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DETERMINATIONS REGARDING THE PERCENTAGE OF KERNELS OBTAINED THROUGH DIRECTED HYBRIDIZATION OF THE APRICOT SPECIES AT SCDP CONSTANȚA

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Abstract

As climate changes are more and more evident, obtaining new elites in order to improve the assortment of apricots, with new varieties, having high agrobiological potential, requires a better selection of parental lines used for directed hybridization. In order to obtain hybrids with a high potential, the apricot varieties Elmar, De Valu, Augustin and Amiral were taken into consideration. The combinations used were the following: Elmar x De Valu, Elmar x Augustin, Admiral x Elmar. From the total of 2,500 hybridized flowers, a number of 150 viable kernels were obtained, resulting in a percentage of 6%, which means that there are factors that influence the hybridization process. High numbers of viable kernels were observed to be correlated with favorable weather conditions for the crop in that year. The research took place in the experimental fields of SCDP Constanta. They were planted in 2011, the planting scheme is 4/4 m, in an irrigated system. The trees are at full maturity, benefiting from an agricultural technique specific to the crop.

Key words*: Prunus armeniaca, cultivars, yields, kernels.*

INTRODUCTION

Propagation of fruit plants by grafting is an objective necessity once fruit growing has passed to a status with a crop of great economic and food interest. Sexual hybridization is the main method of obtaining varieties with the complex of characteristics necessary for the fruit economy. There are no particular difficulties regarding the technique of hybridization between varieties and species of apricots and no limits of genetic combination (Balan et al., 2008). From a methodical point of view, it should be remembered that hybridization within the limits of the apricot species ensures a much lower variability, compared to other species, regardless of its character, the acquisition pursued through the breeding program (Cociu, 1989). This fact is explained by the reduced degree of heterozygosity of the apricot, an effect of long self-fertilization. The autogamy of most varieties of common apricot *P. armeniaca* L. contributes to the dominance of traits and basic characters (Cociu et al., 1999). The studies performed and published by Viorica Bălan et all. in Romania, Couranjou and Audergon in France, Bassi et al. in Italy, Egea and Bourgos in Spain include the known data regarding apricot genetics. Couranjou emphasizes high correlation between descendants and parents, heritability four surface colour af fruit, taste, firmness, production, pulp colour, aroma, juiciness, fruit size and maturation, flowering time, genetic transgression at maturation time, early fruit maturation.

Guerriero, Monteleone and Marroco pointed out the genetic transgression for late maturation, genetic correlations between parents and descendant regarding fruit size, long fruit viability, fruit firmness.

Bourgos showed a monofactorial system and multi-allelic series controlling self-compatibility in the apricot tree.

D. Bassy and J.M. Audergon emphasized apricot susceptibility to genetic improvement from the viewpoint of adaptability, resistance to disease, and fruit quality.

Viorica Balan et al. evidenced through investigation the genetic mechanism and heredity of certain features and characteristics of the hybrids resulting from controlled hybridization, crossbreeding and mutagenesis.

MATERIALS AND METHODS

The study was carried out in apricot demonstrative lots at Research Station for Fruit Growing Constanta, located in south-eastern Romania, near the Black Sea.

The site is located at 44°10' Northern latitude and 28°29' Eastern longitude, and 70 m above sea level. Climate is continental with warm and droughty summers, frequent dry winds all the year round and temperate winter generally without snow. The mean annual temperature is 12.0°C and the total active temperature is 3988°C, out of which 3170°C during the growing season; the annual precipitation amount is 400 mm, out of which during the growing season (April 1 to September 30), 240.7 mm.

The lowest winter temperatures below -20°C are not very often: 1 out of 10-15 years and so are the spring frosts susceptible to cause apricot yield damage.

The climatic water deficit reaches as much as 400 mm/year, so irrigation application is needed for apricot.

The zonal soil type is a calcaro-calcic chernozem formed on loess, with loam texture and a proper capacity of water preserving, holding and circulation. The humus content ranges between 2.5 and 4%; pH of the soil is poor alkaline (7.0-8.1).

In order to obtain hybrids with a high potential, the apricot varieties Elmar, De Valu, Augustin and Amiral were taken into consideration. The apricot trees are grafted on Constanta 14 described by Indreias et al. (2010). The combinations used were the following: Elmar x De Valu, Elmar x Augustin, Admiral x Elmar. From the total of 2,500 hybridized flowers, a number of 150 viable kernels were obtained (Photo 1 and Photo 2). During the study period, there were deviations from normal climatic parameters, in the sense that winters are warm and without precipitation and springs are long, cold and with a high frequency of late frosts. Observations and determinations were observed between 2021 and 2023 in the demonstration lots and nursery in Field I and II at RSGF fruit tree nursery.

RESULTS AND DISCUSSIONS

The varieties Elmar, De Valu, Augustin, Amiral, used as parents, have a complex heredity.

