EVALUAREA UNOR SOIURI LOCALE DE PRUN DIN PUNCT DE VEDERE AL CALITĂȚII FRUCTELOR

EVALUATION OF SOME LOCAL PLUM ACCESIONS FOR FRUIT QUALITY TRAITS

Madalina Butac, Madalina Militaru, Sergiu Budan
Research Institute for Fruit Growing Pitesti, Romania

Abstract

Twenty five local plum accessions originating from national plum collection located at RIFG Pitesti were studied to assess fruit quality traits for selecting some potential genitors to be used in the breeding programs. Studies show that some local plum varieties can be used in breeding work to improve fruit quality, such as: 'Galbene mari aurii', 'Mirabele mari locale' and 'Uriase de Sibiu' for fruit size, 'Grase' and 'Jambon' for high content of soluble dry weight, 'Vanat de vara', 'Rosior timpuriu' and 'Uriase de Sibiu' for firmness, and many genotypes for tolerance to Plum Pox Virus.

Cuvinte cheie: soiuri locale, prun, calitate fruct
Keywords: local varieties, *Prunus domestica*, fruit quality

1. Introduction

Romania has a long tradition in plum culture as well as in the collection and conservation of local plum germplasm. Autochthonous plum cultivars grown in Romania belong to *Prunus domestica* L. and *Prunus insititia* L. (Cociu et al., 1997)

Conservation and utilization of plant genetic resources is one of the main trends in creating new varieties. Local plum varieties are mainly characterized with lower demands and higher adaptability to environmental factors. They also have potential for increased productivity, are often better adapted to local climatic conditions, cultural practices and pests and diseases (Vukojevic et al., 2012).

It is also known that the autochthonous plum cultivars have fruits rich in nutrients necessary for human nutrition and different diets.

For this reason local plum genotypes can be used as an outstanding source of germplasm and as a genetic basis underlying breeding activities, principally the development of new plum cultivars.

2. Material and Methods

For this reasons we have studied twenty five local plum varieties cultivated in the national plum collection of the Genetics and Breeding laboratory of Research Institute for Fruit Growing Pitesti.

On 30 fruits, per sample, collected during full maturity, fruit weight, size, shape, color, soluble solid contents and firmness were measured. These are reported as part of European *Prunus* Data Base standard descriptors (Annex 1).

Fruit weight was recorded with a balance in g/fruit; soluble solid contents were measured with a portable refractometer, in % Brix; fruit colour appreciated visually; the external skin colour parameters (*L, a, b*) were measured using a Konica Minolta CR 400 chromameter, where *L* corresponds to Luminance, and *a* and *b* to the chromaticity coordinates (on green to red and blue to yellow tones, respectively); fruit firmness was measured with non-destructive penetrometer Qualitest HPE equipped with a plunger of diameter 0.10 cm^2. The data were statistically calculated considering the following statistical indices: average, standard deviation and variability coefficient (Botu et al., 1997).

3. Results

Harvesting time

Normally in the southern hilly area of Romania, the plum ripening period expend for 3 month (July, August and September). Varieties were classified into 3 classes, namely: class 3 (early maturation) - 9 cultivars, class 5 (mid-season maturation) 12 cultivars, class 7 (late maturation) - 3 cultivars (Table 1). Concerning the maturation are recommend as potential genitors for earliness, the following cvs: 'Rosioare de Iasi', 'Albe mari de vara', 'Galbene mari aurii', 'Goldane', 'Uriase de Sibiu', etc. For lateness (ripening in the end of August) are suggested cvs. like: 'Jambon', 'Albe de Bilcesti', Mirabele mari locale', etc. (Butac et al., 2009, 2010).

Fruit weight

All monitored local plum cultivars have small fruits according standard descriptors European *Prunus* Data Base. The average fruit weight of local plum cultivars was 23.86 g, ranged from 10.40 g ('Buburuze') to 53.00 g ('Uriase de Sibiu'). We noted for large fruits, over 40 g, the following varieties: 'Albe mari de vara', 'Galbene mari aurii', 'Mirabele mari locale' and 'Uriase de Sibiu'. The variability coefficient of character „fruit weight" was very high (52.65%), indicating a high variability and, therefore, opportunities to use the potential genitors for breeding work (Table 1).

Fruit soluble solids content

Fruit soluble solids content is very important to prune, as well as to other fruits and it mostly depends on the taste of the fruits. The average soluble dry substance was 14.77%, the amplitude being 6.00. The highest soluble solids content of all fruit varieties was 'Grase' (18.8%) and the lowest 'Mirabele mari locale' (12.8%). As with other characteristics analyzed, the standard deviation was low, of 1.42 and the coefficient of variation was only 9.64% (very small variation) (Table 1).

