Scientific Papers. Series B, Horticulture. Vol. LXII, 2018
Print ISSN 2285-5653, CD-ROM ISSN 2285-5661, Online ISSN 2286-1580, ISSN-L 2285-5653

STUDY OF THE CYTOLOGICAL CHARACTERISTICS AND GERMINATION POTENTIAL OF SOME PEACH CULTIVARS FROM RSFG CONSTANŢA

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Abstract

The paper shows the results of the genetic potential of some peach cultivars (Prunus persica L.) used as genitors in the breeding process. A detailed morphological and structural description of pollen grains of four peach cultivars 'Raluca', 'Florin', 'Filip' and 'Monica' was done. The pollen was collected from peach flowers in April from the demostrative plots at Research Station for Fruit Growing Constanta (RSFG Constanta). The viability and pollinated tube cultures were made in order to determine the fertility and germination capacity of the analyzed biological material. The one with the highest viability of the pollen grains was recorded at 'Raluca'. 'Florin' cv. has been shown the highest germination capacity on a 15% sucrose nutrient medium after a 2 hour sprouting time (89.6%), followed by a 5% sucrose nutrient medium with after 2 hours of germination time (88.9%).

Key words: *Prunus persica L., pollen, sucrose.*

INTRODUCTION

The peach is one of the most appreciated species that is very very well adapted to the southeastern part of the country.
The studied peach cultivars were created to RSFG Constanta and belong to the fresh consumption type.
Pollen sterility is a character that is finding in few cultivars of peach, being a recessive and monogamy character (Scott and Weinberger, quoteds by Cociu V., 1981).
Reached by stigma, due to wind, insects, birds, water and humans, the pollen grains are soaked with water from the stigmatic liquid, it is swells and germinates: the exine cracks and intine exits out like a pollinic tube through the germination pore.
The pollen is retained by the stigma and absorbs the water from the adhesive mixture that is produced by it; it is moisturizes and then germinates.
In general, pollen moisturizing lasts from few seconds to few minutes and germination begins after 45-210 minutes, both phenomena depending on the species (Andrei, 1978; Şerbănescu-Jitariu and Toma, 1980).

MATERIALS AND METHODS

In order to analyze **the viability of the pollen**, were used substances that bind H_2-catalysed dehydrazes resulting a new colored substance (*formazam*) that distinguished the viable pollen from the unviable one. The mature anthers strike on a lamella in a drop of 0.5% carmin acetic solution; 3 - 5 preparations are microscopic analysis, respectively 5 microscopic fields of each preparation; microscopic fields include red pollen granules because viable granules are colored in red while unviable pollen retains its original yellow colored and there are wrinkled (Andrei and Paraschivoiu, 2003; Doroftei et al., 2008). The statistical interpretation was based on the number of germinated and non-germinated pollen grains from a total of 1000 pollen grains from the analyzed microscopic fields in 3 repetitions, in order to determine the germination capacity of pollen grains.
For microscopic analysis, observations were made and images were taken on a FLUO 2 research microscope provided with a BEL PHOTONICS DV-1300 video camera.
Determination of pollen germination capacity was achieved by collecting pollen of

peach cultivars at the time of full flowering: put 5%, 10% and 15% sucrose solutions on one blade, sprinkle mature pollen on each blade and analyzed at a microscope at 30 minute intervals (up to two hours); the coloring with a 0.5% carmin acetic solution for 2-3 minutes, then covering with the lamella. Three to five preparations are analyzed for each experimental variant, 5 microscopic fields of each preparation are numbered, and germinated and non-germinated pollen granules are included in the microscopic fields (Andrei and Paraschivoiu, 2003; Doroftei et al., 2008).

In order to determine the germination capacity of pollen grains the statistical interpretation was based on the number of germinated and non-germinated pollen grains from a total of 1000 pollen grains from the analyzed microscopic fields in 3 repetitions. For microscopic analysis, observations were made and images were taken on a FLUO 2 research microscope provided with a BEL PHOTONICS DV-1300 video camera.

