Fruit Drop Pattern of Sour Cherry Cultivars

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Abstract

Fruit drop rates of 9 sour cherry cultivars ('Érdi bőtermő', 'Debreceni bőtermő', 'Kántorjánosi', 'Újfehértói fürtös', 'Éva', 'Petri' 'Oblacsinszka', 'Pandy 279' and 'Csengődi') were studied. Trees were eight years old, grafted on *Prunus mahaleb* and grown in Újfehértó, located in the Eastern north part of Hungary. Significant differences have been found in fruit set among cultivars. The average fruit set was 18.3%; 'Oblacsinszka' fruit set was highest (32.6%), while 'Debreceni bőtermő' and 'Pandy 279', was lowest (12%). Seasonal changes for fruit set and drop revealed four abscission peaks. The first fruit abortion wave appeared during the second week after pollination. Thereafter, the second and third periods occurred during the third and fourth weeks after pollination. The fourth abscission peak was during the fourth week after pollination. The highest fruit drop occurred in 'Pandy 279' (92.4%) followed by 'Éva' (90%), while the lowest fruit drop was observed in 'Oblacsinszka' (71.5%).

INTRODUCTION

The most important factors affecting sour cherry (*Prunus cerasus* L.) fruit set and drop are: heat, drought and/or rainy spring weather during bloom, extreme temperatures or wind impairing pollination, adequate and compatible combinations of pollen donors and pollinated cultivars, rootstock, soil fertility, delayed pruning, and diseases and pests (Looney, 1996; Kozma et al., 2003). Regular-bearing cultivars have a unique property of self-thinning capacity by which they maintain fruit load year after year (Davarynejad et al., 1993). Drop of flowers and fruit is a common problem in most fruit crops; fruits continue to drop at various stages of development. Davarynejad et al. (1993) and Nyéki et al. (2003) explained that fruit drop is not always detrimental, but that drop at the initial stages of fruit development seems to be necessary, through balancing resources. In apple (*Malus domestica*) and other tree fruits, fruit yield depends on fruit set and the amount of fruit drop.

Dry springs can cause severe fruit drop (Davarynejad et al., 2009). In sweet cherry (*Prunus avium*) and pear (*Pyrus communis*), the first growth phase of fruits was more important; in sour cherry and plum (*Prunus domestica*), the severity of the first and second fruit drop was nearly equal (Soltész, 1997). In sweet and sour cherry, the second period of fruit drop may occur earlier than 6 weeks after bloom, whereas the third fruit drop (also "red drop") occurs as fruit start to ripen (Nyéki, 1978). Gardner et al. (1952), however, found the dynamics of fruit drop to be very similar in apple, pear and sweet cherry. Thompson (1996) found that in sour and sweet cherry, the flowers shed within 1.5-2.5 weeks after full bloom. Nyéki (1978) reviewed the factors that influence fruit drop of sweet cherry, plum and sour cherry. In sour cherry, flower fertilization and rate of development was implicated. The pit-hardening process slowed down, with fruits being shed 10-25 days after full bloom (Soltész, 2003). In sour cherry, preharvest fruit drop is rare, only occurring with excessively heavy fruit loads. Preharvest drop is aggravated by wind, depending on the fruit species and variety (Roemer, 1968-70; Gautier, 1974).

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MATERIAL AND METHODS

This study was conducted using nine sour cherry cultivars; 'Érdi bőtermő', 'Debreceni bőtermő', 'Kántorjánosi', 'Újfehértói fürtös', 'Éva', 'Petri', 'Oblacsinszka', 'Pandy 279' and 'Csengődi'. Eight year-old trees grafted on *Prunus mahaleb* and located in Újfehértó, in the Eastern north part of Hungary were observed. Tree spacing was 4.0 x 3.5 m. Soil preparation, fertilization and pest control were according to local recommendations and need. Tree training was done according to commercial practices, with the general goal of a spindle-shaped canopy. Grass alleyways were used in the rows. Irrigation and fruit thinning were not used.

Open pollinated flowers were observed, on 5-10 branches at 1.5-2 m above ground level at four different orientations (north, east, south, and west; N, E, S, W, respectively), comprising 400-500 flowers per cultivar. Number of flowers and fruit set on a branch in four directions was counted according to method explained by Kozma et al. (2003). Fruit set was registered weekly and compared in all cultivars and for different orientations (N, E, S, and W). The number of abscised fruits was recorded the second week after flowering and every week thereafter until fruit ripened. The ratio of dropped fruits was expressed as a percentage of the total number of fruit set.

Statistical Analysis: Diameter data were analyzed as repeated measures model using proc Mix from SAS software. Fruit set and drop data were analyzed as a completely randomized design using proc GLM from SAS software. Duncan's multiple range tests ($\alpha = 0.05$) were done using MSTATC program.