Firmness measurements

Average fruit firmness was 40.26 units HPE (N/0.10 cm^2), the lowest average recorded at variety 'Goldane' (30.14 units HPE) and the highest average was recorded at 'Vanat de vara', 'Uriase de Sibiu', 'Rosior de Iasi' varieties (over 50 units HPE). The standard deviation was 7.70 units HPE and coefficient of variation (standard deviation / mean, expressed as a percentage) was small, 19.13% (Table 1).

Fruit shape and stone adherence

The shape of the fruits varied from spherical to ellipsoidal. In plums, elliptic shape without protruding tips is preferred by Romanian consumers.

Regarding the stone adherence to the flesh, we can say that only eight of the studied local varieties had free stones.

Fruit colour

To appreciate the fruit colour of studied plum varieties we used several methods: visual appreciation and Konica Minolta chromameter. Thus, fruit colour ranged from yellow ('Albe mari de vară, Galbene mari aurii', 'Albe de Bilcesti') to dark blue ('Vanat de vara') (Table 2). The CIELAB colour scale is an approximately uniform color scale. In a uniform color scale, the differences between points plotted in the color space correspond to visual differences between the colours plotted. The CIELAB colour scale is organized in a cube form. The l* axis runs from top to bottom. The maximum for L* is 100, which represents a perfect reflecting diffuser. The minimum for L* is zero, which represents black. The a* and b* axes have no specific numerical limits. Positive a* is red. Negative a* is green. Positive b* is yellow. Negative b* is blue.

Analyzing the data from Table 3, it is noted that, there are not significant differences between varieties. Average value for L* is 30.69, values ranging between 21.44 ('Boboloase') and 56.09 ('Albe de Bilcesti'), values which situated varieties on L* axis closer to black colour.

Regarding axis a*, values obtained show that there are significant differences between varieties. Thus, the average was 2.68, which is red colour, the highest values occurring at 'Mirabele mari locale'' variety, 10.71 (light blue fruit) and lowest at 'Galbene mari aurii' variety, -5.76 (yellow fruits) (Table 3).

On axis b * was found also that there were significant differences between varieties, most values were negative, indicating blue colour. The average value was 8.65, the highest values (positive) were 'Albe de Bilcesti' (21.96) and 'Gatlana' (21.19) varieties, which have yellow fruits, and the lowest values (negative) occurring at 'Vanat de vara' (-4.41) and 'Grase' (-3.65) varieties, which have blue and dark blue fruits (Table 3).

Considering the fact that the consumers prefer varieties of blue and dark blue colour fruits, we recommend as potential genitors for blue colour fruits the following cvs.: 'Vanat de vara', 'Vanat mare sferic', 'Negre de Saru', 'Timpurii de Ceptura', 'Boboloase', 'Grase', Lungulete', 'Buburuze', etc.

Susceptibility to Plum Pox Virus

Plum pox virus is a disease that can cause great yield losses to plum culture. Regarding the tolerance to Plum Pox Virus, the varieties made up 5 classes (Table 1), as follows: no susceptible (on the fruit) - 16 cultivars, low susceptible – 4 cultivars, mid susceptible – 2 cultivars, susceptible – 1 cultivar and very susceptible – 1 cultivar. As a gene source for the resistance to Plum Pox Virus (Sharka) can be used – 'Rosioare de Iasi', 'Buburuze', 'Albe de Bilcesti' and 'Uriase de Sibiu', etc. As a conclusion to these aspects, we found that there was not always a positive correlation between the symptoms on leaves and on fruits of the same cultivar, but the most severe damages were rather presented on leaves than on fruits.

4. Conclusions

Investigated local plum cultivars from the national plum collection of RIFG Pitesti, are well adapted to the environmental conditions in the area of the research institute.

In this study the local plum cultivars were classified as having small fruits with the exception of 'Galbene mari aurii', 'Mirabele mari locale' and 'Uriase de Sibiu', which had very large fruits, over 50 g weight.

The local plum cultivars could serve as an outstanding genetic basis and a source of germplasm for plum breeding, aimed to develop new cultivars.

The cultivar 'Uriase de Sibiu' was remarked by its commercial aspect, good taste and tolerance to PPV and can be recommended both as genitor in breeding programs and also for extension in commercial plantations in Romania.