RESULTS AND DISCUSSIONS

Morphological an structural characteristics of pollen grains to peaches cultivars studied

The cross sections in the antennas at different stages point to the existence of a homogeneous mass of meristematic cells (at the beginning); differentiation of the array of hypodermic cell strings (at a more advanced stage); repeated division of the anther's cells and differentiation of the primary parietal layer as well as the primary sporogen layer.

The parietal layers that appear a little bit later are: epidermis, endothelium, several medium layers and the inner most layer called wallpaper, whose physiological importance is special because it serves to nourish spores.

The sporogenic tissue has as orgin primary sporogenic cells. Some of the sporogen cells degenerated frequently and are absorbed by the rest of the cells. The resulted microspors from the microsporus parent cell divisions are disposed in tetrades that can be of different types.

The distinct elements of the pollen grains are the polar axis, the equatorial axis, and the poles. Pollen granules analyzed have different shapes: spherical, oval or triangular, with average dimensions ranging from 19-30 µm (Table 1).

The pollen membrane has a complex composition that differs from the outside consisting of ectexin and endexin.

Exina is covered with tubers or beaks of different shapes and sizes, with positive elements prevailing, the surface of which is praying, with ornamental elements larger than one micrometer, elongated and distributed irregularly.

In the field of microscopy they appear as elongated, irregularly spaced ridges (Table 1, Figure 1).

Apertures or germinating apertures include colps and pores. Colps have different shapes and can form with the granule (with regular margins) or later than the granule (with irregular margins).

On the analyzed microscopic preparations we usually observed 3 colts, but their number can be between 2 and 4.

The pores are cone-shaped acamerate. The main pollen morphological types observed at the microscope were: bicolpat, polarized or tricolpic pollen, tricolor (Table 1).

Table 1. The characteristics of the analized pollen from four peach cv.

Cultivars	Average size	Shape	Elements of the exine	Apertures
'Raluca'	28 µm	triangular, spheroidal	rugulată	tricolpat triporat
'Florin'	30 µm	triangular,	rugulată	tricolpat triporat
'Filip'	26 µm	triangular, spheroidal	rugulată	tricolpat triporat monocolpat monoporat
'Monica'	23 µm	triangular, oval	rugulată	tricolpat triporat bicolpat biporat

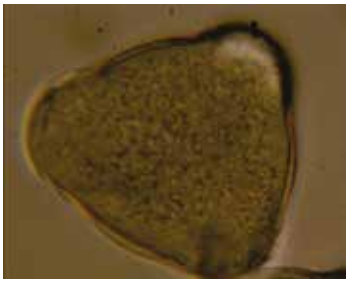

Figure 1. Morphological aspect of pollen grains in *Prunus persica* L. 'Monica' (1000x). There are exine, intine, 3 germinating pores and the surface of the exine

The viability of the pollen it can be seen as one of the most fertile peach from the cultivars analyzed, with the highest viability is 'Raluca' and low fertile with minimal viability 'Florin' (Table 2).

Table 2. The viability of the pollen for the analized cultivars

Cultivars	The total number of the analized pollen grains	The number of unviable pollen grains	The number of viable pollen grains	Viability %
'Raluca'	1000	125	875	87.5
'Florin'	1000	258	742	74.2
'Filip'	1000	189	811	81.1
'Monica'	1000	176	824	82.4

Germination capacity The comparative analysis of the four peach cultivars showed that the highest germination capacity was observed to the 'Florin' cultivar on a 15% sucrose nutrient medium after a 2 hours germination time (89.6%) (Figure 2), followed by 5% sucrose nutrient medium after 2 hours of germination time (88.9%). This cultivar proved to be fertile, although viability was the smallest of the four analyzed varieties (74.2%) (Table 3).

At 'Raluca' cultivars, the highest germination capacity was observed on a 5% sucrose nutrient medium after a 2 hours (85.9%) germination time (Figure 3) and the lowest on a 10% sucrose nutrient medium after a germination time of 30 minutes (22%) (Table 3).

