

Studies on the expression of morphological characters of some Romanian peach varieties

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Abstract

In Europe, PPV (Plum pox virus) is by far the virus with the greatest impact on the Prunus genus and the most limiting factor in peach culture from economic point of view. The sharka virus is causing big damage and losses not only for apricot crops but as well for all other Prunus species. Varieties with genetic resistance to disease are a major pursuit in amelioration programs. Identifying new genotypes with natural resistance to PPV creates new premises and possibilities for obtaining varieties that better meet current and future market requirements.

In this paper the peach varieties Alexia, Alex, Flacăra and Triumf, are initially evaluated for morphological characters, followed by the most important results to be proposed in spring in the new hybridization programs.

Given the character's heredity and the way parental forms behave throughout the selection process, the final objective (obtaining superior varieties) is based on the new characters' heredity.

Key words: Characters; Peach; Varieties; Amelioration; Virus; Resistance.

1. Introduction

The sensibility of varieties to disease attacks and the need for costly phytosanitary treatments that at the same time, have major repercussions both on the environment and on human health are vital problems that must be the central aim of sustainable technologies [1].

Genetic amelioration is a means of conscious change of genotypes for the benefit of the cultivator and the consumer. The collection, preservation and rational use of the peach germ cell fund is a basic condition for the successful amelioration of the new varieties [2].

The identification, creation and introduction into culture of new genotypes with genetic resistance to diseases, but also of high biological and nutritional value is the main way of qualitative and quantitative amelioration of plants [3].

Resistance is an all-embracing term used when the plant undergoes the stress caused by the pathogen without being affected both qualitatively and quantitatively. This type of situation is encountered if the host plant contains a resistance gene and the pathogen that infects it contains the corresponding viral gene [4].

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Establishing definitive parasitic relationships between the two partners (the virus and the host plant) implies the existence of certain properties [5], that each gives the ability to act and react as a prerequisite for establishing ecological balance, cohabitation in case of sensitive plants or blocking the activity of the pathogen in the case of resistant plants. The essential condition for a pathogen to parasitize a plant, is the existence of a mutual affinity. If the pathogen permeates the plant and the infection occurs, the plant is susceptible to the pathogen. If the infection does not occur after the pathogen infects the plant then the plant is resistant to the pathogen [5].

In order to identify potential genitors, it is necessary to evaluate morphologically and phenotypically the existing germplasm fund as well as to study the variability of these characters and to establish the correlations between the main features and characters [7].

The negative effects of the use of pesticides, and in particular of environmental pollution and waste accumulation, as well as increasing practical difficulties in solving disease control problems, have been linked to the widespread and sometimes abusive use of pesticides, consequences that have strengthened research into the identification and selection of varieties resistant to diseases, pests and their use in breeding programs [8].

2. Material and methods

Observations, measurements and determinations were performed on each variety in 2018 on: phenology (bloom, harvest, maturation stage) and morphological characteristics.

The varieties study was carried out according to the CPVO Testing Protocol (Community Plant Variety Office), TP / 053/2 Rev [8].

The method use to observe the characteres is the following:

- MG – single measurement of a group of plants or parts of plants;
- MS – measurement of a number of individual plants or parts of plants;
- VG – visual assessment by a single observation of a group of plants or parts of plants;
- VS - visual assessment by observation of individual plants or parts of plants.

By type of expression the characteristics can be:

- Qualitative characteristics, QL, are those characteristics expressed by discontinuous stages. These stages are self-explanatory and independently significant. All steps are required to describe the full level of character, and each form of expression can be described in a single step. These characters are not influenced by pedo-climatic conditions (for example, ovary pubescence: absent (1), present (9));
- Quantitative characteristics, QN, are those characteristics whose expression covers the entire range of variation from one extreme to the other. Expression can be recorded on a one-dimensional, continuous or discrete linear scale. The range of expression is divided into a number of stages for the purpose of describing (for example, the size of the fruit: very small (1), small (3), medium (5), large (7), very large (9)). The division aims to offer, as far as practicable, a uniform distribution across the scale.
- Pseudo-qualitative characteristics, PQ. In the case of pseudo-qualitative characters, the expression range is at least partially continuous but varies in more than one dimension (for example, color of the fruit: not visible (1), green (2), cream green (3), greenish white (4), cream white (5), cream (6), pink white (7), greenish yellow (8), cream yellow (9), yellow (10), orange-yellow (11) , in which case it can only be properly described by defining two ends of the linear range. Each individual stage of the expression needs to be identified to describe the proper level of character.

3. Results and discussion

Characteristics with an asterisk (marked with *) are characters of particular importance for the international harmonization of descriptions, being invariable, regardless of pedo-climatic conditions.

