The Fruit Set Capability of Some Sour Cherry Cultivars (*Prunus cerasus* L.)

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Abstract

To determine the capability of 9 sour cherry cultivars to set fruit, two factorial experiments were carried out during 2008 and 2009. Flowers of each cultivar were isolated and pollinated with the pollen of donor cultivars. Arc-sinus transformation was carried out on the final fruit set percentage data. In the case of open pollination, average fruit set of all cultivars was 11%, compared with artificial self-pollination (9%) and natural self-pollination (2%). 'Debreceni bőtermő' was the best pollen donor for other examined cultivars, with more than 90% overlap of flowering time and 37% fruit set in 2008. The results of reciprocal cross-pollination will be discussed.

INTRODUCTION

The most important factors that affect sour cherry (*Prunus cerasus* L.) fruit set and drop are: heat, drought and rainy spring weather during bloom as well as excessive hot, cool or windy weather that impairs pollination; the combination of pollen donors and pollinated cultivars; the rootstock; soil fertility and lack of nutrients, mainly nitrogen; soil drought or water stress; and agro-technical management. Moreover, late pruning and the appearance of diseases and pests all influence the fate of flowers and ultimately ripe fruits (Looney, 1996; Kozma et al., 2003). Early information on sour cherry self-fertility was mentioned by Magyar (1935), Maliga (1942) and Husz (1943). In sour cherry, maximum fruit set due to self-fertility could reach 50%. Fruit set values of 64% (Blazek et al., 1974), 55.2%,(Wocior, 1976) and up to 50% (Misic et al., 1977) have been reported.

All variants of 'Pándy meggy' proved to be self-incompatible, and mutually inter-incompatible. Nyéki and Soltész (1996) called attention to the fact that the self-incompatible 'Pándy meggy' cannot be fertilised by several self-fertile cultivars ('Debreceni bőtermő', 'Kántorjánosi', 'Újfehértói fürtös'), i.e., they are inter-incompatible.

To obtain adequate yields in sour cherry, 25 to 30% of flowers should set fruits. Percentage of fruit set in self-fertile varieties may increase by cross pollination (Krapf, 1976). Cold and rainy weather during bloom have negative effects on the yield of self-sterile sour cherry cultivars. Enikeev (1973) reported that yearly variations in weather have more salient effects on the yield of self-sterile sour cherries in comparison with those that are self-fertile, namely, in self fertile varieties, yield is stable. In sour cherry, the highest rate of fruit set reaches when flowers pollinate exactly when they are opening. Therefore, pollination should occur after emasculation in balloon stage up to one to two days later.

The ability of cultivars to fertilize each other could be determined only by pollination. Nyéki (1989) mentioned that fruit set obtained from open pollination in Pandy sour cherries is low and highly variable during different seasons. He expressed that there is a direct correlation between the rate of self-fertility and yield from open pollination.

Nyéki et al. (2002) showed that open pollination of self-sterile and highly self-sterile sour cherry varieties resulted in 12.1% and 6.3% fruit set, respectively. Meanwhile,

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self-fertile and highly self-fertile varieties set 29% and 29.4%, respectively, during open pollination.

MATERIAL AND METHODS

The experiments were carried out on nine sour cherry cultivars: 'Érdi bőtermő', 'Debreceni bőtermő', 'Kántorjánosi', 'Újfehértói fürtös', 'Éva', 'Petri', 'Oblacsinszka', 'Pandy 279' and 'Csengődi'. Trees were eight years old trees and were grown in 'Újfehértó', located in the Eastern north part of Hungary. The orchard was planted in 1999 with tree spacing of 4.0 x 3.5 m. Trees were grafted on *Prunus mahaleb* L. seedlings. Open pollinated flowers were observed, equally, on 5-10 branches that were 1.5-2 m above ground level. There were four different canopy orientations, comprising 400-500 flowers per cultivar. Fruit set was recorded and compared in all treatments and investigated by canopy orientation (N, E, S, and W). Number of flowers and fruit set on a branch in each direction were counted. The number of abscised fruits was recorded from the second week after flowering until fruit ripening every week. The ratio of dropped fruits was expressed as a percentage of the total number of fruit set.

RESULT AND DISCUSSION

Fruit Set

Significant differences directly before harvest were found in fruit set among cultivars. The average percentage of fruit set following open pollination of all examined cultivars was 18.3%, with 'Oblacsinszka' having the highest (32.6%) and 'Debreceni bőtermő', which was very similar to 'Pandy 279', having the lowest (12%). This agreed with the results of Nyéki (1989). He stated that fruit set of open pollinated *Pándy meggy* types is low and seasonally highly variable (Fig. 1).

