Agronomy Research **2**(1), 23–27, 2004

Evaluation of nine sweet cherry clonal rootstocks and one seedling rootstock

H. Jänes[1] and A. Pae[2]

[1] Polli Horticultural Institute of the Estonian Agricultural University, 69104 Karksi-Nuia, Viljandimaa, Estonia; e-mail: heljo11@hot.ee
[2] Department of Horticulture, Estonian Agricultural University, Kreutzwaldi 64, 51014 Tartu, Estonia; e-mail: aiandus@eau.ee

Abstract. In spring 2002, nine clonal rootstocks: the German 'Gisela 5', the Russian 'LC-52', 'OVP-2', 'OVP-3', 'VC-13', 'VSL-2', 'V-2-180', 'V-2-230' , 'V-5-172' and *Prunus mahaleb* L. seedlings (control), were planted at a nursery of Polli Horticultural Institute and in late July the sweet cherry cultivar 'Kristiina' and three selections 'Karmel', 'Polli 10/8' and 'Polli 6/2' were budded on them. The highest bud take percentages were observed on V-2-230, OVP-2, and V-5-172. Incompatibility between 'Karmel' and several rootstocks was noted. The growth of one-year-old plants at the nursery was most vigorous on *P. mahaleb* seedlings, OVP-2 and OVP-3 and the weakest on VC-13. The trunk diameters of the clonal rootstocks were significantly smaller than those of the control rootstocks.

Key words: sweet cherry, clonal rootstocks, bud take, growth vigour, compatibility

INTRODUCTION

Prunus cerasus cultivars and their seedlings have been used as rootstocks in Estonia (Palk, 1984). Those rootstocks have shown, however, insufficient graft compatibility, suckering and sensitiveness towards leaf spot caused by *Coccomyces hiemalis* Higg. Some *Prunus mahaleb* L. and *Prunus avium* L. types have also been tested as rootstocks for sweet cherry. Although these seedling rootstocks have controlled the growth vigour of sweet cherry, none of them reduces growth sufficiently (Palk, 1984).

In the last 2 or 3 decades, several dwarfing sweet cherry rootstocks have been developed. Most of them are clones of *Prunus* hybrids (Walther & Franken-Bembenek, 1998). 'Colt', a very widespread rootstock in the world, originates from the East Malling Experimental Station. 'Colt' has a good graft compatibility with many cultivars but is not sufficiently winterhardy (Cummins et al., 1986; Vogel, 1990). In Germany, at the University of Giessen, crosses of different *Prunus* forms have been carried out and clones of 'Gisela' were released (Gruppe, 1985). At the University of Weihenstepan, Weiroot clones (*Prunus cerasus*) were selected (Schimmelpfeng & Liebster, 1979). At a research station in Gembloux, Belgium, three rootstocks –'Inmil', 'Damil' and 'Camil' – were selected (Druart, 1996). 'Inra SL 64' and 'Tabel Edabriz' are from France (Trefois, 1985a). In the USA, the rootstock 'Maxma Delbard 14', originated from Oregon, is the most known one (Perry, 1987). In Russia, there have been bred several clonal rootstocks by interspecies hybridisation (*P.cerasus* x *C. maakcii*). These rootstocks include in their genome gene A which is able to control the resistance to *Coccomyces hiemalis* Higg. (Vehov et al., 1992).

Sweet cherry rootstock research in Estonia is aimed at finding a less vigorous rootstock than the commonly used *P. mahaleb* seedlings. The objective of this trial was to give an assessment of the new introduced sweet cherry clonal rootstocks at our nursery (graft take and plant size). Their suitability for sweet cherry rootstock will be further investigated under field conditions.

MATERIALS AND METHODS

On 28 April, 2002, nine clonal rootstocks: 'Gisela 5', LC-52, OVP-2, OVP-3, VC-13, VSL-2, V-2-180, V-2-230 and V-5-172 and *P. mahaleb* seedlings as the control rootstocks, were planted at a nursery of the Polli Horticultural Institute. Plant spacing was 90 cm between the rows and 25 cm within the rows. The soil type was a sandy clay, with a pH of 6.7 and a content of humus of 1.5%. Fertilisation was carried out according to soil analyses. Weeds between rows were controlled mechanically. Weeds in the rows were removed by hand. On 30 July, 2002, the sweet cherry cultivar 'Kristiina' and three selections 'Karmel', 'Polli 10/8' and 'Polli 6/2' were budded on rootstocks at a height of 10 cm. Each graft combination included nine plants in three replications, three plants per replication.

