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Experiences on the fertilization of foreign apricot cultivars

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Summary: Between 2005 and 2007, the self- and free fertilization of 11 foreign apricot cultivars were studied. Among the studied cultivars, two were self-fertile: Z81 and Latecot. These two self-fertile cultivars showed a very high fruit set ratio (above 60%) via free pollination. The lowest fertilization levels (8–15%) were observed at cultivars with a genetically high fruit weight (Jumbocot, Toyesi). In cultivar associations, Toyesi and Robada proved to be a suitable pollinator for most cultivars, while Latecot, Jennycot and Z81 were good pollinators in certain combinations only.

Key words: self-fertile, self-sterile, fruit set, self-fertilization, free fertilization

Introduction

The basis of safe apricot production is the growing of cultivars with good frost tolerance and good fertility. A good yield can be expected after a fruit set of 20–30% (*Nyéki*, 1989). The level of fruit set is determined by the weather conditions (year), cultivar association, plant condition, the cultivar itself and fungal diseases during blossom periods (*Nyéki*, 1989; *Szabó & Nyéki*, 1991; *Nyéki & Szabó*, 1995; *Pedryc*, 2003; *Holb*, 2003, 2004ab). The fertilization of cultivars grown for a long time has been thoroughly studied. It is known which cultivars are self-sterile, self-fertile and we know mutually incompatible groups. However, in recent years, the range of cultivars was widened with several foreign cultivars for testing. When planning orchards to be established with these cultivars, growers could rely only on foreign experience and observations. The different sources sometimes give different data about the fertilization of the cultivars. With genetic research, we can quickly obtain precise knowledge about the cultivars. In addition to knowing the genetic information determining the fertilization of cultivars, field studies are necessary for supporting the theoretical results by the practice.

In most species, creation of self-fertile cultivars is an important breeding objective. Self-fertile cultivars can be grown more safely in orchards, since their flowers are always set in a higher ratio after free pollination than those of self-sterile cultivars. The fruit set of free-pollinated flowers is always higher in cultivar associations, the fruit set after self-pollination. Therefore, for the sake of yield safety, self-fertile cultivars and cultivar associations should be preferred. In order to be able to select the proper pollinating cultivars, we should know the pollen of which cultivar is good for pollinating the flowers of which cultivar. To determine this, crossings are necessary. In previous experiments, it was observed that self-fertile cultivars were not always good pollinators, while self-sterile cultivars can be good pollinators for other cultivars (*Brózik*,1979; *Szabó & Nyéki*, 1991).

Most grown apricot cultivars originate from the species *Prunus armeniaca* L. The apricot cultivars can be classified into four geographical groups. The Central Asian group is the oldest and most diverse, most of its cultivars are self-sterile. The Caucasian group consists of partly self-sterile cultivars with larger fruit and lower cold requirements. The Jungarian-Altaic group contains selections with small fruit. Most of the European apricot cultivars are self-fertile, while most of the Asian and North-American cultivars are self-sterile.

In apricot, self-sterility is due to genetic reasons. The genes responsible for sterility (S_X) form a multiple allelomorph series. Apricot is characterized by gametophytic sterility (*Nyéki*, 1980). The creation of cultivars satisfying the market demand requires the broadening of the array of breeding materials included in crossings. Therefore, an increasing number of widely spread self-sterile cultivars were bred by crossing Asian and North-American genotypes in recent years to achieve frost tolerance and virus resistance (*Nyujtó* et al., 1985; *Burgos* et al., 1993; *Nyéki & Szabó*, 1995; *Pedryc*, 2003).

Most of the cultivars are self-fertile in Hungary (*Horn*, 1939), the first self-sterile cultivar was cv. 'Szegedi mammut' (*Brózik & Nyéki*, 1975). Later, it was proved about the other cultivars of the Óriás (Giant) cultivar groups that they are self-sterile (*Nyujtó* et al., 1985; *Szabó & Nyéki*, 1991).

