

First results of varios sour cherry cultivar on Oblacsinska as interstocks and *Prunus mahaleb* rootstocks

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Summary: At the experiment orchard of the Fruit Research and Extension Institute, Újfehértó, Hungary in spring 2000 a trial was designed included: Érdi bőtermő, Debreceni bőtermő, and Csengődi sour cherry (*Prunus avium* L) cultivars which were budded at 1999 on Oblacsinszka sour cherry (as a dwarf inter stock), which had been budded on *Prunus mahaleb* seedlings at 1998 with the aim to investigate the dwarfing effects of Oblacsinszka sour cherry cultivars on scion cultivars. Trees of each cultivar directly on *Prunus mahaleb* seedling, severed as controls. Use of Oblacsinszka as an interstock reduced the rootstock trunk diameter. Trees of Debreceni bőtermő, and Csengődi sour cherry cultivars with Oblacsinszka interstock were smaller than similar trees grafted directly onto *Prunus mahaleb* as a rootstock. Trees of Érdi bőtermő grafted on Oblacsinszka interstock which buded on *Prunus mahaleb* were the smallest. Growth of the trees was reduced also by using of the Oblacsinszka as interstock for other examined cultivars.

Key words: sour cherry, Oblacsinszka, *Prunus mahaleb*, interstocks, rootstocks

Introduction

The fruit growers prefer to have dwarf trees in intensive orchard, because of advantages of better harvesting, disease and pest control. Interstocks of dwarfing rootstock clones have proved much or less reliable in reducing scion vigor. The earliest reports on cherry rootstocks, cited by Anthony et al. (1937), Webster & Schmidt (1996) reported that interstocks improving the yield productivity of cherry scions. Previous investigation by Bujdosó et al. (2004) showed that in intensive cherry orchards the moderately vigorous rootstocks gave the best yields and fruit quality. Rootstocks, interstocks and scions may effect several cherry tree performance parameters, including growth characteristic, tree size, fruit bud survival, fruit quality, yield and yield efficiency (Larsen, 1970; Westwood et al., 1976; Larsen & Patterson, 1981; Millikan & Hibbard, 1984, Stebbins & Cameron, 1984; Holb & Schnabel, 2005). Extensive breeding efforts and using of interstocks in several countries have succeeded in introducing size-controlling rootstocks and interstocks over a wide range of vigor (Bryant, 1939; Rozpara et al., 1998; Tabel, 2005; Hrotkó & Simon, 1996; Hrotkó et al., 1997, 1998).

In response to the problem of vigor control in existing orchards this study was designed to investigate the vegetative and reproductive habit and the effects of Oblacsinszka as a dwarfing interstock on scion, rootstock, tree vigor, yield, trunk cross-sectional area and yield efficiency of some sour cherry cultivars after 8-year period of planting, in the north part Hungary.

Materials and methods

The experiment included Érdi bőtermő, Debreceni bőtermő, Csengődi, sour cherry cultivars grafted at 1999 on Oblacsinszka which were budded on *Prunus mahaleb* at 1998. The orchard is situated on a sandy soil with low (0.9%) humus content at Újfehértó between the Debrecen and Nyereghaza, Hungary. The pH of the soil was 7.5. with 4 trees per plot for a total of 12 trees of each scion/interstock/rootstock combinations. *Prunus mahaleb* used as a rootstock and Oblacsinszka sour cherry cultivar as an interstock (over *P. mahaleb* seedling rootstocks). Sour cherry cultivars were grafted on interstocks and planted at March 2000 at 7 × 5 m (275 trees/ha). Trees of each cultivar on *Prunus mahaleb* seedlings, without an interstem, served as controls. The whole interstock part (30 cm) was above soil line.

The experimental orchard was not irrigated and the average annual precipitation in this area was about 600 mm. The trees were trained as free spindles with central leader. Soil management includes frequent grass moving in the alleyways in conjunction with the maintenance of 1-m wide herbicide strips along the tree rows.

Tree vigor, crown cross-sectional area (CCSA) of rootstock (below the first grafting union), interstock trunk cross-sectional area (ITCSA) (between two grafting), Trunk cross-sectional area (TCSA), (10 cm above the second graft union), Specific yield kg/cm² trunk sectional area, stem height, tree height and width, the area under-canopy (m²), canopy volume (m³), beginning of flowering, full bloom, Post blooming time, ripening time and other phonological

observation (flower density) were recorded, when the trees had reached their final size at the eight leaf stage, in the evaluation plots.

