Sex expression of flowers in cultivated sweet and sour cherries

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Summary: During the period of 1968–1972 nine sweet cherry varieties were investigated by the author on mazzard seedling rootstock, moreover cv. *Germersdorfi óriás* and cv. *Münchebergi korai* sweet cherry cultivars grafted on mahaleb, cv. *Korponai* and cv. *Sukorói* cherries were observed on rootstocks of cv. *Cigánymeggy* sour cherry seedling, too.

Yet, there are other relations between the different parts of sweet cherry flowers too, which perhaps indicate the effect of rootstocks in *Cerasus* scions. The flower structure shows feminine character on mahaleb, the effect is intermediate on mazzard, however, the sour cherry rootstock strengthens the male character.

Four sour cherry varieties as cv. *Cigánymeggy C. 404.* cv. *Érdi nagygyümölcsű,* cv. *Meteor korai* and cv. *Pándy C. 101* were studied on three rootstocks: mazzard, mahaleb and Cigánymegy C. 215 seedling rootstocks between 1976 and 1980.

The pistil length, stamen number and relative stamen number diverged significantly on different rootstocks. The results revealed a close negative correlation between the pistil length and stamen number, furthermore noticing that, in the self-fertile cv. *Meteor korai* and cv. *Újfehértói fürtös* presented increasing of the relative stamen number, so the fertility decreased, while in the case of self-sterile varieties the change was favourable.

Summing up the results, it is obvious, that the fertility of flowers can be modified by rootstocks and the ecological factors cause sex reversions on different combinations.

Introduction

Mohácsy and Maliga (1956) and Brózik (1959) observed some sweet and sour cherry cultivars and found differences in their flower fertility. A new aspect of the cherry research are the morphological and fertility problems, for example in sour cherries (Nyéki, 1974 and 1989). There were numerous morphological studies in sweet and sour cherry varieties, and rootstocks (Nyujtó, 1971, Surányi, 1976, 1977, 1985, 1990a and 1990b). A traditional problem for cherry production is the questions of compatibility between scions and rootstocks in Hungary (Probocskai, 1968, Nyujtó, 1971, Tomcsányi, 1979), but the new cultivars and growing technologies are also investigated.

Material and method

The studies are carried out on sweet cherries between 1968 and 1972, and on sour cherries between 1976 and 1980 on different seedling rootstocks. The sex expression of flowers was measured in the nine sweet cherry and five sour cherry cultivars with different grafting combinations.

Each sample of 30 flowers was measured. Pollen germination was determined 3-times in vitro on 15 per cent saccharose solution. The teratomes of flowers are counted at least on 300 samples. All cherry trees studied were 15–21 year olds in the orchard at Cegléd.

Results

The five sweet cherry cultivars had long and fertile pistils (as cvs. Münchebergi korai, Márki korai and Májusi korai, Szomolyai fekete and Jaboulay), those cherries are good pollinators and give highly productive – except cv. Jaboulay. Deviations in the diameter of stigma and antherophylly of cv. Münchebergi korai is uncommon, comparing with the others.

It appeared, that the flowers of cvs. Münchebergi korai, Szomolyai fekete, Májusi korai and Márki korai develop a female organ (gynoecium) of different vigour, but those are good producers, too. According to an earlier definition (*Surányi,* 1976) these cultivars have a strong feminine character compared with other sweet cherries. In other cases, the androecium changes in the relationship of gynoecium and androecium with more stamina (polyandry) or with high rate of pollen germination.

This fact was a typical example of the feminization in flowers, but there are a different kind of sex reversion, too.