The apricot variety Elmar, an early ripening variety, slightly sensitive to frost, was used as a basic parent for uniformity in fruiting, earlyness, relatively late flowering.

The De Valu apricot variety, with a medium ripening period, as a parent of character for large, strongly aromatic fruits, good tolerance to the main diseases specific to the apricot culture.

The Augustin apricot variety, with a late ripening period, as a parent of character for frost resistance, productivity, late ripening period.

Within the mentioned combinations, 2,493 flowers were pollinated, from which 1,733 kernels were obtained (Table 1).

Table 1. Pollinated flowers and seeds obtained

COMBINATION	Pollinated flowers		Obtained kernels	
	buc.	%	buc.	%
Elmar x De Valu	825	100	489	59.27
Elmar x Augustin	861	100	654	75.96
Amiral x Elmar	807	100	590	73.11
TOTAL	2.493	100	1733	69.51

Photo 1. Aspects from the hybridization

Photo 2. Aspects from the hybridization

The flower buds are activated 7-10 days before the vegetative buds. Buds begin to swell when the average daily air temperature remains high above 10-12ºC and 140-160ºC active temperatures have accumulated. From the moment of fertilization, the flowers begin the phase of growth and fruit ripening. To go through these phases, 900-1200ºC are needed, i.e. 65-85 days from flowering to ripening for extra-early and early varieties and 1800-2200ºC, i.e. 80-130 days for medium and late ripening varieties. The apricot varieties used for hybridization, Elmar, De Valu, Amiral and Augustin are apricot varieties with staggered ripening, starting from extra-early fruits to late fruits.

From the Elmar x De Valu hybrid combination, 489 kernels were obtained by pollinating 825 flowers, resulting in a 59.27% success rate.
From the Elmar x Augustin hybrid combination, 654 kernels were obtained by pollinating 861 flowers, resulting in a 75.96% success rate.
From the Amiral x Elmar hybrid combination, 590 kernels were obtained by pollinating 807 flowers, resulting in a 73.11% success rate.

From the stated data, the Elmar x Augustin hybrid combination with a percentage of 75.96 was in first place, the Amiral x Elmar hybrid combination with a percentage of 73.11 in second place and the Elmar x De Valu hybrid combination with a percentage of 59.27 in third place.

Photo 3. Hybrid fruits

From the data (Table 2), the Elmar x Augustin hybrid combination had a success rate of 10.25% sprouted kernels out of a total of 489, ranking first, the Admiral x Elmar hybrid combination in second place with a percentage of 8.47 sprouted kernels and the hybrid combination of Elmar x De Valu in third place with a success rate of 6.75%.

Table 2. Seeds planted/sprouted and hybrids obtained

COMBINATION	Seeds planted		Sprout kernels		Obtained hybrids	
	buc.	%	buc.	%	buc.	%
Elmar x De Valu	489	100	33	6.75	25	100
Elmar x Augustin	654	100	67	10.25	48	100
Amiral x Elmar	590	100	50	8.47	32	100
TOTAL	1733	100	150	8.65	105	100

Photo 4. Hybrid fruits

Photo 5. a)

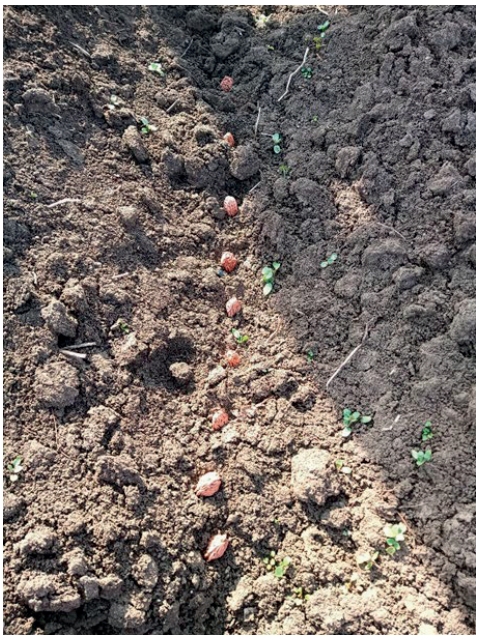

Photo 5. b)

Aspects from seed planting in the SCDP Constanța nursery

CONCLUSIONS

Among the three hybrid combinations, the Elmar x Augustin hybrid combination achieved a better success rate (10.25%) compared to the other two hybrid combinations.

Instead, overall we observe that all hybrid combinations have less than 10% success.

The unfavorable weather conditions during the year, among which we list: prolonged pedological drought, atmospheric drought, low temperatures during flowering, lack of sunlight and heat necessary for pollen maturation, lack of insects, lead to a low percentage of viable kernels and implicitly to a number lack of hybrids necessary for the improvement processes of the apricot species.

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