Data were analyzed statistically using a 3*2 factorial design based on completely randomized design. Analysis of variance and Duncan's multiple range test ($\alpha=0.05$) was provided using the MSTATC program. Analysis of variance and Duncan's multiple range test ($\alpha=0.05$) was provided using the MSTATC program.

Results and Discussion

Crown cross-sectional area of rootstock

Crown cross-sectional area (CCSA) of rootstock are presented in Figure 1. The CCSA of *Prunus mahaleb*, as root stock, when grafted by Oblacsinska interstock and Érdi bőtermő as cultivar, significantly (3 times) was smaller in comparison with CCSA of *Prunus mahaleb* when directly buded by Érdi bőtermő. The CCSA of tree of Debreceni bőtermő/Oblacsinska/*Prunus mahaleb* was smaller than Debreceni bőtermő/*Prunus mahaleb*. In the case of Csengődi/Oblacsinska/*Prunus mahaleb* in comparison with Csengődi/*Prunus mahaleb*, the CCSA also was smaller. It means that the Oblacsinska interstock inhibit the growth of root crown area of *Prunus mahaleb*. Use of 'Oblacsinska' as an interstock highly reduced the rootstock crown diameter. In all combinations a sizeable swelling forms on the graft union with Oblacsinska sour cherry on *P. mahaleb*.

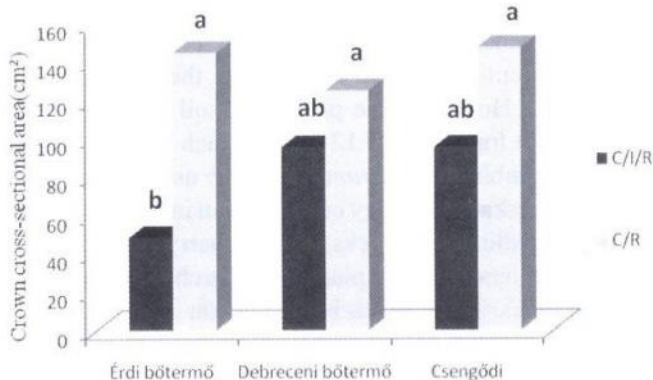


Figure 1. Effects of interstock on CCSA of rootstock of sour cherry cultivars Legend: C/I/R = Cultivar buded on Interstock which buded on *Prunus mahaleb* C/R = Cultivar directly buded on *Prunus mahaleb*

Inter stock cross-sectional area (ITCSA)

The length of Oblacsinska as an interstock was between 30-40 cm but its ITCSA differs with the combination with the scion cultivars. (Figure 2). The results shows that the ITCSA of Érdi bőtermő cultivars were bigger than CCSA of root stocks and TCSA of scion (cultivar), while in the case of Debreceni bőtermő The ITCSA was bigger than CCSA and smaller than TCSA. In combination of Csengődi/ Oblacsinska/*Prunus mahaleb* the ITCSA is approximatly the

same size as CCSA and TCSA. In all combinations a sizeable swelling forms on the graft union with Oblacsinska sour cherry on *P. mahaleb*. This swelling occurs below the graft union. Similar observations were made with the interstock which was thinner than the crown of rootstock (*P. mahaleb*) and the TCSA of scion cultivar used. It means that the trunk of the tree seems bad configuration (malformed) of appearance. The largest ITCSA diameter, over the eight years period was recorded for the Érdi bőtermő trees; the least was recorded on the Csengődi grafted on *Prunus mahaleb*.

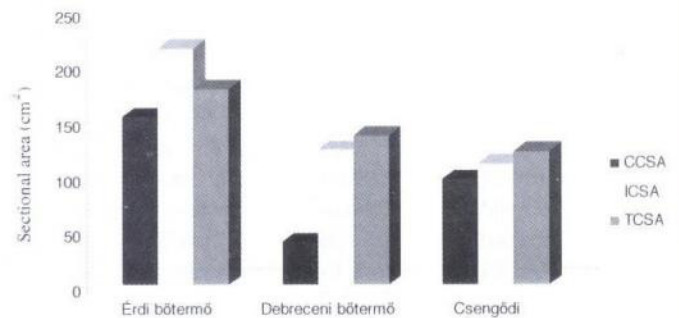


Figure 2. Cectional area of crown (root stock), interstock and trunk (sion) of sour cherry cultivars

