

RESEARCH ON MICROSPOROGENESIS AND THE DEVELOPMENT OF MICROSPORES IN SOME ROMANIAN VARIETIES OF PEACHES AND NECTARINES FRUIT TREES

CERCETĂRI PRIVIND MICROSPOROGENEZA ȘI EVOLUȚIA MICROSPORILOR LA UNELE SOIURI ROMANEȘTI DE PIERSIC ȘI NECTARIN

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Abstract. *In this study is investigated microsporogenesis and evolution of young microspores both three varieties of Romanian peach Amalia, Congress and Splendid and two Romanian varieties of nectarine Tina and Michaela. Within these species it was considered that at the choice of the varieties to be included the all three ripening periods of the fruits (early, middle and late). The aim of the research consists in the knowledge of the maturing microspores steps at peaches and nectarines, regarding the development of sporoderma by reaching the final dimensions beginning from young microspores, to mature pollen. Also we had in view the selecting of peaches and nectarines varieties with resistance to very low temperatures in winter. It was studied the effect/impact of negative temperatures in winter on the successive stages of maturation microspores starting with CMP (pollen mother cells) to binucleat mature pollen of flowering buds. From the biological perspective the microsporogenesis was not disturbed by external factors and tetrad and young microspores had a normal aspect for the development phase. The pollen maturation went under normal physiological and undisturbed conditions in the line with the changing weather.*

Key words: pollen, young microspores, external factors

Rezumat. *În prezenta lucrare se cercetează microsporogeneza și evoluția microsporilor tineri, atât la trei soiuri românești de piersic Amalia, Congres și Splendid, cât și la două soiuri românești de nectarin Tina și Mihaela. În cadrul acestor specii s-a avut în vedere ca la alegerea soiurilor să fie cuprinse toate cele trei perioade de coacere (timpurie, medie și tardive). Scopul cercetării constă în cunoașterea etapelor de maturare a microsporilor la piersic și nectarin, privind evoluția sporodermei, prin atingerea dimensiunilor finale, începând cu microsporii tineri până la polenul matur, de asemenea cât și selectarea soiurilor de piersic și nectarin cu rezistența la temperaturile scăzute din iarna. S-a studiat microscopic efectul /impactul temperaturilor negative din iarna asupra stadiilor și etapelor succesive de maturare ale microsporilor începând cu CMP (celulele mama polinice) până la inclusiv polenul matur binucleat din mugurii floriferi. Din punct de vedere biologic, microsporogeneza nu a fost perturbată de factorii externi iar tetradele și microsporii tineri au avut aspect normal pentru etapa de dezvoltare. Maturarea polenului a decurs în*

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condiții fiziologice normale și neperturbate în concordanță cu evoluția condițiilor meteorologice.

Cuvinte cheie: pollen, microspori tineri, factori externi

INTRODUCTION

The developments of the microsporogenesis biological processes are dependent both genetic and the thermic factors. All the microsporogenesis steps to the pollination represent "critical phenophases" in comparison with to resistance to much lower temperatures below 0 Celsius degrees (Balan, 2008). These stages mark the transition from the winter resting buds to the optional (Bordeianu, 1961; Tarnavski, 1963). Both the tetrad stage, the uninucleate microspore and the pollen stage binucleat, all these stages depend on "the necessary cold" that the buds compulsory sprout during the optional quiescence (Baciu, 1971). The period from December to January is very important for fruit trees, because the low temperatures creates by the continuity of their flowering buds, an accumulation of cca.200 hours of cold with temperatures below -7°C (Ivascu, 2001). The winter stability protects flowering buds (Cociu, 1993). Both unfavorable and harmful weather conditions and the pronounced fluctuations of low/very low temperature in winter correlated with increased sensitivity of the flowering buds to extremes of temperature, can usually produce profound physiological disturbance in the microsporogenesis at some fruit tree varieties. All these can also cause disparities in the steps of the sporoderma pollen stratification, that affects the further development of the pollen tube, which ultimately it manifests in the orchard, through early fall fruit in large proportion. Also in other cases it manifests by disrupting physiological of fertilization (fertility and then through the weakly fruit binding (Iordache, 2010). The objective of this research is to select the peach and nectarine sorts and the resistance at very low temperatures in winter.