At the 'Filip' cultivars, the highest germination capacity was observed on a 5% sucrose nutrient medium after a 2 hours germination time (72.4%) (Figure 4) and the lowest on a 15% sucrose nutrient medium after a germination time of 30 minutes (42%).

'Monica's' cultivar highest germination capacity was observed on a 10% sucrose nutrient medium after a 2 hours germination time (61.2%), and the lowest on a 5% sucrose nutrient medium after a germination time of 30 minutes (24.3%) (Figure 5).

Table 3. The germination capacity of analyzed peach cultivars

Cultivars	Treatment	Total number of pollen grains	Germinated pollen grains	Non-germinated pollen grains	Germination capacity %
'Raluca'	Distillated water (Control)	1000	0	1000	0
	Sucrose 5%, 30 minutes	1000	556	444	55.6
	Sucrose 5%, 1 hour	1000	668	332	66.8
	Sucrose 5%, 2 hours	1000	859	111	85.9
	Sucrose 10%, 30 minutes	1000	220	780	22.0
	Sucrose 10% 1 hour	1000	276	724	27.6
	Sucrose 10% 2 hours	1000	283	717	28.3
	Sucrose 15%, 30 minutes	1000	478	522	47.8
	Sucrose 15%, 1 hour	1000	544	456	54.4
	Sucrose 15%, 2 hours	1000	604	396	60.4
'Florin'	Distillated water (Control)	1000	0	1000	0
	Sucrose 5%, 30 minutes	1000	678	322	67.8
	Sucrose 5%, 1 hour	1000	790	210	79.0
	Sucrose 5%, 2 hours	1000	889	111	88.9
	Sucrose 10%, 30 minutes	1000	584	416	58.4
	Sucrose 10% 1 hour	1000	667	333	66.7
	Sucrose 10% 2 hours	1000	834	166	83.4
	Sucrose 15%, 30 minutes	1000	632	368	63.2
	Sucrose 15%, 1 hour	1000	821	179	82.1
	Sucrose 15%, 2 hours	1000	896	104	89.6
'Filip'	Distillated water (Control)	1000	0	1000	0
	Sucrose 5%, 30 minutes	1000	482	518	48.2
	Sucrose 5%, 1 hour	1000	663	327	66.3
	Sucrose 5%, 2 hours	1000	724	276	72.4
	Sucrose 10%, 30 minutes	1000	355	645	35.5
	Sucrose 10% 1 hour	1000	507	493	50.7
	Sucrose 10% 2 hours	1000	654	346	65,4
	Sucrose 15%, 30 minutes	1000	420	580	42.0
	Sucrose 15%, 1 hour	1000	506	494	50.6
	Sucrose 15%, 2 hours	1000	591	409	59.1
'Monica'	Distillated water (Control)	1000	0	1000	0
	Sucrose 5%, 30 minutes	1000	243	757	24.3

Cultivars	Treatment	Total number of pollen grains	Germinated pollen grains	Non-germinated pollen grains	Germination capacity %
	Sucrose 5%, 1 hour	1000	305	695	30.5
	Sucrose 5%, 2 hours	1000	347	653	34.7
	Sucrose 10%, 30 minutes	1000	462	538	46.2
	Sucrose 10% 1 hour	1000	506	494	50.6
	Sucrose 10% 2 hours	1000	612	388	61.2
	Sucrose 15%, 30 minutes	1000	269	731	26.9
	Sucrose 15%, 1 hour	1000	318	682	31.8
	Sucrose 15%, 2 hours	1000	364	636	36.4

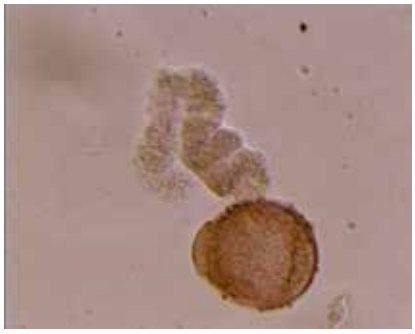

Figure 2. Pollen grains of *Prunus persica* 'Florin' on sucrose 15%, 2 hours (400x)