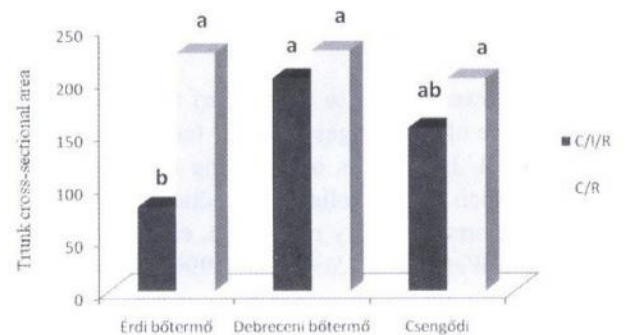


Figure 3. Effects of interstock on TSA of sour cherry cultivars Legend: C/I/R = Cultivar buded on Interstock which buded on *Prunus mahaleb* C/R = Cultivar directly buded on *Prunus mahaleb*

Trunk cross-sectional area (TCSA)

Intrstock of Oblacsinska limited growth as measured by TCSA of all examined sour cherry cultivars (Figure 3). The significant differences of TCSA of Tree Cultivar Érdi bőtermő/Oblacsinska/*Prunus mahaleb* was 46.5 cm², while TCSA of this cultivar directly on *Prunus mahaleb* was 3.1 time (143.5) bigger. Trees grafted on *Prunus mahaleb* seedlings whit Oblacsinska interstock grew weaker than those grafted on *Prunus mahaleb* directly. There was no significant differences between the TCSA of Debreceni bőtermő and Csengődi trees when was grafted on interstock whit in the case of directly grafted on *Prunus mahaleb*.

The area under-canopy was also affected by Oblacsinska as interstock being shorter than control trees. the area under tree canopy of sour cherry cultivars/ interstock/

rootstock are presented in Figure 4. The area under tree canopy of Érdi bőtermő/Oblacsinska/Prunus mahaleb significantly (3 times) was smaller in comparison with Érdi bőtermő when directly buded on Prunus mahaleb.

The area under-canopy of Debreceni bőtermő/Oblacsinska/Prunus mahaleb was smaller than Debreceni bőtermő/Prunus mahaleb. In the case of Csengődi/Oblacsinska/Prunus mahaleb in comparison with Csengődi/Prunus mahaleb, the area under-canopy also was smaller. It means that the Oblacsinska interstock inhibit the growth and spread of shoot of the trees. Our results were agreed with the result obtained by Hrotkó et al. (1997). They found that; scions of sweet cherry may be dwarfed by grafting on to dwarfing rootstocks. The dwarfing effect of the rootstock may also be induced by a stem piece or interstock, grafted between a scion and rootstock.

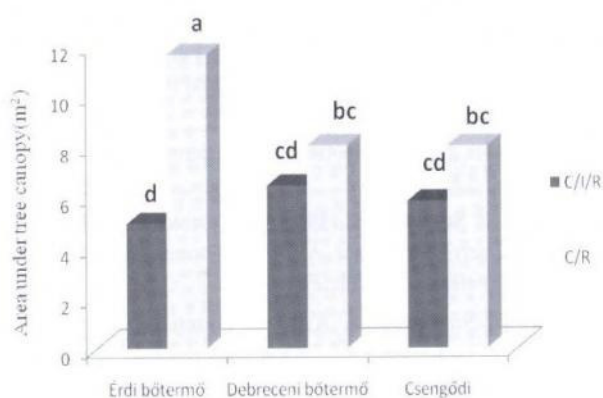


Figure 4. Effects of interstock on the area (m²) under tree canopy of sour cherry cultivars Legend: C/I/R = Cultivar buded on Interstock which buded on Prunus mahaleb C/R = Cultivar directly buded on Prunus mahaleb

Canopy volume

Interstem also modified canopy size. The control tree of Érdi bőtermő/Prunus mahaleb had biggest canopy volume after eight years. The smallest canopy occurred on Érdi bőtermő grafted with Oblacsinska as interstem which was grafted on Prunus mahaleb as seedling. Also the Csengődi tree with interstock of Oblacsinska/Prunus mahaleb in comparison with Csengődi directly on Prunus mahaleb was significantly smaller canopy volume (Figure 5). The canopy volume of Debreceni bőtermő/Oblacsinska/Prunus mahaleb was smaller than Debreceni bőtermő/Prunus mahaleb. This results are agree with the results of Larsen (1970) and Stebbins & Cameron (1984). They believe that interstocks and scions may effect several cherry tree growth characteristics and tree size. With respect to Canopy volume from the various evaluative trials, Érdi bőtermő/ trees on Oblacsinska interstock on Prunus mahaleb rootstock were 30% less vigorous than directly on Prunus mahaleb (Figure 5).