Table 1 The flower morphogenetic traits of nine sweet cherry varieties

Cultivars	Mean size of petal, mm	Pistil lenght, m (PL)	Diameter of stigma μm	Stamen number, no. (SN)	Pollen germination %	Relative Stamen number, no./mm (SN/PL)	Apistilly, %	Staminodia, %
Münchebergi	10,0	16,7	977	33,4	57,1	2,00	0,1	32,4
Szomolyai fekete	9,3	15,2	1002	32,1	62,3	2,07	0,4	0,7
Márki	9,5	14,6	1148	36,1	50,5	2,44	0,1	1
Jaboulay	9,7	14,7	1096	34,6	46,0	2,38	0	0
Májusi	9,4	14,3	1155	36,3	67,4	2,54	0	0
Hedelfingeni	9,0	14,2	1291	36,0	51,2	2,55	0,2	0
Bing	9,2	13,7	1167	35,6	40,7	2,59	0	0
Ferenc császár	8,9	13,8	1200	36,7	44,3	2,65	0	0
Germersdorfi	8,6	13,8	1264	37,6	47,6	2,73	0	0

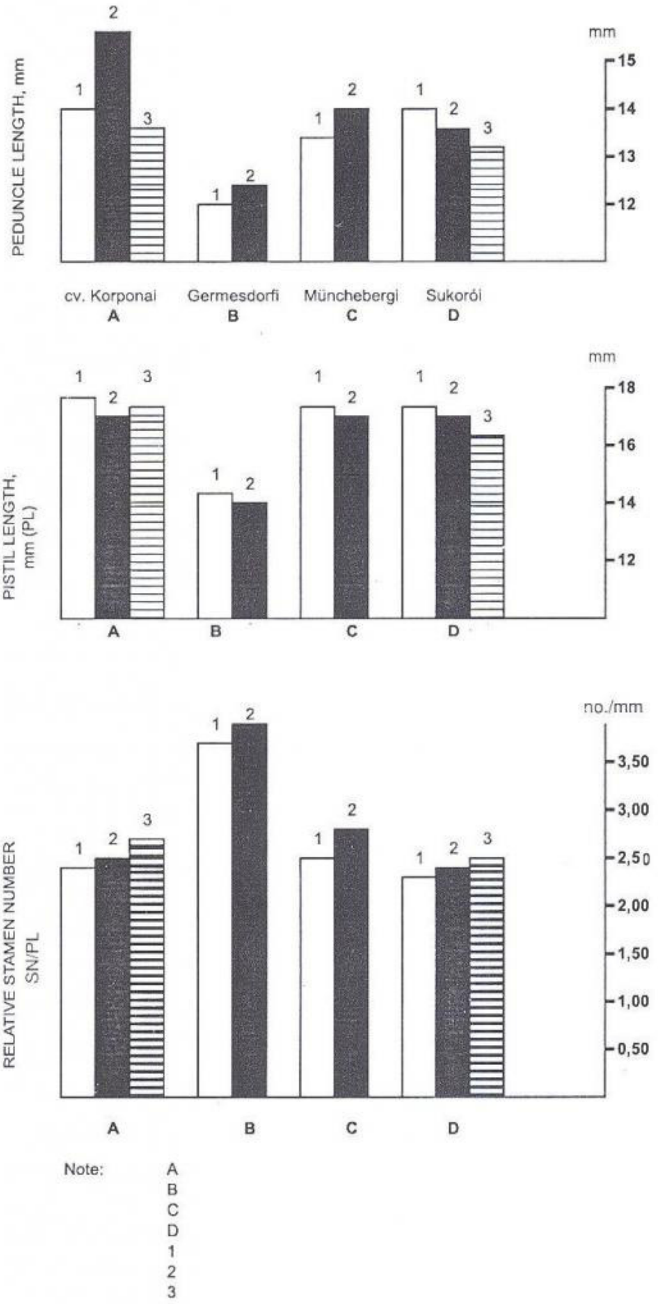


Figure 1 Rootstock's effect in flowers of sweet cherries

The strengthening of androecium as typical change is in such reversion according to the theory of euanthium and telome. But the high rate of pollen germination has alternative possibilities *(Table 1)*. There are effects of rootstocks on the expression of sex organs *(Figure 1)*. The author found several correlations in sweet cherries between the expression of sexual organs and rootstocks. In comparison to the trees on mazzard the rootstock of sour cherry seedling strengtens the male characters of flowers *(Figure 2)*.