Fruit set and fruit drop varied by the tree canopy direction. Solar radiation and wind direction, and growing site as well as the season, affected the susceptibility of sour cherry to micro-ecological adversities. Figure 2 shows fruit set of open pollinated flowers of the various sour cherry cultivars by canopy direction. In all cultivars, the fruit set for each quadrant significantly differed except for 'Érdi bőtermő' and 'Oblacsinszka', for which the direction of the tree canopy did not affect fruit set significantly. The eastern portion of the canopy set more fruits compared to the other directions. The eastern and western sides of the tree usually retain more fruits as compared to the north or south sides.

The lowest fruit set percentage was in the west tree quadrant, most likely determined during bloom. Just before harvest, average fruit set from open pollination of all cultivars in all directions was 18.3%. The highest fruit set was measured on the north quadrant (12.3%), while the lowest fruit set was on the west quadrant (10.1%). The final fruit set of the cultivars varied in each direction, for example, the lowest fruit set in the north occurred with 'Debreceni bőtermő' (5.2%) and the highest was with 'Oblacsinszka' (22.2%). Regarding the east quadrant, 'Újfehértói fürtös' was highest (16.6%) and 'Petri' was lowest (2.4%). 'Oblacsinszka' fruit set was 21.6% and 19.2% for the south and west quadrants, respectively, which was highest, and 'Petri' was lowest at 3% for the south while 'Debreceni bőtermő' was lowest for the west (6%).

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Figures

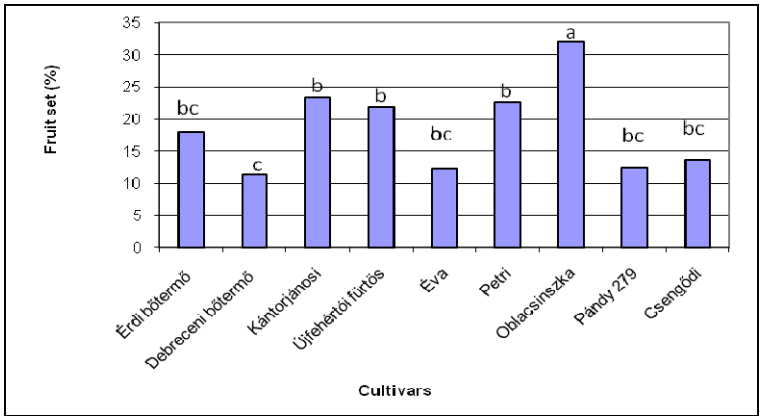

Fig. 1. Final fruit set of nine Hungarian sour cherry cultivars (Újfehértó, 2008).

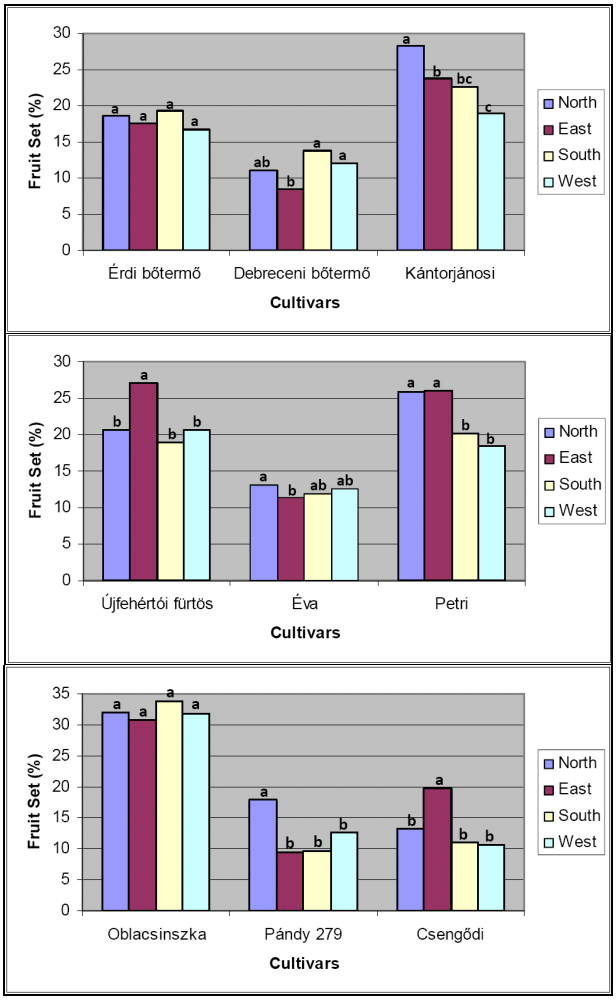

Fig. 2. Fruit set of sour cherry cultivars in different directional quadrants of the tree: A) 'Érdi bőtermő', 'Debreceni bőtermő', and 'Kántorjánosi'; B) 'Újfehértói fürtös', 'Eva', and 'Petri'; C) 'Oblacsinszka', 'Pándy 279', and 'Csengődi'.