MATERIAL AND METHOD

They were evaluated 5 (experiments) - Romanian fruit tree varieties with different ripening periods (early, middle and late): - for peaches it was analyzed three varieties Amalia, Congress and Splendid, and for nectarine varieties they were evaluated two Tina and Michaela varieties. Suitable to microsporogenesis and maturation stages of pollen in the SCDP Baneasa, they were weekly collected in the months (February, March, April 2011), flowering shoots in stages bud swell, bud burst, calyx red, white bud first/full bloom. The fastening of the taken flowering buds, was made in a Carnoy solution and ethanol 70% vol., after the method for the preserving buds (Andrei and Paraschivoiu, 2003). The microspores were released at each sample, in part by cutting the anthers for observing the early stages of microsporogenesis process (microspore mother cells, dyads, tetrads, monads in various stages and mature pollen). For microscopic examination was used optical microscope IOR ML4-M type. The examination was done in transmitted light and phase contrast with ocular 10x and objectives 10x20x40x.

RESULTS AND DISCUSSIONS

The peaches flowering buds and nectarines sampled in from the second decade of February (21.02.2011) period: by their cutting were obtained very young anthers with normal looking and consistency, as a result of undisturbed organogenesis by climatic factors. There were not tetrads in the anthers because in this time the microsporogenesis process was not released (started). In the first decade of March at flowering buds of nectarine, they were revealed microspore mother cells and tetrad in training (fig. 1). The nectarine flowering buds sampled period of 21 March 2011: they were already found tetrad very mature 21 March 2011, at flowering peach buds were highlighted microspore mother cells and tetrad very young (fig. 3). At the random sampling of the flowering buds in the period 25 March 2011, observed that Amalia peach varieties and Splendid had very mature tetrads and at Congress variety, were also found buds which contained young tetrads (fig. 4).

At the flowering nectarines buds were sampled in 25 March 2011 period, it is noted that in the sporoderma level begin to differentiate fine ornamentations and the shaping of apertures (fig. 5). It should be noted that in the terms of climate, the winter period December 2010 -January -February 2011 (fig. 6), was relatively mild with negative temperatures, but not excessive, that create harmful differences so as to disrupt the natural rhythm adaptation of the flowering buds. So the average temperature in December 2010 was (-0.4°C) and the annual average (-0.1°C).

The average temperature in January 2011 was (-2°C) and the annual average (-3.1°C). The average temperature in February 2011 was (-1.9°C) and the annual average (-0.7°C). In the last decade of January, the minimum temperature dropped from (-10°C) to (-14°C) and continued in the first decade of February with $T^{\circ}\text{C}$ minimum at (-17°C) to (-8°C).

This prolonged moderate interval of cold, had favorable consequences, because by its thermal values did not present a risk of harm (because it has not reached -20°C). On the other hand, the uninterrupted cold protected by fading (decălire) the flowering buds and the risk of accelerated preparation for entrance into vegetation; on the other hand the uninterrupted cold maintained the cellular respiration at a low level as reserves and consumption of starch. In this period was actually created a stabilization of the winter that protect of the flowering buds. March and April 2011 have been positive temperatures with average (5°C) and ($+10^{\circ}\text{C}$). In conclusion, from the examination of microscopic preparations obtained from samples of flowering buds, from the period 21.02.2011-18.04.2011, results that the stages of microsporogenesis process was held at peach, during/in period 21.03.-18.04.2011 and at nectarin during/in period 08.03.-13.04.2011, so:

1. **At peach** tetrad stage was held from 21.03.- 27.03.2011;
2. The very young microspores stage and undergoing maturation during 27.03.-07.04.2011;

3. The mature microspores appeared starting with approx 10 days before anthesis;
4. The flowering peach this year started on 18.04.2011;
5. The status of tetrad **at nectarine** was held from 08.03. - 21.03.2011;
6. The stage of very young microspores and undergoing maturation during 21.04. - 01.04.2011;
7. The mature microspores appear starting from 01.04. - 12.04.2011 with approx. 10 days prior to anthesis;
8. The flowering of the nectarine this year started on 13.04.2011 with 5 days before peach.

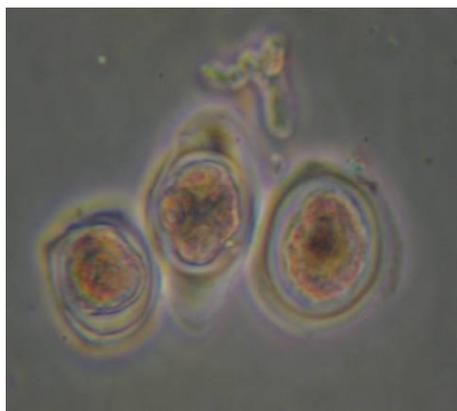


Fig. 1 The Tina and Michaela nectarine varieties, microspore mother cells and tetrads in training (08. 03. 2011) in contrast phase and transmitted light.