RESULTS AND DISCUSSION

Fruit Drop

There was no significant relationship between fruit set and fruit drop among the examined cultivars. The lowest fruit drop occurred on 'Oblacsinszka' (71.5%). Taking the first fruit set to be equal to 100%, the highest total fruit drop occurred on 'Pandy 279' (92.4%), which was similar to 'Éva' (90%). Seasonal changes for fruit set and drop can be seen (Fig. 1). Four abscission peaks were identified based on the average of the nine cultivars. The first fruit abortion wave appeared during second week after pollination. At this time, large drops were not characteristic. Thereafter, the second and third dropping period occurred during the third and fourth weeks after pollination. The fourth abscission occurred between the fourth and fifth week after pollination, which resulted in one percent fruit drop. Fruit drop gradually diminished over subsequent weeks. 'Érdi bőtermő' was especially remarkable for drop of yellowish red fruits (Fig. 2), given that Soltész (1997) found the severity of the first and second fruit drop to be nearly equal. High rates of fruit drop were observed by Nyéki (1978) in 'Pandy meggy 114' (99.7%), 'Pandy meggy 10' (98.9%). In sweet and sour cherry, the second period of fruit drop may occur earlier than 6 weeks after bloom, whereas the third fruit drop ("red drop") occurs as fruit start to ripen. The results in this study support Nyéki (1978); in the case of 'Érdi bőtermő', when the fruit size reached 6-8 mm diameter, a fraction of the crop turned yellowish and dropped.

Fruit abscission significantly ($P<0.05$) varied by branch orientation. Most fruit abscission occurred in branches facing north. West-oriented branches had the least abscising fruits. Branches oriented in the other two directions had intermediate abscission rates (Fig. 3). Within cultivars, the number of fruit shed relative to direction differed, except for 'Petri' and 'Oblacsinszka' where branch direction did not affect number of fruit shed. The branches facing east and north shed more fruits compared to the other directions. The highest amounts of fruit shed occurred on 'Pandy' east facing branches and the lowest fruit shed occurred on 'Érdi bőtermő' north and west facing branches (Fig. 3a, c).

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Figures

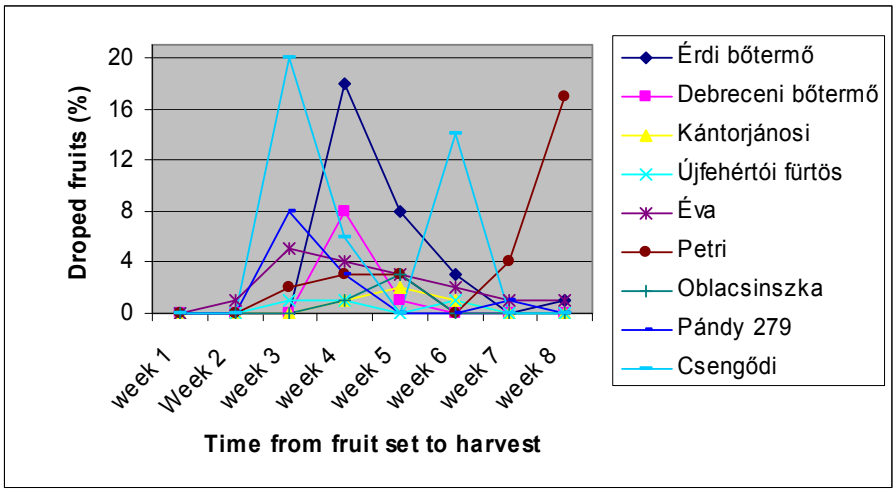

Fig. 1. Seasonal fruit drop of 9 sour cherry cultivars.

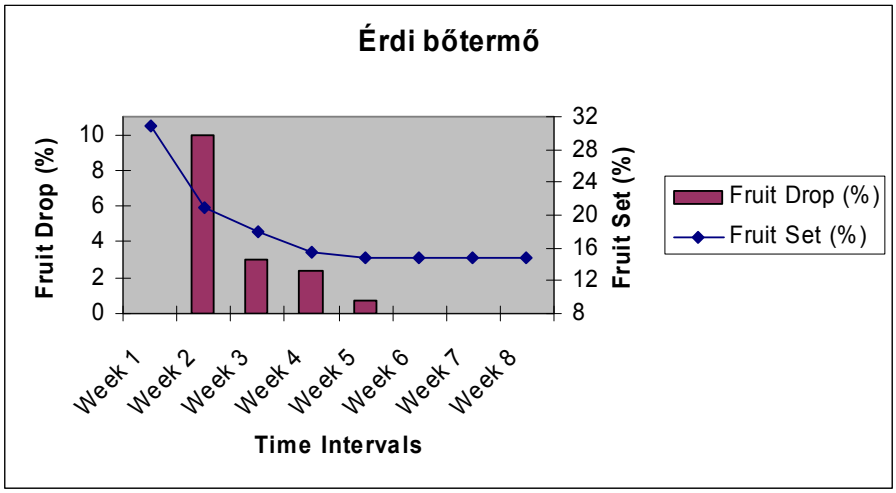

Fig. 2. Seasonal fruit set and drop of 'Érdi bőtermő' sour cherry.