Expression levels are indicated for each characteristics to facilitate the harmonization of descriptions. Each level of expression is assigned a numerical equivalent for ease of data recording (Table 1)

Table 1 Results concerning the level of expression of characteristic on peach varieties

CPVO No.	Obs. Method	Characteristic	The level of expression of characteristic				Note			
			Alex	Alexia	Flacăra	Triumf	Alex	Alexia	Flacăra	Triumf
1. G QL	VG	Tree: size	medium	medium	large	medium	5	5	7	5
2. QN	VG	Tree: vigour	medium	medium	strong	medium	5	5	7	5
3. QN	VG	Tree: habit	upright to spreading	upright to spreading	upright to spreading	upright to spreading	3	3	3	3
4. QN	VG	Flowering shoot: thickness	medium	thick	medium	medium	5	7	5	5
5. QN	VG	Flowering shoot: length of internodes	medium	medium	medium	short	5	5	5	3
6. QL	VG	Flowering shoot: presence of anthocyanin coloration	present	present	present	present	9	9	9	9
7. QN	VG	Flowering shoot: intensity of anthocyanin coloration	weak	medium	medium	medium	3	5	5	5
8. QN	VG	Flowering shoot: density of flower buds	dense	medium	medium	medium	7	5	5	5
9. G QL	VG	Flower: type	rosette	rosette	campanulate	campanulate	2	2	1	1
10. PQ	VG	Corolla: main colour (inner side)	medium pink	medium pink	dark pink	medium pink	4	4	5	4
11. PQ	VG	Petal: shape	broad elliptic	circular	narrow elliptic	narrow elliptic	2	3	1	1
12. QN	VG/ MS	Only variety with flower type campanulate. Petal: width	-	-	narrow	narrow	-	-	3	3
13. QN	VG/ MS	Only varieties with flower type: rosette. Petal: width	broad	broad	-	-	7	7	-	-
14. QL	VG	Flower: number of petals	five	five	five	five	1	1	1	1
15. QN	VG	Stamen: position compared to	below	below	below	below	1	1	1	1

		petals								
16. QN	VG	Stigma: position compared to anthers	same level	same level	above	above	2	2	3	3
17. QL	VG	Anthers: pollen	-	present	-	present	-	9	-	9
18. QL	VG	Ovary: pubescence	absent	present	present	present	1	9	9	9
19. QN	VG/ MS	Stipule: length	medium	long	long	medium	5	7	7	5
20. QN	VG/ MS	Leaf blade: length	medium	medium	medium	medium	5	5	5	5
21. QN	VG/ MS	Leaf blade: width	medium	medium	medium	medium	5	5	5	5
22. QN	VG/ MS	Leaf blade: ratio length/width	medium	high	medium	medium	5	7	5	5
23. QL	VG	Leaf blade: shape in cross section	convex	convex	convex	convex	3	3	3	3
24. PQ	VG	Leaf blade: margin	crenate	shallow serrate	shallow serrate	crenate	1	2	2	1
25. QN	VG	Leaf blade: angle at base	acute	acute	acute	acute	1	1	1	1
26. QN	VG	Leaf blade: angle at apex	small	small	small	medium	3	3	3	5
27. PQ	VG	Leaf blade: colour	green	green	green	green	2	2	2	2
28. QL	VG	Leaf blade: red mid-vein on the lower side	absent	absent	absent	absent	1	1	1	1
29. QN	VG/ MS	Petiole: length	medium	scurtă	medium	medium	5	3	5	5
30. QL	VG	Petiole: nectaries	present	present	present	present	9	9	9	9
31. QL	VG	Petiole: shape of nectaries	reniform	reniform	reniform	reniform	2	2	2	2
32. QN	VG	Fruit: size	medium	medium	large	large	5	5	7	7
33. PQ	VG	Fruit: shape (in ventral view)	broad oblate	circular	ovate	circular	1	3	4	3
34.	VG	Fruit:	absent	absent	present	present	1	1	9	1

QL		mucron tip at pistil end								
35. QN	VG	Fruit: shape of pistil end (without mucron tip)	weakly pointed	pointed	pointed	weakly pointed	4	5	2	1
36. QN	VG	Fruit: symmetry (viewed from pistil end)	symmetric	asymmetric	asymmetric	symmetric	2	1	1	2
37. QN	VG	Fruit: prominence Of suture	medium	medium	medium	medium	5	5	5	5
38. QN	MS/ VG	Fruit: depth of stalk cavity	medium	deep	deep	deep	5	7	7	7
39. QN	MS/ VG	Fruit: width of stalk cavity	medium	medium	broad	medium	5	5	7	5
40. PQ	VG	Fruit: ground colour of skin	greenish white	cream white	yellow	yellow	3	4	9	9
41. QN	VG	Fruit: relative area of over colour of skin	medium	large	medium	large	5	7	5	7
42. PQ	VG	Fruit: hue of over colour of skin	light red	medium red	dark red	medium red	4	5	6	5
43. PQ	VG	Fruit: pattern of over colour of skin	striped	mottled	spots	mottled	2	4	3	4
44. QL	VG	Fruit: pubescence of skin	present	present	present	present	9	9	9	9
45. QN	VG	Fruit: density of pubescence	medium	very sparse	medium	medium	5	1	5	5
46. QN	VG	Only varieties with fruit pubescence: absent: Fruit: glossiness	-	-	-	-	-	-	-	-
47. QN	VG	Only varieties with fruit pubescence: absent. Fruit: conspicuousness of lenticels	-	-	-	-	-	-	-	-
48. QN	VG	Fruit: thickness of skin	medium	medium	thick	medium	5	5	7	5
49. QN	VG	Fruit: adherence of skin to flesh	absent or very weak	medium	medium	medium	1	5	5	5

