OVERVIEW OF THE RECENT STUDIES REGARDING IDENTIFICATION OF THE LESS SUSCEPTIBLE PLUM GENOTYPES TO PLUM POX VIRUS FIELD INFECTION

EVALUAREA FONDULUI DE GERMOPLASMĂ LA GENUL *PRUNUS* PRIVIND SUSCEPTIBILITATEA LA INFECȚIA NATURALĂ CU PLUM POX VIRUS

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Abstract. *In Romania, the main problem which occur in commercial plum orchards is endemic infection with Sharka, which is the most destructive viral disease, and even if does not kill plants seriously affects, in a wide range of symptoms, photosynthetic capacity of tree's foliage, causes high losses by considerably yield decreasing and fruit quality depreciation, outclass planting material making difficult to sell nursery stock. At RIFG, activities relating to germplasm maintenance and evaluation include for Prunus genus accessions of plum/prune and sweet/sour cherries. Evaluation of plum accessions is made by the descriptors used for Prunus genus, in ECP/GR GENRES Project 61 and is carried out to identify potential genitors with tolerance or resistance to infection with Plum Pox virus. So, despite of the very high infection pressure in field collection there are same varieties which did not present any distinguish specific symptoms of PPV (on the leaves or fruit) as Grase de Becs, Grase de Pesteana, Ciorasti de Mehedinti, Ciorasti de Prahova, Rosior de Densus, Negre de Bilcesti, Porumbele, Boambe de Leordeni, Negre de Toamna, Buburuze (old local varieties), Flora, Carpatin, Ialomita, Alina (new Romanian cultivars), Can, Wilhelmina Spath, Peche, Belle de Louvain, Kirke (foreign introduced varieties) and seven wild species. It is apparent that, by symptomatological evaluation, same local varieties are tolerant to PPV and, is a strong reason to believe that they include in their heredity a multigenic structure that can provide moderate levels of resistance or tolerance to a least some strains of Sharka.*

Rezumat. *In Romania, principala problema care apare in plantatiile comerciale de prun, cais si piersic este infectia endemica cu Sharka, care este cea mai distructiva boala virala si, chiar daca nu ucide pomul, afecteaza serios, printr-o gama larga de simptoame, capacitatea fotosintetica a foliajului, provoaca scaderea considerabila a productiei, depreciaza calitatea fructelor, declaseaza materialul saditor obtinut in pepiniere, etc. Activitatile legate de mentinerea si evaluarea fondului de germoplasma include pentru genul Prunus accesii din speciile prun, cires si visin. Evaluarea genotipurilor de prun se face utilizand metodologia ECP/GR GENRES Proiect 61 si are in vedere identificarea de potentiali genitori cu toleranta sau rezistenta la infectia cu PPV. In ciuda unei foarte mari presiuni a infectiei naturale, in colectie au fost identificate genotipuri care nu au etalat simptoame specifice de PPV pe frunza sau fruct cum ar fi Grase de Becs, Grase de Pesteana, Ciorasti de Mehedinti, Ciorasti de Prahova, Rosior de Densus, Negre de Bilcesti, Porumbele, Boambe de Leordeni, Negre de Toamna, Buburuze (vechi soiuri locale), Flora, Carpatin, Ialomita, Alina (noi soiuri autohtone), Can, Wilhelmina Spath, Peche, Belle de Louvain, Kirke (soiuri straine) si sapte specii salbatice. Se pare ca, dupa o evaluare simptomatica unele soiuri locale sunt tolerante la Sharka si, sunt motive sa credem ca ele include in ereditate structuri multigenice care induc un nivel, cel putin mediu, de rezistenta sau toleranta la unele forme de PPV.*

In Romania, by use, orchards cover 221 100 ha (1, 5% from total agricultural area) and produce in average 1 585 400 t of fruits from which 557 460 t are plums. (Romanian Statistical Yearbook, 2000-2005).

According to the available data, in 2004, Arges district (one of the 42 Romanian territorial administrative units), situated in South (Muntenia Region), as one of the main fruit and especially plum producing area, have had 97 882 t total fruit production from which 41 399 t where plums (70% of total orchard's area), that means 42,3% from total fruit production of the district and 8,7% from total Romanian plum production of the year. In fact, Arges district and other three from the same area, situated in close left-right-below vicinity, on the small surface (8,7% of total country's agricultural area) provide 20,4% of all Romanian fruit production and by extensive plum growing 26,7% of Romanian plum production.

The main problem which occur in commercial plum, apricot and peach orchards is endemic infection with Sharka, which is the most destructive viral disease, and even if does not kill plants seriously affects, in a wide range of symptoms, photosynthetic capacity of tree's foliage, causes high losses by considerably yield decreasing and fruit quality depreciation, outclass planting material making difficult to sell nursery stock.

Yield of sensitive varieties, which externalize disease's symptoms on fruit, lose commercial value for fresh market. Affected blemished, misshapen, distorted fruit with sunken lesions, if don't drop prematurely and rich harvest maturity, have poor flavor, lowered size, sugar content and anthocyanin level and can be sold, at low price, only to distilleries for brandy processing. Economically speaking, this highly damaging phatogen makes plum harder to grow with an acceptable profit. Only in Arges district 4 860 ha of plum orchards were abandoned in the last 15 years.

In Romanian natural environment, disease is everywhere present on wild host plants (trees, bushes, common weeds). So, keeping under control is very difficult by usual cultural methods as well eradication is impossible.

Studies regarding commercial cultivar's susceptibility to Plum Pox show that in the natural environmental conditions with high level of field infection pressure, disease spreads up to 36,6%, in orchards planted with healthy material, in the first 10-12 years after establishing, by aphid vectors from infected nearby trees and weeds.(Minoiu,2001).

