzard seedlings (Rozpara et al., 2004). Similar results

were obtained when *Prunus fruticosa* 8 (FRUTANA®) was used as an interstem for some sweet cherry trees (Rozpara and Grzyb, 2004).

The objective of this study was to compare the growth, yielding and fruit quality of five sweet cherry cultivars with 'Northstar' interstem grafts with trees of the same cultivars grafted on Mazzard seedlings and the 'P-HL A' dwarfing rootstock.

MATERIAL AND METHODS

The experiment was set up in the spring of 1995 on a grey-brown podzolic soil in the Experimental Orchard at Dąbrowice (central Poland). Virus-free trees of five sweet cherry cultivars ('Burlat', 'Vega', 'Kordia', 'Büttner's Red' and 'Merton Premier') grafted on Mazzard seedlings with 'Northstar' interstems were compared with trees of the same cultivars grafted on 'P-HL A' rootstocks and on Mazzard seedlings without interstems. The trees were planted at a distance of 4.5 x 2.5 m in a complete randomized pattern with 3 trees per plot in 4 replications. Two lengths of the 'Northstar' interstem were investigated: 50 and 70 cm. The experimental trees were trained in the spindle form and irrigated. Herbicide strips were maintained along tree rows and grass swards were kept in alleyways.

Trunk diameter was measured at 30 cm above ground level in the case of the trees grafted on Mazzard seedlings and those on 'P-HL A' rootstocks. In the case of the trees with 'Northstar' interstems, measurements were taken at 20 cm above the interstem. Yield (kg/tree) and mean fruit weight (g) were recorded each year.

All results were statistically elaborated using analysis of variance, followed by means separation using Duncan's multiple-range t-test at $P \leq 0.05$.

RESULTS AND DISCUSSION

The trees with 'Northstar' interstems and those grafted on 'P-HL A' rootstocks were growing less vigorously compared to the control trees (Tab. 1). Several studies have shown that increasing the height of budding increases the dwarfing effect of the rootstock or interstem upon the scion cultivar (Parry, 1986; Grzyb et al., 1987; Czynczyk and Buczek, 2000). In this experiment, two different lengths of the interstock (50 and 70 cm) did not modify tree size for any of the cultivars except 'Vega'. The trunk cross-section area of the 'Vega' trees with 70-cm-long 'Northstar' interstems was signi-ficantly smaller compared with the trees with 50-cm-long interstems. This result was in agreement with the results obtained by others (Parry, 1986; Grzyb et al., 1987; Czynczyk and Buczek, 2000); (Tab. 2). The trunk cross-section area of 'Burlat' trees which were grafted on 'Northstar' interstems was more than ten times smaller than that of the control trees. Such a great reduction in tree growth was clearly the result of physiological incompatibility

Table 1. Tree size expressed as TCSA, cumulative yield and fruiting efficiency of five sweet cherry cultivars grafted directly on Mazzard seedlings, P-HL A rootstocks, and Mazzard with 'Northstar' interstocks

Rootstock + interstem	TCSA 2003 [cm^2]	Cumulative yield 1997-2003 [kg/tree]	Fruiting efficiency [kg/cm^2]
Burlat			
***Prunus avium* sdlg. – control**	**232.7 c***	**32.3 b**	**0.14 a**
P-HL A rootstock	176.5 b	51.9 c	0.29 c
Prunus avium L. sdlg. + Northstar 50 cm	24.4 a	5.9 a	0.24 b
Prunus avium L. sdlg. + Northstar 70 cm	23.1 a	5.0 a	0.22 b
Vega			
***Prunus avium* sdlg. – control**	**179.9 c**	**29.6 a**	**0.17 a**
Prunus avium L. sdlg. + Northstar 50 cm	103.2 b	46.1 c	0.44 b
Prunus avium L. sdlg. + Northstar 70 cm	85.4 a	39.8 b	0.47 b
Kordia			
***Prunus avium* sdlg. – control**	**216.3 c**	**31.0 a**	**0.15 a**
P-HL A rootstock	161.3 a	35.6 a	0.23 b
Prunus avium L. sdlg. + Northstar 50 cm	185.0 b	49.1 b	0.27 bc
Prunus avium L. sdlg. + Northstar 70 cm	178.7b	52.5 b	0.30 c
Büttner's Red			
***Prunus avium* sdlg. – control**	**168.7 b**	**25.7 a**	**0.15 a**
P-HL A rootstock	152 b	54.4 c	0.36 a
Prunus avium L. sdlg. + Northstar 50 cm	89.5 a	43.9 b	0.50 b
Prunus avium L. sdlg. + Northstar 70 cm	107.9 a	50.3 c	0.47 a
Merton Premier			
***Prunus avium* sdlg. – control**	**191.2 b**	**75.3 a**	**0.40 a**
Prunus avium L. sdlg. + Northstar 50 cm	139.7 a	82.8 a	0.59 b
Prunus avium L. sdlg. + Northstar 70 cm	134.0 a	80.0 a	0.60 b

*Means in columns followed by the same letter do not differ significantly according to Duncan's multiple-range t-test at $P \leq 0.05$

between the scion of 'Burlat' and the 'Northstar' interstem. 'Burlat' trees with 'Northstar' interstems also had yellow leaves every year. Webster (1998) reported that the dwarfing effect of the interstem on the growth

Table 2. Fruit weight of five sweet cherry cultivars grafted directly on Mazzard seedlings, P-HL A rootstocks, and Mazzard with 'Northstar' interstocks

