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Pollination Interrelations in some Sour Cherry Cultivars

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Vzájemné opylovací poměry některých kultivarů višní

V období šesti let byly zkoumány vzájemné opylovací poměry i schopnost samosprášení u sedmi významnějších kultivarů višní (*Cerasus vulgaris* MILL.), pěstovaných v Československu. Úspěšnost opylení byla posuzována podle procenta uzrálých plodů. Celkový přehled výsledků podává Tabulka 1.

Mezi dvěma kultivary (De Olivet a Bruselská hnědá) zjištěna reciproká inkompatibilita. Stanovena tak první inkompatibilitní skupina u višní. V ostatních případech jde o kombinace v různém stupni kompatibilní. Podle celkové úrodnosti a podle opylovací schopnosti sestaveny studované sorty v pořadí, uvedené v tabulce 2.

U dvou kultivarů (Körösská a Bruselská hnědá) zjištěna naprostá autosterilita, naopak u dvou druhých (Moreillská a Vítova) nalezen vysoký stupeň samosprašnosti. Tyto dvě sorty skýtají rovněž při vzájemném opylení vynikající výsledky. Zbývající tři sorty (De Olivet, Vackova a Ostheimská) jsou jen velmi slabě samosprašné a potřebují dobré opylovače pro zajištění úrody.

Summary

In the course of six years, pollination interrelations and self-pollination ability were investigated in seven more important Sour Cherry (*Cerasus vulgaris* MILL.) cultivars grown in Czechoslovakia. The success of pollination was evaluated according to the percentage of fully ripened fruits. A survey of results obtained is given in Table 1.

Reciprocal incompatibility was found between two cultivars (De Olivet, Brune de Bruxelles). Thus, the first incompatibility group in Sour Cherries has been established. The other varieties form combinations with different degrees of compatibility. The varieties studied are listed in Table 2 according to their general fertility and pollinating ability.

Complete autosterility was found in two cultivars (Körösi, Brune de Bruxelles), two others, on the other hand, showed a very high degree of self-

fertility (Morello, Griotte de Vít). These two varieties also render the best results when intercrossed. The remaining cultivars (De Olivet, Griotte de Vacek and Ostheimer) are only very little self-fertile and need the presence of good pollinators to ensure a satisfactory crop.

Introduction

Whereas in Sweet Cherries [*Cerasus avium* (L.) MOENCH.] the mutual compatibility relations have been studied thoroughly and different incompatibility groups defined (e.g. CRANE & LAWRENCE 1938, CRANE & BROWN 1955) and also the relative fertility in different intercrossings established (HRUBÝ 1962), the actual knowledge of these relations in Sour Cherries (*Cerasus vulgaris* MILL.) is far from satisfactory. The allotetraploid condition in Sour Cherries, like the hexaploid amphidiploid state in plums, causes much more complicated compatibility relations which are, however, more advantageous from the grower's point of view. In Sour Cherries we meet both extreme cases: complete self-fertility as well as complete autosterility which are linked by a series of intermediate types. Moreover, these relations may be influenced considerably by climatic and weather conditions in different years.

Therefore in most pomological books and special papers there are merely general data on self- and cross-fertility and only rarely actual statements. The cultivar Morello, for instance, is given as self-fertile (BLASSE 1957, ZWINTSCHER 1960) as well as Griotte de Vít (FERKL 1958); on the contrary, the variety Ostheimer is quoted as autosterile (KAMENICKÝ 1947, ZWINTSCHER 1960), like variety Körösi (MALIGA 1954) etc. As a rule, the fruit set percentage resulting from different cross-pollinations and autogamies is not given, or the data are only within broad limits, e.g. from 8 to 44 per cent (OLDÉN 1959). According to a recent survey of Cherry breeding (ZWINTSCHER 1960), no reciprocal intersterility in Sour Cherries has been established hitherto. Increased attention is being paid at the present time to the cultivation of Sour Cherries for industrial purposes. Whereas the plantings of Sweet Cherries are to be reduced, those of Sour Cherries will be considerably enlarged. The aim of the present paper, therefore, was to gather information on compatibility relations in some important Sour Cherry varieties grown in Czechoslovakia.

Material and Methods

Seven Sour Cherry cultivars were investigated, all of them belonging to the group of the true Sour Cherries with dark red fruit juice, as follows:

Brune de Bruxelles. A variety probably originating from Belgium, cultivated in Central Europe already in the eighteenth century.

De Olivet. Sometimes erroneously quoted as a Duke Cherry, but actually belonging to *Cerasus vulgaris* MILL. Perhaps of French origin.

Griotte de Vacek (Vackova). Raised in 1893 by the famous Czech pomologist J. Říha at Chlumec n. Cidlinou (Eastern Bohemia) as a seedling of Ostheimer.

Griotte de Vít (Vítova). Selected in 1899 at Eisenstadt (then Hungary, now Austria) by the late

Czech pomologist V. Vít as a seedling of unknown origin, characterized by abundant fruit set as early as in the third year.
Körösi (Pándy). A cultivar of Hungarian origin, presumably a seedling of Ostheimer.
Morello (Schattenmorelle). Well known cultivar originating in the south of France, cultivated in very many countries of the world.
Ostheimer. Another very common variety originating from Sierra Morena in Spain, but introduced at the beginning of the eighteenth century to Ostheim (Germany) and widely propagated from there.