Materials and methods

Orchard and plant material

The experiments were carried out at Boldogkőváralja in the orchard of North-Cot Ltd. The orchard was planted in 1999 with a spacing of 6×4 m on myrobalan rootstock. Cultivars are alternated in 1 and 2-row blocks, so that the cultivars pollinating each other are next to each other.

Examinations

Self- and free-fertilization of cultivars were evaluated between 2005 and 2007. For both examinations, 12 shoots were selected for each cultivar. For evaluating self-fertilization, the shoots at white bud were covered by a pergamen isolator bag. The opened flowers were removed. The flowerets were counted. After blooming, the isolator bags were removed and the set fruits were counted at regular intervals (except for 2005, when an early fruit thinning was performed). For evaluating free-fertilization, the initial number of flowers at white bud and the the number of set fruit at 10-day intervals were determined. There were 3–4 differences in the start of the blloming time of cultivars in each year, so the blooming times were overlapping.

Table 1. Self-fertilization and free fertilization of cultivars

Cultivar	Self-fertilization			Free fertilization		
	2005*	2006	2007	2005*	2006	2007
Toyesi		0,00%	0,00%		10,48%	9,34%
Jumbocot	10,08%	0,00%	0,98%	19,63%	10,50%	14,63%
Toyuda	4,80%		0,00%			33,92%
Jennycot	4,39%	3,24%	0,00%	8,41%	9,43%	33,73%
Latecot	22,99%	0,00%	5,73%		32,35%	68,81%
Z81	27,16%	7,17%	15,71%	25,17%	41,32%	57,24%
Robada	16,69%	0,00%	0,34%			33,53%
Bergarouge			0,00%	27,25%		26,38%

*Assessed data on the same date before fruit drop

Results

From the three years, we could detect the fertilization of cultivars for a long period only in 2006. The experimental results were distorted by an early fruit thinning in 2005 and by a late frost in May 2007.

Self-fertilization

Among the studied new cultivars, cv. Z81 showed a fruit set higher than 5% in all years (*Table 1*). There were great differences among years in the level of fertilization. This value was 17.11% and 6.84% for Z81 in 2007 and 2006, respectively. According to our examinations, cv. Latecot was also self-fertile in addition to cv. Z81. In 2007, 4.75% of the isolated flowers set 5 weeks after blooming.

The following cultivars proved to be self-sterile: Jumbocot, Toyesi, Toyiba, Toyuda, Robada, Bergarouge. Cv. Jennycot showed 1–2% self-fertilization in certain years.

Free fertilization

In the average of three years, we observed a fruit set above 30% in cvs. Z81 and Latecot(in 2007, it exceeded 60%) (*Table 1*). High fruit set ratios were observed also for cvs. Bergarouge, Toyuda and Robada. In the relative order of cultivars, cvs. Toyesi and Jumbocot were weaker. Cvs. Toyiba and Jennycot belonged to the first or second group depending upon the year.

By analysing the fertilization data of cultivars and clones not mentioned above (Priboto F12, Priboto 11), we confirm that the a higher setting ratio is achieved by the flowers of self-fertile cultivars via free fertilization than by those of self-sterile cultivars.

Crossings

In 2006, we performed a reciprocal crossing series consisting of six cultivars. The results of the crossings are shown in *Table 2*. Among the studied cultivars, cv. Toyesi was a suitable pollinating partner for most of the cultivars. Cv. Robada also showed good results. However, these cultivars were badly pollinated by all other cultivars (based on data of 2007, cvs. Toyesi and Jennycot fertilized cv. Robada well). Cv. Latecot was found to be the weakest pollinating partner for most cultivars. Similar results were obtained for cvs. Z81 and Jennycot. However, they were fertilized well by almost all cultivars.

Table 2. Fertilization results of crossings

Male partners	Female partners			
	Toyesi	Jumbocot	Latecot	Jennycot
Toyesi	43.59%	18.29%	23.00%	
Robada	2.86%	16.67%	17.72%	40.00%
Jumbocot	3.57%		6.93%	17.58%
Latecot	4.40%	14.58%		0.00%
Jennycot	4.76%	0.00%	51.46%	
Z81	x	0.00%	42.59%	15.31%

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