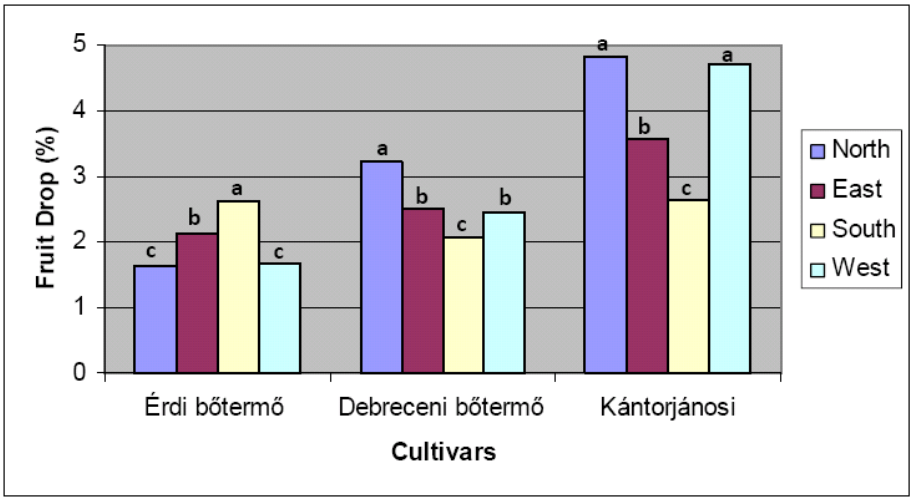

Fig. 3a. Fruit drop of 'Érdi bőtermő', 'Debreceni bőtermő', and 'Kántorjánosi', sour cherry relative to branch direction (Means with the same letter are not significantly different from each other).

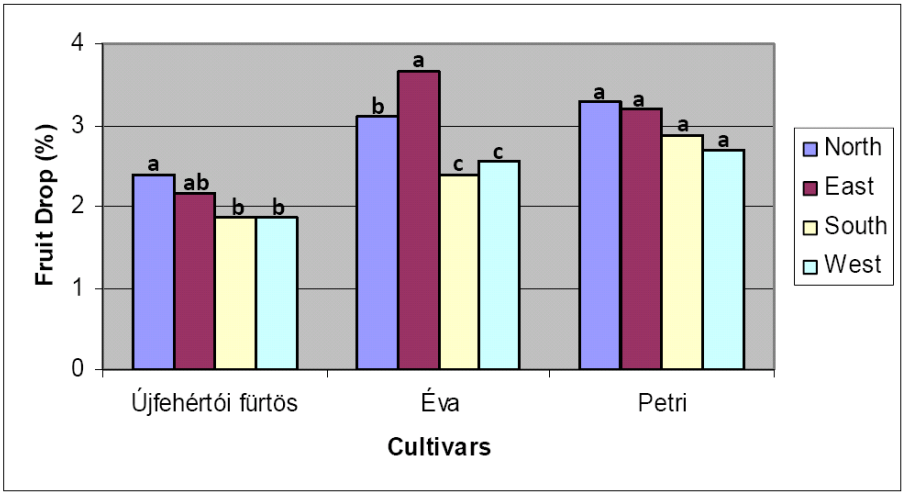

Fig. 3b. Fruit drop of 'Újfehértói fürtös', 'Éva', and 'Petri', sour cherry relative to branch direction (Means with the same letter are not significantly different from each other).

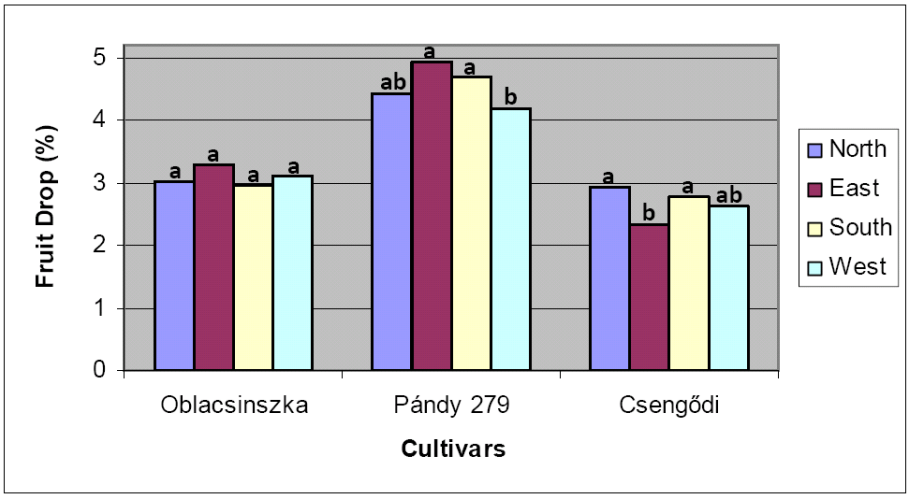

Fig. 3c. Fruit drop of 'Oblacsinszka', 'Pandy 279' and 'Csengődi' sour cherry relative to branch direction (Means with the same letter are not significantly different from each other).