UN NOU PROGRAM DE AMELIORARE PRIVIND REZISTENTA LA PPV ÎN CATEVA DESCENDENTE HIBRIDE DE CAIS CU PROVENIENTA ROMANEASCĂ

A NEW BREEDING PROGRAM FOR RESISTANCE TO PPV (PLUM POX VIRUS) IN SOME ROMANIAN APRICOT PROGENIES

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Abstract
Breeding for fruit resistant to pests and diseases has become a major objective for many research laboratories. Excessive use of pesticides is increasingly denounced by consumers and the rules controlling their use (particularly with respect to toxic residues) are increasingly restricting. The use of resistant cultivars reduces production costs and increases workers safety. Prospecting through Romanian apricot collections has leaded us to the discovery of several sources of resistance to *Sharka*. The different Romanian hybrids or local apricot varieties was chosen among the different sources of resistance as it could also be used to develop a weeping variety in the some breeding program. To start with, the resistance mode of heritability was studied by creating F1 generations from the resistant parent crossed with a sensitive one, Mari de Cenad The resistance character is dominant and monogenic (symbols Rm1/m1). Breeding was continued by creating the F2 generations using by resistance parent " Stark Early Orange" and " NJA 2" and after that to improve fruit quality by use backcrosses with extra quality varieties like Mamaia, Ovidiu, Tudor etc. The paper describes the breeding work involved in this program. The resistance/susceptibility level of 213 descendants from three different crosses between the Romanian apricot cultivar 'Mari de Cenad' (susceptible to Plum pox virus, sharka), and the North American cultivar 'Stark Early Orange', and "NJA 2" (resistant) was evaluated during four cycles of study under controlled greenhouse conditions. Resistant: susceptible ratios were 91:16 in the case of the 'Stark Early Orange' open-pollination descendants, 52:26 in 'Mari de Cenad' _ 'Stark Early Orange' descendants.

Keywords: plum pox virus, apricot, cultivars, breeding, resistance
Cuvinte cheie:.plum pox virus, soiuri, cais, ameliorare, rezistență

1. Introduction

Described for the first time in Bulgaria in 1917, it spread throughout all Europe, North Africa, India and Chile (Kolber, 2001). Sharka (Plum pox virus, PPV) is one of the most serious viral diseases affecting apricot (Prunus armeniaca L.)

No control means have been developed yet except for the complete destruction of infected trees and the application of quarantine measures (Dicenta et al., 1999; Martınez-Gomez et al., 2003). On the other hand, the development and cultivation of new, resistant cultivars could be the definitive solution to this problem (Martınez-Gomez et al., 2000).

In order to plan an efficient breeding program to obtain cultivars resistant to sharka, it is important to know the genetic control of this resistance. Although there is controversy about the genetic control of the resistance to PPV in apricot, all authors consider that resistance could be transmitted from resistant progenitors to offspring. However, Dosba et al. (1988) found that descendants from crosses between susceptible and resistant cultivars segregated in a complex way. Later, Dosba et al. (1991, 1992) suggested that two genes controlled this trait, the resistance being dominant.

To solve this problem in the long term, two breeding programs aimed at introducing PPV resistance from apricot sources were initiated in Romania (L. Ion et al., 2011) as was done earlier in Spain (Badenes et al. 2002), France (Audergon 1995), Italy (Bassi et al., 1995), and Greece (Karayiannis et al. 1999).

In addition, Badenes et al. (2001), Moustafa et al. (2001a) and Krska et al. (2002), studying different crosses of their breeding program, established the hypothesis of two dominant genes.

In this sense, the objective of this work is to supply new information about the response to PPV infections in new Romanian apricot progenies obtained from crosses between resistant and susceptible genotypes.

2. Material and method

2.1. Plant material

Plant material evaluated included the Romanian apricot (P. armeniaca L.) cultivar 'Mari de Cenad' (susceptible to PPV) and the North American 'Stark Early Orange'(SEO) (resistant to PPV) and the beak crosses (Viceroy x NJA2) x SEO (L.Ion et al., 2011). In addition, 163 descendants from three different crosses were studied: 'Viooceroy' _ 'NJA2' (93 descendants), 'Mari de Cenad' _ 'Stark Early Orange' (70)

2.2. PPV isolate

The PPV isolate assayed was RB3.30, a Dideron type from the collection of the (PPV-D, provenance of SCDP Bistrita) (Romania) from the plum 'Tuleu dulce.

2.3. Evaluation of PPV resistance

The resistance of the descendants was evaluated following the method of Badenes et al (2001). One bud from each descendant was grafted onto a 'GF305' rootstock previously infected with sharka. Three replicates were grafted for each descendant. Plants were placed in a chamber at 7 - 8C for 2 months in order to overcome bud dormancy. Afterwards, they were taken to an insect-proof greenhouse for 4 months. Symptoms of sharka infection were scored visually, both on the scion and on rootstock leaves, from 0 (no symptoms) to 5 (maximum intensity of symptoms), 6 weeks after the plants were placed in the greenhouse. In addition, the optical densities of ELISA-DASI at 405 nm, at 600, using monoclonal antibodies (Cambra et al., 1994), were recorded to check the presence or absence of the virus. Samples with OD double that of the healthy control were considered ELISA-positive (Sutula et al., 1986). Plants were studied for four vegetative cycles (1 year). A descendant was considered susceptible when at least one replicate in one cycle of study showed symptoms and was ELISA-positive, and resistant when no replicates showed symptoms or a positive ELISA reaction after four cycles.