In this experiment bud take percentage was calculated as a percentage for each rootstock type. Also the lengths and diameters of budded rootstocks were measured. As the summer 2002 was extremely dry (only 28.9 mm rain fell in the period from 7 July to 31 August, 2002), rootstocks were watered several times during the summer. The sum of precipitation from May to August was 191 mm. The mean monthly temperatures were 14.3ºC in May, 16.8ºC in June, 19.8ºC in July, and 18.8ºC in August. The winter of 2002/2003 was cold. Several low temperature periods occurred at the end of December 2002 as well as in January and February 2003. On 11 January minimal air temperature fell to -32.5ºC. The sum of precipitation from May to August 2003 was 348 mm. The mean monthly temperatures were 12.4ºC in May, 14.1ºC in June, 20.6ºC in July and, 16.9ºC in August.

Rootstocks tested: 'Gisela 5': *Prunus cerasus* 'Schattenmorelle' x *P.canescens,* from the Giessen rootstock breeding program (Germany) (Gruppe, 1985). After many years of testing, 'Gisela 5' has proven to control tree size, to induce precocity and to be very productive (Franken-Bembenek, 1996). VSL-2: *Prunus fruticosa* x *Prunus lannesiana* (Russia). It is characterised by dwarfness and tolerance to heavy wet soils. (Eremin et al., 2000). LC-52 and VC-13: *P.cerasus* x VP-1 (*P. cerasus* 'Zolushka' x *C. maakcii*) (Russia). Practically compatible with all cultivars of sweet and sour cherry (Vehov et al., 1992; Eremin, 2000). OVP-2 and OVP-3: *P. cerasus* 'Zolushka' x *C. maackii* (Russia). Their root system is especially well developed and tolerant of low temperatures (Kolesnikova et al., 1991; Revjakina, Upadysheva, 1996). V-5-172, V-2-180 and V-2-230: *P. cerasus* 'Vladimirskaya' x VP-1 (*P. cerasus* 'Zolushka' x *C. maakcii*) (Russia). They perform well in various climatic conditions and are not infected by *Coccomyces hiemalis* (Vehov et al., 1992; Kolesnikova et al., 2000).

The data were elaborated statistically by the analysis of variance, using LSD test at *P* = 0.05 for the comparison of treatment means. An arcsin/square root transformation was performed on percentage data.

RESULTS AND DISCUSSION

Long lasting drought during the growth period and high temperatures in 2002 may have had some negative influence on rootstock growth but all rootstocks planted in spring 2002 grew well in the nursery and were suitable for budding, especially VSL-2 which preserved long the ability of cortex separating. A similar finding was also reported by Eremin et al (2000).). In spite of the unfavourable winter of 2002/2003, no serious winter damages of plants grafted on the rootstocks studied were observed in spring 2003.

As often in sweet cherry, the bud take percentages were not high in our trial. The bud take percentage varied greatly per cultivar-rootstock combination (Fig.1). A higher bud take percentages, compared with the control, were recorded on V-2-230, OVP-2 and V-5-172 while the lowest bud take percentage appeared on OVP-3. This result confirms earlier literature data concerning the rootstocks V-2-230 and V-5-172 (Kolesnikova et al., 2000). The bud take percentage was the highest on all rootstocks when 'Kristiina' (with the exception on VSL-2) and No 6/2 (with the exception on OVP-3) were used as the scion cultivars (Fig.1).

Unfortunately for 'Karmel', gum exudation at the bud union appeared when grafted on 'Gisela 5', LC-52, OVP-2, VC-13, VSL-2 and V-2-180 rootstocks and the bud take percentages remained very low. It indicated incompatibility of this selection and the rootstocks. A good bud take of 'Karmel' was observed on V-2-230 (Fig.1).