Rootstock + interstem	Fruit weight [g]			
	2000	2001	2002	2003
Burlat				
***Prunus avium* sdlg. – control**	**7.13 b**	**7.25 b**	**6.98 b**	**6.98 b**
PHL A rootstock	7.23 b	7.85 c	7.28 c	7.35 b
Prunus avium L. sdlg. + Northstar 50 cm	4.60 a	4.28 a	5.10 a	5.10 a
Prunus avium L. sdlg. + Northstar 70 cm	4.55 a	4.40 a	4.95 a	4.60 a
Vega				
***Prunus avium* sdlg. – control**	**9.03 a**	**10.09 a**	**9.50 a**	**9.48 a**
Prunus avium L. sdlg. + Northstar 50 cm	9.50 a	9.98 a	10.03 a	10.83 b
Prunus avium L. sdlg. + Northstar 70 cm	9.13 a	9.50 a	9.60 a	9.50 a
Kordia				
***Prunus avium* sdlg. – control**	**9.28 a**	**9.85 a**	**9.25 a**	**8.85 a**
PHL A rootstock	9.83 a	10.73 b	9.40 a	9.03 a
Prunus avium L. sdlg. + Northstar 50 cm	10.78 b	10.98 b	9.00 a	10.25 a
Prunus avium L. sdlg. + Northstar 70 cm	10.15 ab	10.70 b	8.85 a	9.65 a
Büttner's Red				
***Prunus avium* sdlg. – control**	**8.55 a**	**8.30 a**	**8.70 a**	**6.68 a**
PHL A rootstock	8.88 b	9.03 a	8.50 a	7.25 a
Prunus avium L. sdlg. + Northstar 50 cm	9.03 b	8.95 a	8.55 a	7.03 a
Prunus avium L. sdlg. + Northstar 70 cm	9.10 b	8.88 a	9.00 a	6.88 a
Merton Premier				
***Prunus avium* sdlg. – control**	**5.88 a**	**5.78 a**	**6.05 a**	**5.55 a**
Prunus avium L. sdlg. + Northstar 50 cm	5.98 a	5.63 a	5.80 a	5.68 a
Prunus avium L. sdlg. + Northstar 70 cm	5.90 a	5.63 a	5.88 a	5.55 a

*Explanations, see Table 1

of the scion cultivar could sometimes be a result of a virus infection of one of the components, but fortunately only virus-free components were used in this experiment. Research by Soumelidou et al., (1994) indicates that hormone metabolism and transport are possible causes of

different rootstock/interstock and scion interactions. However, this hypothesis remains to be proven.

Rozpara and Grzyb (2002ab), and Rozpara et al. (2004) have proved that sweet cherry trees grafted on the 'P-HL A' dwarfing rootstock and 'Frutana' interstem come earlier into bearing fruit compared with the trees grafted on Mazzard seedlings. Similar observations were made in the experiment presented here. The trees with the interstem, as well as those grafted on the 'P-HL-A' rootstock, started to yield in the third year after planting, whereas the control trees started to bear fruit one or two years later, depending on the cultivar. The 'P-HL A' rootstock and 'Northstar' interstem increased yielding of sweet cherry trees in the early period of the study (Tab. 1). The only exception was the cultivar 'Burlat' with its incompatibility with the 'Northstar' interstem. Almost all of the trees with 'Northstar' interstems were more productive than the trees grafted on *Prunus avium* L. seedlings (see the efficiency index in kg/cm^2 of TCSA in Table 1).

'Kordia' trees grafted on 'P-HL A' rootstocks were smaller and less productive than those on 'Northstar' interstems.

Mean fruit weight of 'Burlat' cherry trees with 'Northstar' interstems was considerably smaller in comparison with the control fruit (again as a result of the incompatibility with the interstem). The studied rootstocks and interstems did not affect significantly fruit weight of the other cultivars.

CONCLUSIONS

1. 'Northstar' is a good interstem for the following sweet cherry cultivars: 'Vega', 'Merton Premier', 'Büttner's Red' and 'Kordia'. It causes a significant reduction in tree size and increases yields and winter hardiness of these cultivars. Trees with the 'Northstar' interstem come earlier into bearing fruit than those grafted directly on *Prunus avium.*
2. The 'Northstar' interstem is not compatible with the cultivar 'Burlat'.
3. The influence of interstock's longevity on the scion varied and depended on the cultivar.

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WPŁYW WSTAWKI 'NORTHSTAR' NA WZROST, OWOCOWANIE I JAKOŚĆ OWOCÓW PIĘCIU ODMIAN CZEREŚNI

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S T R E S Z C Z E N I E

W doświadczeniu prowadzonym w latach 1995-2003 w Sadzie Doświadczalnym w Dąbrowicach k. Skierniewic (Polska centralna) badano wpływ wstawki 'Northstar' na wzrost, owocowanie i jakość owoców czereśni: 'Burlat', 'Vega', 'Kordia', 'Buttnera Czerwona' i 'Merton Premier'. Kombinacją kontrolną dla drzew z wstawkami była czereśnia szczepiona bezpośrednio na siewkach czereśni ptasiej. Wstawka 'Northstar' istotnie ograniczała rozmiary drzew wszystkich badanych odmian. Drzewa ze wstawkami wcześniej wchodziły w okres owocowania i lepiej plonowały niż drzewa kontrolne. Wyjątkiem były drzewa czereśni 'Burlat', które wykazywały wyraźne symptomy niezgodności fizjologicznej ze wstawką 'Northstar'. Wpływ długości zastosowanej wstawki na wzrost i owocowanie czereśni był różny i zależał od badanej odmiany.

Słowa kluczowe: czereśnia, podkładka, wstawka, odmiana, wzrost drzew, plonowanie, jakość owoców