The pistil length, stamen number and relative stamen number diverged significantly on different rootstocks. The most striking effect of the cv. Meteor korai on mahaleb C. 2740 compared with the trees of the same variety on mazzard

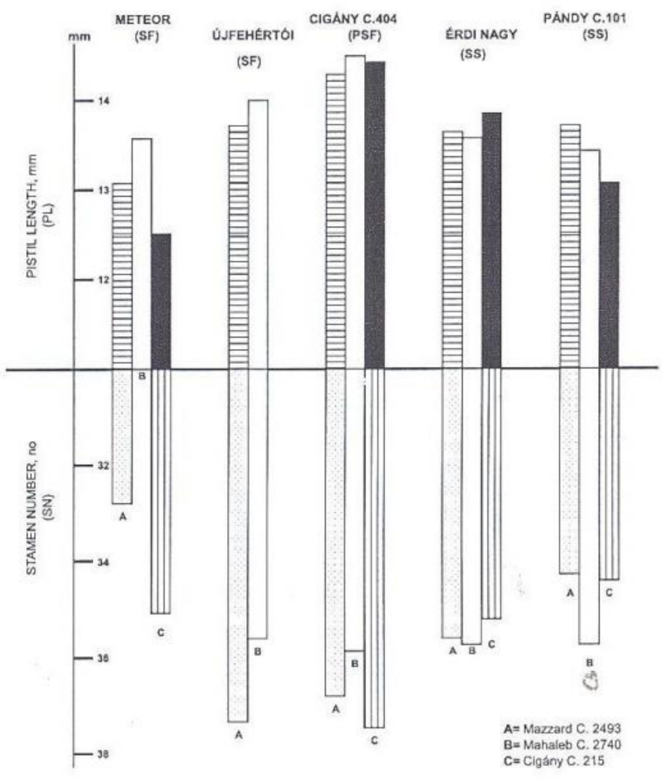
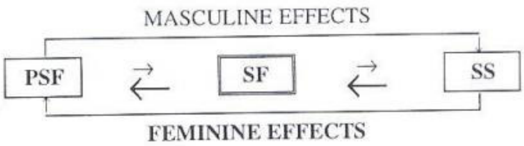


Figure 2 Rootstock's effect in flowers of sour cherries

Figure 3 An integration of sexual changes in sweet and sour cherry varieties

GOOD fertility	MODERATE fertility	POOR fertility
Münchebergi (SCH) Szomolyai (SCH) Márki (SCH) Májusi (SCH)	Jaboulay (SCH) Cigány C. 404 (SOUR)	Hedelfingeni (SCH) Bing (SCH) Ferenc császár (SCH) Germesdorfi (SCH)
Meteor (SOUR) Újfehértói (SOUR)		Érdi nagy (SOUR) Pándy (SOUR)
RATHER FEMININE and BLANCED SEX FORMS by good rootstocks and →	UNBALANCED by strong vigour of rootstocks and genetic causes	

FORMS of SEX in CHERRIES:
FEMININE: longer PISTIL and fewer stamina
MASCULINE: shorter PISTIL and more stamina



PSF = Pactially Self Fertile, etc.

C. 2493 and Cigánymeggy C. 215 rootstocks. The pistil (style) was longer by 6.1 and 13.8 per cent, the stamina fewer by 17.1 and 29.9 per cent, and the relative stamen number lower by 20.7 and 45.3 per cent, respectively. The effects were significant in sour cherry varieties too, so that the ratio of pistil length (PL) and stamen number (SN) was an unambiguous proof (2 1976).

Finally, the correlation of sexual organs was a new result of floral biology which brings up evolutionary problems in relationship between flower structure and its function related to fertility. The feminization in masculine flowers (cultivars, rooststock and scion combinations) is advantageous, but the over-feminization causes some problem on self-fertile and female flowers: the fertility may decrease. The process of differentiation and change backward cause contrary effects in flowers and in fertility.

The (hormonal) balance of sexual organs was different in the combinations and species. The change in sex expression was caused by rootstock in the self-fertile, partly self-fertile and self-fertile cultivars which is of relevance in horticulture and fruit biology alike *(Figure 3)*.

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