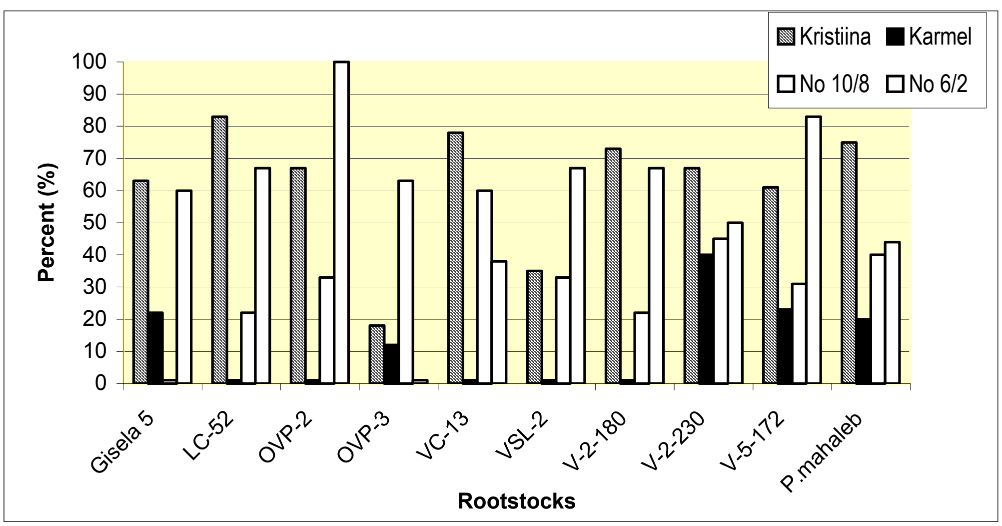

Fig. 1. Bud take percentage of the cultivar and selections on different rootstocks.
$LSD_{0.05}$ = 3.29 for rootstocks
$LSD_{0.05}$ = 2.08 for cultivars
$LSD_{0.05}$ = 6.58 for rootstocks x cultivars

Table 1. Effect of nine clonal rootstoocks and one *P. mahaleb* seedling rootstock on plant height and trunk diameter of the sweet cherry cultivar 'Kristiina' and three selections.

Rootstock	'Kristiina'		'Karmel'		No 10/8		No 6/2	
	Plant height, cm	Trunk diameter, mm	Plant height, cm	Trunk diameter, mm	Plant height, cm	Trunk diameter, mm	Plant height, cm	Trunk diameter, mm
'Gisela 5'	86	11	113	11	103	11	68	8
LC-52	103	11	103	11	100	10	100	8
OVP-2	110	11	125	9	132	12	90	10
OVP-3	140	12	111	11	95	10	105	11
VC-13	82	10	92	10	88	10	85	9
VSL-2	103	11	116	12	83	10	81	9
V-2-180	90	10	101	11	106	11	66	10
V-2-230	116	10	128	11	98	9	78	10
V-5-172	128	11	115	12	124	11	77	9
P. mahaleb	143	19	123	19	125	20	110	20
$LSD_{0.05}$	10.3	1.5	10.9	1.0	10.7	1.2	12.1	1.4

The bud take percent was 62.5 ('Kristiina') and 60.0 (No 6/2) on 'Gisela 5'. Approximately the same bud take percentages were observed on 'Gisela 5' in other trials (Wertheim et al, 1998). The bud take percentage on OVP-3 was very low. This may be an indication of genetic incompatibility between the scion cultivars and rootstock. Grafted on this rootstock, only No 10/8 showed a satisfactory bud take percentage (Fig.1).

Contrary to our results, OVP-3 had a better bud take than some other rootstocks in Russian trials (Vehov et al, 1992). The size of one-year-old plants on different rootstocks at the nursery, measured in autumn 2003, differed significantly (Table 1). Plants grafted on *P.mahaleb* seedlings were the highest, followed by plants grafted on OVP-2, OVP-3 and V-5-172. It is in line with the results presented by Revjakina & Upadysheva in 1996. The lowest mean plant height was recorded in plants grafted on VC-13. A mean trunk diameter of plants on different rootstocks varied from 8 to 12 mm while diameters of plants grafted on the control rootstock were significantly greater (Table 1).