These seven varieties were both intercrossed reciprocally and self-pollinated. The investigation was carried out in the years 1956—1961. The trees were cultivated in large pots and pollinations made in an isolation greenhouse. For cross-pollinations the young flowers were carefully emasculated before opening. At least 20 flowers were pollinated in each combination and/or autogamy. Pollination of very flower was repeated once or twice within two or three days of blooming. The unsuccessful combinations were always repeated in the subsequent year's experiments. A total of 2985 flowers were pollinated. Most pollinations were performed on trees grown in the Experimental Genetic Garden of Charles University, Praha, some check pollinations were done by the late Mr. F. Ferkl in his planting at Chlomek (Central Bohemia). I wish to express my thanks for kind collaboration to him and also to members of the staff of the Department of Genetics and Experimental Genetic Garden for technical assistance. Successful pollination was considered to be only that in which fully ripe fruits resulted. The number of these ripe fruits is always expressed as a percentage. In the final evaluation of each variety a mean percentage of fruit setting was calculated. Each variety was also characterized according to its self-pollination ability and classified as a pollinator according to the mean percentage of fruits set in all combinations with maternal varieties.

Results and Discussion

The results of all possible 49 pollination combinations are given in the Table 1. The numbers in this table represent percentage of ripe fruits from flowers pollinated. The marks — designate repeatedly unsuccessful combina-

Table 1

♀ \ ♂	Brune de Bruxelles	De Olivet	Griotte de Vacek	Griotte de Vít	Körösi	Morello	Ostheimer	$\bar{x}$
Brune de Bruxelles	—	—	15	27	—	19	14	10
De Olivet	—	5	5	5	3	10	7	5
Griotte de Vacek	5	15	4	20	—	4	5	7
Griotte de Vít	9	8	14	28	16	56	4	19
Körösi	12	—	11	21	—	—	13	8
Morello	—	47	5	67	21	47	60	35
Ostheimer	—	5	10	33	—	5	3	8
$\bar{x}$	4	13	9	29	6	20	15	13

tions. The last column and the last row contain mean percentages of individual varieties.

It is apparent from this table that actual reciprocal incompatibility exists in one case, i.e. between two varieties, De Olivet and Brune de Bruxelles. It may be suggested that these two cultivars belong to one incompatibility group having the same genotype of S alleles respectively. The remaining seven cases of unsuccessful pollination are not reciprocal and this fact may be caused physiologically, or genetically in respect of the allotetraploid condition of Sour Cherries. Only two varieties were found to be actually autofertile, i.e. Morello with 47 per cent of fruit setting after autogamy, and Griote de Vít with 28 per cent of fruit set. Our result in Morello is in very good acordance with BLASSE (1957) who reports 45·7 per cent of fruit set at Müncheberg (Germany). These two varieties can be planted even without the presence of other pollinators. Three further varieties which bore a few fruits after autogamy, viz. De Olivet (5 per cent), Griotte de Vacek (4 per cent) and Ostheimer (3 per cent) evidently need cross-pollination for a satisfactory crop. Indeed, Ostheimer is usually quoted as an autosterile variety. The remaining two cultivars, Brune de Bruxelles and Körösi were found to be completely self-sterile. This is in agreement with MALIGA'S (1954) report on Körösi giving autosterility and moreover a poor pollinating ability. The latter is confirmed by our results.

Individual cultivar combinations render different results when cross-pollinated. The fruit set percentage ranges from very poor, 3 per cent (De Olivet × Körösi) to very high, 67 per cent (Morello × Griotte de Vít). It is possible to arrange the varieties studied according to their fertility expressed by fruit set percentage after all possible pollinations. The pollinating ability, however, gives another order of individual varieties. Both these sets are presented in Table 2.

Table 2

Fertility of cultivars			Pollinating ability of cultivars		
Order	Name	per cent of fruit set	der	Name	per cent of fruit set
1	Morello	35	1	Griotte de Vít	29
2	Griotte de Vít	19	2	Morello	20
3	Brune de Bruxelles	10	3	Ostheimer	15
4	Ostheimer	8	4	De Olivet	13
5	Körösi	8	5	Griotte de Vacek	9
6	Griotte de Vacek	7	6	Körösi	6
7	De Olivet	5	7	Brune de Bruxelles	4

It is worthy of attention that in both sets the varieties Morello and Griotte de Vít occupy the two first places. These varieties are self-fertile and also rendered the best results obtained on mutual pollination. Thus, cultivating them together may be recommended in large plantings of Sour Cherries.

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Взаимное опыление некоторых сортов вишен

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В течение шести лет изучались взаимное опыление и самоопыление у семи более важных сортов вишен (*Cerasus vulgaris* Mill.) культивированных в Чехословакии. О положительном результате опыления мы судили по проценту зрелых плодов. Общий обзор результатов дает таблица № 1.

Между двумя сортами (De Olivet и Brune de Bruxelles) найден обратный инкомпабилитет. Таким образом определена первая инкомпабилитетная группа у вишен. В остальных случаях идет речь о комбинациях в различной степени совместимости. По общей урожайности и по опылению выше описанные сорта составлены в таблицу № 2.

Два сорта (Körösi, Brune de Bruxelles) совсем автостерильные, наоборот, у двух других (Morello, Griotte de Vit) найдена высокая степень самоопыления. Эти два сорта дают тоже при взаимном опылении выдающиеся результаты. Остальные три сорта (De Olivet, Griotte de Vacek, Ostheimer) являются очень мало самоопыляемыми и нуждаются в хороших опылителях для обеспечения урожайности.