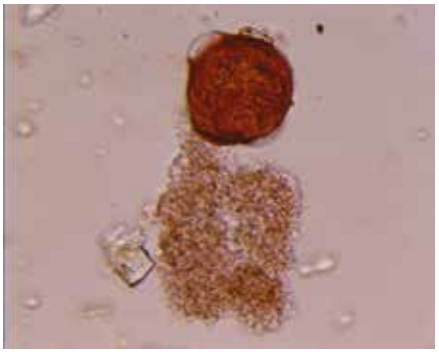

Figure 3. Pollen grains of *Prunus persica* 'Raluca' on sucrose 5%, 2 hours (400x)

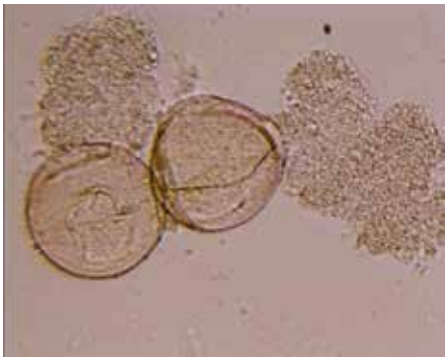

Figure 4. Pollen grains of *Prunus persica* 'Filip' on sucrose 5%, 2 hours (400x)

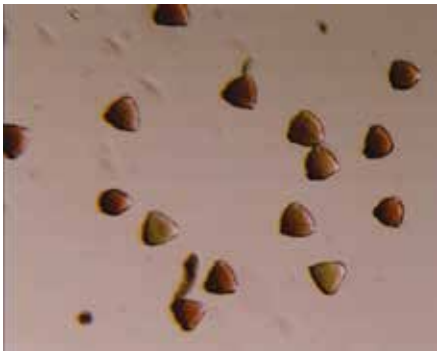

Figure 5. Pollen grains of *Prunus persica* 'Filip' on sucrose 5%, 30 minutes (100x)

CONCLUSIONS

The analyzed pollen granules have different shapes: spherical, oval or triangular, with average dimensions ranging from 19-30 μm.
Exina is covered with tubers or beaks of different shapes and sizes with positive elements predominantly, the surface is rugulate, with ornamental elements larger than one micrometer, elongated and distributed irregularly. Three colps and three pores were usually observed on the analyzed microscopic preparations, but their number may range from 2 to 4. The pores are conical.
From all peach varieties analyzed the one with the highest viability is 'Raluca' and the least viable is 'Florin'.
The comparative analysis of the five peach and nectarine varieties showed that the highest germination capacity was observed in the 'Florin' variety on a 15% sucrose nutrient medium after a 2 hours sprouting time (89.6%) followed by the medium 5% sucrose nutrition after 2 hours of germination time (88.9%).
The comparative analysis of the four peach cultivars showed that the highest germination capacity was observed in the 'Florin' cv. on a 15% sucrose nutrient medium after a 2 hours sprouting time (89.6%) followed by the 5% sucrose nutrition medium after 2 hours of germination time (88.9%).

ACKNOWLEDGEMENTS

This research work was carried out with the support of Ministry of Agriculture and Rural Development, and was financed from Project ADER 3.2.2.

REFERENCES

Andrei M., 1978. Anatomia plantelor. Editura Didactică şi Pedagogică, Bucuresti, 321-326, 339-343.
Andrei M., Anghel I., Popescu I., Stoica E., 1981. Lucrări practice de biologie vegetală. Editura Didactică şi Pedagogică, Bucureşti.
Andrei M., Paraschivoiu R.M., 2003. Microtehnica botanica. Editura Niculescu, Bucureşti.
Cociu V. si colab, 1981. Cultura piersicului. Editura Ceres, Bucuresti.
Doroftei E., Rotaru-Stăncic M., Dobrinas S., Mandalopol D., 2008. Relationships between metals extent and cytological characteristics at *Prunus persica* L. pollen. Environmental Engineering and Management Journal, Vol.7, No.2, 97-101.
Şerbănescu-Jitariu G., Toma C., 1980. Morfologia şi anatomia plantelor, E.D.P., Bucureşti.


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