CONCLUSIONS

- The highest bud take percentages were observed on V-2-230, OVP-2 and V-5-172.
- Incompatibility between 'Karmel' and several rootstocks was noted.
- The growth of one-year-old plants was most vigorous on *P. mahaleb* seedlings, OVP-2 and OVP-3, and the weakest on VC-13.

ACKNOWLEDGEMENTS. Financial support from the Estonian Science Foundation (grant no. 4982) is gratefully acknowledged.

REFERENCES

Cummins, J., N., Wilcox, W. & Forsline, P., L. 1986. Tolerance of some new cherry rootstocks to December freezing and to *Phytophthora* root rots. *Compact Fruit Tree*, **19**, 90–96.

Druart, P. 1996. Performance of the GM rootstocks in high density sweet cherry orchards. *Acta Hort*., **410**, 217–226.

Eremin, G.,V., Provotchenko, A., V., Gavrish, V., F., Podoroshny, V., N. & Eremin, V., G. 2000. *Stone fruits. Growing on clonal rootstocks and as own-rooted*. Phoenix. Rostov–na–Donu (in Russian).

Franken-Bembenek, S. 1996. The Giessen cherry rootstocks. *Compact Fruit Tree*, **29**, 13–36.

Gruppe, W. 1985. An overview of the cherry rootstock breeding programme at Giessen 1965-1984. *Acta Hort*., **169**, 189–198.

Kolesnikova, A., F., Vehov, J., K. & Retinskaja N., N. 1991. New rootstocks for cherry. *Horticulture*, **1**, 21–23 (in Russian).

Kolesnikova, A., F., Dzhigadlo, E., N., Guljajeva, A., A & Ozhereljeva, Z., E. 2000. The cultivars and clonal rootstocks for intensive orchards. In *New cultivars and technologies for fruit and small fruit in intensive orchards* (E. N. Sedov et al., eds), pp. 106–107, VNIISPK, Orel (in Russian).

Palk, J. 1984. *Ploomi- ja kirsipuude kasvatamine*. Valgus, Tallinn (in Estonian).

Perry, R., L. 1987. Cherry rootstocks. In: *Rootstocks for fruit crops* (R.C.Rom and R.F. Carlson, eds.), pp. 217–264, John Wiley & Sons, Inc., New York.

Revjakina, N.,T. & Upadysheva, G., J. 1996. Peculiarities of growing and crop capacity on sour cherry grafted on clonal root stocks. In: *Fruit growing and berry growing in Russia* (I. V. Kashin, J. A. Utkov & L. A. Prineva, eds.), pp. 162–170, VSTISP, Moscow (in Russian).

Schimmelpfeng, H. & Liebster, G. 1979. *Prunus cerasus* als Unterlage: Selectionsarbeiten, Vermehrung, Eignung für Sauerkirschen. *Gartenbauwissenschaft*, **44**, 55–59.

Tréfois, R. 1985a. Dwarfing rootstocks for sweet cherries. *Acta Hort*., **169**, 147–155,

Vehov J, K., Kolesnikova, A., F. & Retinskaja, N., N. 1992. Study of the new forms of rootstocks for cherry in plant nursery. In *Breeding, Variety Investigation, Reproduction, Growing of Horticultural Crops.* (A. F. Kolesnikova et al., eds.), pp. 140–149, BHIISPK, Tula (in Russian).

Vogel, T. 1990. Beurteilung der Süsskirschenunterlage Colt. *Obstbau*, **15,** 1, 19–20.

Walther, E. & Franken-Bembenek, S. 1998. Evaluation of interspecific cherry hybrids as rootstocks for sweet cherries. *Acta Hort*., **468**, 285–290, 1998.

Wertheim, S.J., Balkhoven, J.M.T., Callesen, O., Claverie, J., Vercammen, J., Ystaas, J. & Vestrheim, S. 1998. Results of two international cherry rootstock trials. *Acta Hort*., **468**, 249–259.