Research Institute for Fruit Growing (RIFG), located in Arges district, lead all research activities in Romania concerning genetic resources and breeding, fruit growing technologies and propagation of planting material.

Collection, preservation, evaluation, study and germplasm use is an important concern of scientists working in the plant breeding.

Action is necessary to avoid the genetic erosion, maintain diversity and guarantee free availability to the genetic resources which can be utilized by current and advancing breeding methods to obtain new, more productive, of high fruit quality, better adapted to biotic and environmental abiotic stresses, varieties.

MATERIALS AND METHODS

At RIFG, activities relating to germplasm maintenance and evaluation include for *Prunus* genus accessions of plum/prune and sweet/sour cherries.

The national plum collection consist of 566 genotypes including 9 wild species, 183 cultivars and landraces of Romanian origin, 318 foreign items and 56 promising hybrids.

In collection, accessions are arranged to illustrate the historical evolution of plum genotypes: wild species, local varieties, foreign varieties and promising hybrids.

Inside each group, the genotypes are arranged taking in to account the ripening time. Each genotype is represented by three trees, grafted on *Prunus cerasifera* and planted at 4m x 4m. Evaluation of plum accessions is made by the descriptors used for *Prunus* genus, in ECP/GR GENRES Project 61.

In addition of collecting, preserving and studying of plum genetic resources activities, other important objective is breeding, by controlled hybridization, and releasing of new cultivars.

For this reason, studies of plum collected genotypes are carried out not only to identify potential genitors for tolerance or resistance to infection with Plum Pox virus, which is considered to be one of the most important diseases limiting Romanian plum production but, also, for other treats like productivity, high quality, low vigor, precocity.

RESULTS AND DISCUSSIONS

In Romania, PPV study has a long history, from over 40 years, being intensify in the last decades, as a response for increasing spreading and disease aggressiveness in commercial orchards.

Recoded data, collected in the last 10 years, regarding infection level with PPV on the leaves allow possibility to make a distribution of the investigated genotypes according to this treat showing cultivar's overmuch susceptibility to the disease and high pressure of the natural field infection in the experimental plot (Table 1).

Table 1

Genotypes distribution according to the % of affected leaves by PPV natural field infection at Research Institute for Fruit Growing, Pitesti-Maracineni

G.T	Total genotypes	Species		Autohtone cultivars		Foreign cultivars		Hybrids	
		Nr.	%	Nr.	%	Nr.	%	Nr.	%
1	142	8	5,63	65	45,77	59	41,55	10	7,05
2	95	1	1,05	31	32,64	54	56,84	9	9,47
3	47	-	-	18	38,30	22	46,81	7	14,89
4	46	-	-	11	23,91	26	56,52	9	19,57
5	78	-	-	20	25,64	51	65,39	7	8,97
6	64	-	-	18	28,12	38	59,38	8	12,5
7	22	-	-	5	22,73	15	68,18	2	9,09
8	32	-	-	5	15,63	26	81,25	1	3,12
9	40	-	-	10	25,00	27	67,50	3	7,50

Observations and determinations made over the years lead to optimistic approach to potential useful donors, with quantitative and eventual qualitative resistance, which can induce, at least, high tolerance to Plum Pox virus infection and, by this way, to control this devastating disease in the longer term.

So, despite of the very high infection pressure in field collection there are same varieties which did not present any distinguish specific symptoms of PPV (on the leaves or fruit) as Grase de Becs, Grase de Pesteana, Ciorasti de Mehedinti, Ciorasti de Prahova, Rosior de Densus, Negre de Bilcesti, Porumbele, Boambe de Leordeni, Negre de Toamna, Buburuze (old local varieties), Flora, Carpatin, Ialomita, Alina (new Romanian cultivars), Can, Wilhelmina Spath, Peche, Belle de Louvain, Kirke (foreign introduced varieties) and seven wild species.(Table 2)

Table 2

The less susceptible cultivars to the natural field PPv infection on leaf and fruit at Research Institute for Fruit Growing, Piteşti – Mărăcineni

No.	Genotype	Susceptibility to PPV infection*	
		Leaf	Fruit
1	Grase de Becs	1	1
2	Grase de Peşteana	1	1
3	Ciorăşti de Mehedinți	1	1
4	Ciorăşti de Prahova	1	1
5	Roşior de Densus	1	1
6	Negre de Bilcesti	1	1
7	Porumbele	1	1
8	Boambe de Leordeni	1	1
9	Negre de toamna	2	1
10	Buburuze	1	1
11	Flora	1	1
12	Carpatin	1	1
13	Ialomița	1	1
14	Alina	1	1
15	Vinete romanesti	8	7
16	Tuleu gras	6	4
17	Can	1	1
18	Wilhelmina Spath	1	1
19	Peche	1	1
20	Belle de Louvain	2	1
21	Kirke	1	1
22	Agen	7	5
23	Anna Spath	5	2
24	Stanley	4	2

* 1= no symptoms; 2= very low susceptibility; 3=low; 5=intermediate; 7=high; 8=very high susceptibility

It is apparent that, by symptomatological evaluation, same local varieties are tolerant to PPV and is a strongly reason to believe that they include in their hereditary multigenic structure that can provide moderate levels of resistance or tolerance to a least some strains of Sharka. Anyway, it seems there is no source of immunity to PPV that will protect trees against all reported strains of the virus.

Collecting data regarding the biological and agronomic traits of the preserved accessions and the current updating generated by losses or by new acquisitions is a continuous concern. Also finding and using of most promising parents in cross combinations, in order to increase efficiency of the traditional, conventional breeding approaches, is a permanently challenge.

Less susceptible genotypes to PPV infection can be used in plum breeding programs to improve tolerance to disease of commercial cultivars.

REFERENCES

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