References

1. Cociu V., Botu I., Minoiu N., Pasc I., Modoran I., 1997. Prunul. Ed. Conphys. Valcea, Romania: 434 p.
2. Botu I., Botu M., 1997. Metode si tehnici de cercetare in pomicultura. Ed. Conphys, Valcea, Romania: 213-224.
3. Butac Madalina, Budan Sergiu, 2009. Evaluation of Local Plum Varieties (*Prunus domestica* L.) from Romanian National Collection. EUCARPIA. XII Fruit Section Symposium. Zaragoza, Spania. Acta Horticulturae, 814.
4. Butac Mădălina, Militaru Mădălina, Budan S., Sumedrea D., 2010. A survey of the genetic resources used in Romanian plum breeding program. Analele Universităţii din Craiova, vol. XV (XLXI). ISSN 1435-1275. pg. 120-126.
5. Vukojevic Dragana, Simic Jasmina, Dragisic Nikolina, Sevo Draana, Misimoic Milutin, Zavisic Nada, Bolic Elmir, Radanovic Bojana, 2012. Evaluation of the quality of autochthonous plum cultivars in the area of Bosanski Petrovac. Third International Scientific Symposium „Agrosym Jahorina2012".

Acknowledgements

This work was supported by the Ministry of Agriculture of Romania under project ADER 118/2011.

Tables and annexes

Annex 1. List of descriptors for *Prunus* genus

Harvest maturity: 1. Extremely early (Earlier than Ruth Gerstetter); 2. Very early (Ruth Gerstetter); 3. Early (Ersinger Fruhzwetsche, Cacak Lepotica); 5. Mid-season (Agen, Tuleu gras); 7. Late (Pozegaca); 8. Very late (President); 9. Extremely late (Later than President).

Fruit size: 1. Very small - sub 10 g (Mirabelle de Metz); 3. Small - 11-25 g (Early Rivers, Bonne de Bry); 5. Medium - 26-40 g (Reine Claude Verte, Ruth Gerstetter); 7. Large - 41-55 g (California Blue, Reine Claude d'Oullins) ; 8. Very large - 56-70 g (Yakima, President); 9. Extremely large – peste 70 g (Record).

Fruit shape: 1. Flat; 2. Round (Reine Claude Verte); 3. Elliptic (Monsieur Hatif); 4. Elongated-elliptic (Pozegaca)); 5. Ovate (Victoria); 6. Heart shaped (Damas); 7. Drop shaped (Coe's Golden drop).

Skin colour: 1. Whitish (Transparent Gage); 2. Green (Reine Claude Verte); 3. Yellow / Green (Reine Claude d'Oullins); 5. Orange (Mirabelle de Nancy); 7. Purple / Red (Reine Claude d'Althan); 8. Violet / Blue (Anna Spath); 9. Dark blue (Pozegaca).

Stone adherence to flesh: 1. Freestone (President, Tuleu gras); 2. Semi-freestone (Frontier, Centenar); 3. Clingstone (Favorita del Sultano).

Susceptibility to PPV: 1. Resistant; 2. Very low susceptible (Opal, Scolduş); 3. Low susceptible (Anna Spath, Oteşani 8); 5. Intermediate (Tuleu gras); 7. Susceptible; 8. Very susceptible (Vinete româneşti, Diana, Debreceni); 9. Extremely susceptible.

Table 1. Evaluation of some local plum varieties from the National Plum Collection (RIFG Pitesti, 2013)

No	Varieties	Harvest maturity	Fruit weight (g)	Soluble solid content (%)	Firmness (HPE units)
1	Rosioare de Iasi	4.08	11.40	13.1	31.96
2	Albe mari de vara	3.08	42.60	15.3	32.88
3	Galbene mari aurii	5.08	51.42	15.6	39.08
4	Goldane	5.08	26.40	14.9	30.14
5	Vanat de vara	8.08	25.20	15.2	55.01
6	Vanat mare sferic	10.08	14.80	12.7	44.10
7	Timpurii de Ceptura	12.08	18.00	13.0	49.19
8	Boboloase	10.08	13.00	12.9	30.28
9	Rosior timpuriu	15.08	22.20	15.9	51.01
10	Roz de vara	15.08	19.60	15.5	38.51
11	Agen de Sirauti	18.08	19.40	14.5	34.78
12	Gatlana	19.08	19.80	13.4	53.28
13	Albe de Tismana	10.08	13.20	15.6	40.46
14	Negre de Saru	19.08	23.25	14.8	45.14
15	Grase	16.08	20.80	18.8	40.51
16	Gatlana galbena	20.08	21.40	13.3	48.83
17	Jambon	23.08	29.00	16.1	42.01
18	Lungulete	20.08	12.20	15.9	38.66
19	Timpurii de Turlesti	18.08	17.20	14.3	36.75
20	Buburuze	12.08	10.40	13.8	34.22
21	Avrame	15.08	27.80	15.1	31.50
22	Mirabele mari locale	30.08	51.00	12.8	37.90
23	Unguresti	18.08	17.00	16.3	35.20
24	Albe de Bilcesti	23.08	16.40	15.4	32.60
25	Uriase de Sibiu	9.08	53.00	14.9	52.44
Average			**23.86**	**14.77**	**40.26**
Standard deviation			**12.56**	**1.42**	**7.70**
Coefficient of variation (%)			**52.65**	**9.64**	**19.13**