Production kg/tree

No significant effects of interstock grafting were found on Specific yield kg/tree of each cultivar at harvest, While

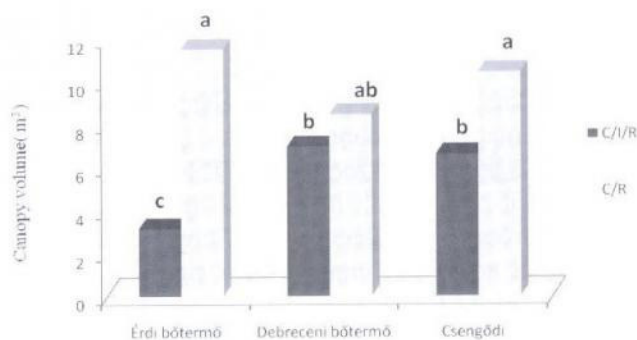


Figure 5. Effects of interstock on Canopy volume (m³) of sour cherry cultivars Legend: C/I/R = Cultivar buded on Interstock which buded on Prunus mahaleb C/R = Cultivar directly buded on Prunus mahaleb

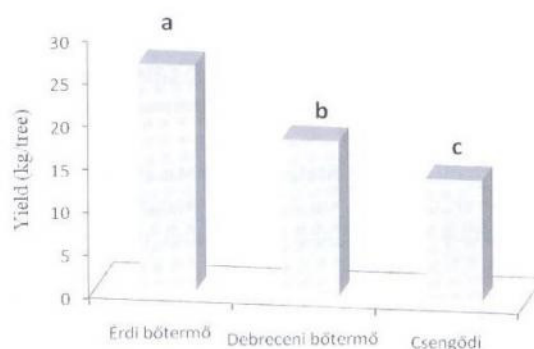


Figure 6. Specific yield kg/tree of sour cherry cultivars

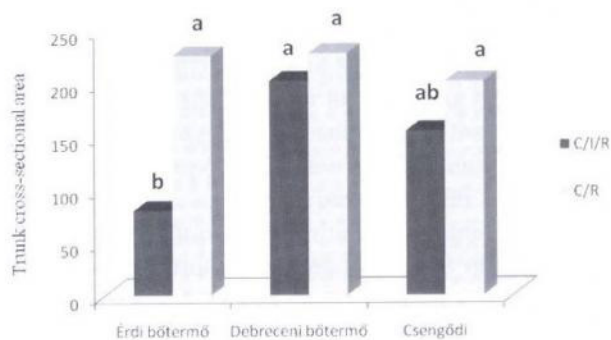


Figure 7. Effects of interstock on Specific yield kg/tree of sour cherry cultivars Legend: C/I/R = Cultivar buded on Interstock which buded on Prunus mahaleb C/R = Cultivar directly buded on Prunus mahaleb

the earliest reports on cherry rootstocks, cited by Anthony et al. (1937) and Webster & Schmidt (1996), reported that interstocks improving the yield productivity of sweet cherry scions. The yield efficiency (kg per tree) showed that the tree of Érdi bőtermő with interstock of Oblacsinska on Prunus mahaleb and also the tree grafted directly on Prunus mahaleb without interstock were more productive, but not significantly (Figures 6 and 7). This results are agree with the results of Millikan & Hibbard (1984) and Stebbins & Cameron (1984). In their opinion rootstocks, interstocks and scions may effect several cherry tree yield and yield efficiency.

Conclusion

It is well known that the use of interstock makes sweet cherry trees smaller and more productive in comparison to trees directly grafted on rootstocks. The results of this research is not consistent with general opinion. However some of the investigated interstock didn't reduce the growth of cherry trees and didn't improve their yields. Our results demonstrate that Oblacsinska as an interstock reduced the growth of trees and canopy volum. These kind of trees are suitable for intensive orchards, but the Interstems modified the tree size and yield of cultivars.

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