3. Results and discussions

The pollinations were started in spring 2008 (photo 1). Number of flowers pollinated, formed percentage of fruit, number of seeds put to germinate, percentage of plants started in vegetation (photo 2) are illustrate in table 1.

Regarding the evaluation of the progenitors, 'Viceroy' and "Mari de Cenad" behaved as susceptible and 'Stark Early Orange' as resistant to Plum pox virus. after four cycles of study, all the replicates of 'Mari de Cenad and Viceroy' showed sharka symptoms while the replicates of 'Stark Early Orange' did not show any symptoms and were not ELISA-positive The resistant progenitor ('Stark Early Orange') was able to transmit its PPV resistance to the descendants, in agreement with previous results observed by other authors (Dosba et al., 1992; Dicenta and Audergon, 1998; Dicenta et al., 2000).

Among the 163 descendants evaluated, 61 (37.4%) were susceptible to PPV and 102 (62.25%) were resistant. A priori, these proportions do not fit to any of the different hypotheses described to date regarding the genetic control of PPV resistance in apricot (Table 1).

4. Conclusions

To date, the genetic control system of PPV resistance remains unknown, and this is being an important handicap for the breeding programs. In addition, attempts to locate this trait in the available maps have not been completely successful, hindering the MAS development. Several reasons may explain this situation: the strong environmental dependence of PPV resistance scoring (Decroocq et al. 2005), the difficulty into evaluating this trait on large-scale experiments, and the differences in the methods of evaluation used by research groups (Llácer et al., 2007).

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Tables and figures

Photo 1 – The pollinations was started in spring 2008

Photo 2 – The resistant progenies

Table 1 – Results concerning number of plants started in vegetation, obtained from hybrid seeds

No. Crt	Combination	No. of pollinated flower/ combination	No. of formed fruits/ combination	No of seeds/ combination	% of formed fruits	No of plants started in vegetation
1	VT 92.02.52 – NJA 17* (female) x R9 [53 (male) (Viceroy x NJA2*)	7,005	95	65	1.35	13
2	VT 92.01.05 – NJA 17* X R9 P 53 (Viceroy x NJA2*)	5,730	89	77	1.55	32
3	VT 92.02.95 - NJA 17* X R9 P 53 (Viceroy x NJA2*)	3,474	58	23	1.66	18
4	VT 92.02.91 - NJA 17* X R9 P 53 (Viceroy x NJA2*)	4,927	65	33	1.30	30
5	R10 P79 (Viceroy x NJA2*) X Tabriz	370	13	0	0	0
6	R10 P79 X Traian*	450	23	0	0	0
7	V5 – VT 30/40 Mari de Cenad x (SEO *)	580	26	7	4.48	7
8	V6 – VT 12/13 – MOONGOLD X NJA 42*	3,099	68	35	2.19	31
9	VT 4/73 – VIVAGOLD X NJA 42*	4,813	75	37	1.55	32
	Total	30,448	482	277	1.58	163

Figure 1.

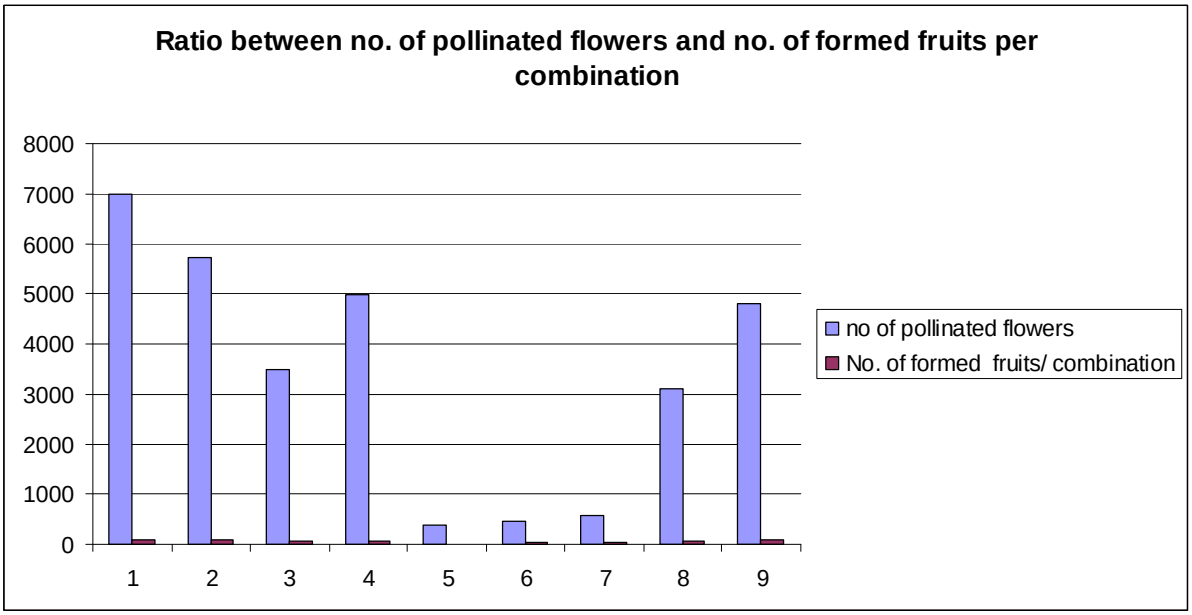

Figure 2.