50. QN	VG	Fruit: firmness of flesh	firm	medium	medium	medium	7	5	5	5
51. PQ	VG	Fruit: anthocyanin coloration of flesh	absent or very weak	absent or very weak	weak	weak	1	1	2	2
52. QL	VG	Fruit: anthocyanin coloration Of flesh next to skin	absent	absent	present	absent	1	1	9	1
53. QN	VG	Fruit: intensity of anthocyanin coloration of flesh next to skin	-	-	-	weak	-	-	1	-
54. QL	VG	Fruit: anthocyanin coloration of flesh in central part of flesh	absent	absent	present	absent	1	1	9	1
55. QN	VG	Fruit: intensity of anthocyanin coloration of flesh in central part of flesh	-	-	weak	-	-	-	3	-
56. QL	VG	Fruit: anthocyanin coloration of flesh around stone	absent	absent	present	present	1	1	9	9
57. QN	VG	Fruit: intensity of anthocyanin coloration of flesh around stone	-	-	weak	weak	-	-	1	1
58. QN	VG	Fruit: flesh fibre	without fibres	with fibres	without fibres	without fibres	1	2	1	1
59. QN	MG	Fruit: sweetness	weak	high	medium	medium	3	7	5	5
60. QN	MG	Fruit: acidity	weak	medium	medium	medium	2	3	3	3
61. QN	VG	Stone: size in relation to fruit	small	medium	medium	medium	3	5	5	5
62. PQ	VG	Stone: shape (in lateral view)	oblate	obovate	obovate	obovate	1	4	4	4
63. QN	VG	Stone: anthocyanin coloration	absent or very weak	absent or very weak	weak	weak	1	1	3	3
64. QN	VG	Stone: intensity of brown colour	light	medium medium	dark	light	3	5	7	3
65. PQ	VG	Stone: relief of surface	small cavities	grooves	small cavities	grooves	1	5	1	5

66. QL	VG	Stone: adherence to flesh	present	present	absent	absent	9	9	1	1
67. QN	VG	Stone: degree of adherence to flesh	weak	weak	-	-	3	3	-	-
68. QN	MG	Time of beginning of leaf bud burst	medium	medium	medium	medium	5	5	5	5
69. QN	MG	Time of beginning of flowering	medium	medium	medium	medium	5	5	5	3
70. QN	MG	Time of maturity	medium	early	late	late	5	3	7	7

In the table 1 are shown the results concerning the level of expression of characteristic on some peach varieties Alex, Alexa, Flacara and Triumf. For each character was done the note from 0 to 10.

Concerning the characteristic on tree size and the tree vigor the varieties Alex, Alexia and Flăcara was the medium values. Concerning the Flowering shoot: presence of anthocyanin coloration all the varieties takes the 9 note. The variety Flacara and Triumf are the note 3 on flower type campanulate. Concerning the characters of Fruit: flesh fibre the most value variety is Alexia with note 2. Concerning the Fruit: anthocyanin coloration of flesh in central part of flesh the variety Flacara are the note 9 with coloration.

4. Conclusions

The evaluation and characterization of the four peach genotypes according to their phenotypic expression allows the highlighting of the amplitude of genetic variability, thus paving the way for a future genetic improvement program.

From a phenotypic point of view, the following were noted (Table 1):

- Blooming is a genetically determined feature and correlated with the fruit maturing period;
- Harvest maturity is a characteristic to be taken into account in any breeding program, with a particular interest in the two extremes, obtaining genotypes with a very early and very late maturity (the genotype may be used as a source of genes : for early - alexia variety, for late - flacăra and triumph varieties;
- The size of the fruit is one of the highlights of the commercial aspect, especially when the fruit is used fresh, for the breeding program, especially with the large and very large fruit genotypes.
- There is a wide variability of characters, which allows multiple choices of genitors as potential sources of genes to achieve the objectives set in the amelioration program.
- Studies on the available biological material have highlighted the existence of basic genitors with mutually complementary characteristics.

The concern to enrich the germplasm fund and to find new sources of genes more valuable than existing ones remains a permanent goal for breeders.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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