Table 2. Evaluation of some local plum varieties from the National Plum Collection (RIFG Pitesti, 2013)

No	Varieties	Fruit characteristics			Susceptibility to PPV	
		Shape	Colour	Stone adherence	On leaf	On fruit
1	Rosioare de Iasi	Elliptic	Red	Semi-freestone	1	1
2	Albe mari de vara	Spherical	Yellow	Semi-freestone	2	5
3	Galbene mari aurii	Spherical	Yellow	Semi-freestone	3	3
4	Goldane	Ovate	Pinkish	Semi-freestone	5	3
5	Vanat de vara	Elliptic	Dark blue	Semi-freestone	1	1
6	Vanat mare sferic	Elongated Spherical	Violet	Freestone	3	1
7	Timpurii de Ceptura	Elongated Spherical	Violet	Semi-freestone	3	1
8	Boboloase	Spherical	Blue	Clingstone	3	1
9	Rosior timpuriu	Elongated Spherical	Blue	Freestone	3	1
10	Roz de vara	Ovate	Yellow – pinkish	Freestone	3	7
11	Agen de Sirauti	Elliptic	Blue	Freestone	2	3
12	Gatlana	Elliptic	Blue	Freestone	7	1
13	Albe de Tismana	Elliptic	Yellow – pinkish	Clingstone	5	7
14	Negre de Saru	Elliptic	Blue	Clingstone	2	3
15	Grase	Spherical	Blue	Clingstone	3	1
16	Gatlana galbena	Ovate	Yellow	Clingstone	5	5
17	Jambon	Elliptic	Reddish	Semi-freestone	5	8
18	Lungulete	Elliptic	Blue	Semi-freestone	3	1
19	Timpurii de Turlesti	Elliptic	Reddish	Freestone	2	1
20	Buburuze	Ovate	Blue	Clingstone	1	1
21	Avrame	Ovate	Reddish	Semi-freestone	2	1
22	Mirabele mari locale	Spherical	Blue	Semi-freestone	5	1
23	Unguresti	Elliptic	Blue	Freestone	7	1
24	Albe de Bilcesti	Elliptic	Yellow	Clingstone	1	1
25	Uriase de Sibiu	Ovate	Violet	Freestone	1	1

Table 3. Colour appreciated with Konica Minolta chromameter

No.	Varieties	CIE L*	a*	b*
1	Rosioare de Iasi	25.38	7.6	0.01
2	Albe mari de vara	43.12	-4.75	14.74
3	Galbene mari aurii	47.20	-5.76	16.87
4	Goldane	27.94	8.51	3.76
5	Vanat de vara	27.05	1.11	-4.41
6	Vanat mare sferic	24.23	1.23	-1.42
7	Timpurii de Ceptura	28.34	5.65	-3.42
8	Boboloase	21.44	2.04	-2.25
9	Rosior timpuriu	21.90	1.61	-1.44
10	Roz de vara	45.48	-3.69	14.12
11	Agen de Sirauti	26.57	5.97	-0.33
12	Gatlana	47.91	-3.47	21.19
13	Albe de Tismana	38.35	-3.01	15.44
14	Negre de Saru	23.39	2.67	-2.69
15	Grase	26.39	2.64	-3.65
16	Gatlana galbena	45.05	-1.73	18.21
17	Jambon	27.12	9.21	0.40
18	Lungulete	27.15	3.05	-1.14
19	Timpurii de Turlesti	24.59	4.68	-0.51
20	Buburuze	26.20	5.43	-0.75
21	Avrame	32.56	5.52	6.15
22	Mirabele mari locale	36.59	10.71	2.04
23	Unguresti	27.67	7.62	0.56
24	Albe de Bilcesti	56.09	-3.30	21.96
25	Uriase de Sibiu	24.10	7.45	1.67
Average		**32.07**	**2.68**	**4.60**
Standard deviation		**9.84**	**4.79**	**8.65**
Coefficient of variation (%)		**30.69**	**178.72**	**187.82**