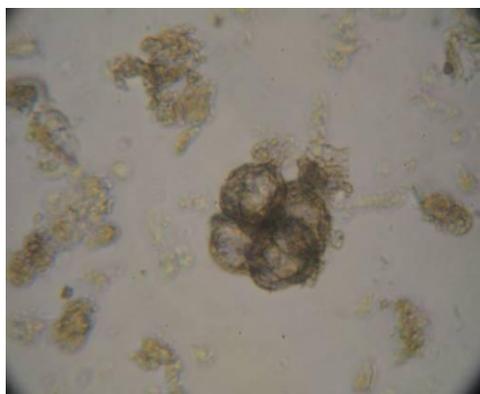


Fig. 2 The nectarine varieties Michaela, monads in detachment, ob.10x, 20x (21.03 2011)

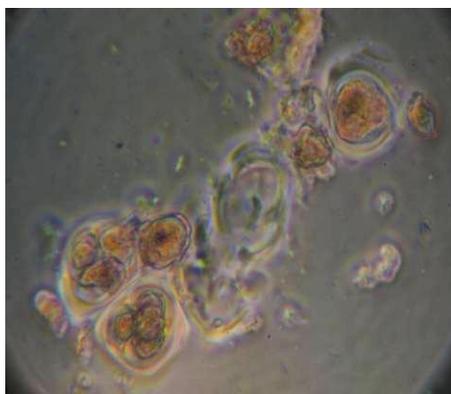


Fig. 3 The peach varieties, Congress and pollen mother cells and very young tetrads in very young in contrast phases, ob.20x, 40x (21.03.2011)

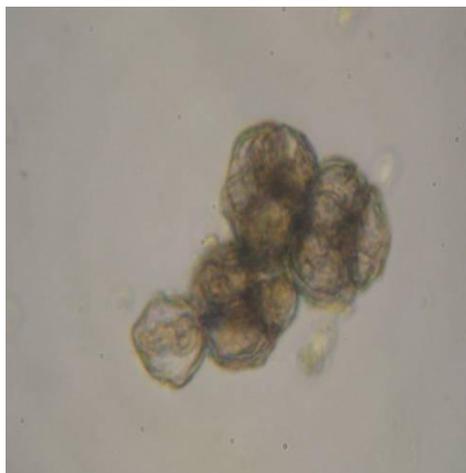


Fig. 4 Tetrades very mature at peach varieties Amalia (25.03.2011)



Fig. 5 Variety nectarine Tina ob.20x, transmitted light (25.03.2011)

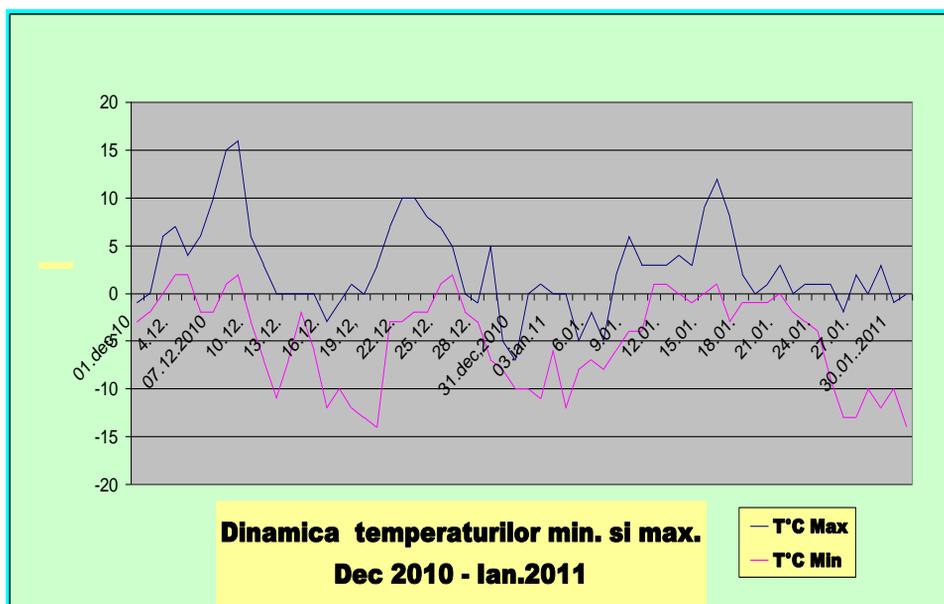


Fig. 6 The dynamic of the minimum and maximum temperatures for the December 2010 and January 2011

CONCLUSIONS

As a result the carried out researches in February-April 2011, in which has been evaluated the microsporogenesis and the young microspores pollen development at the 5 Romanian varieties of peach and nectarine we come to the conclusion that:

1. From the point of biological view, the microsporogenesis had a normal evolution undisturbed and unaffected by external factors;
2. Tetrades and microspores had normal aspect for the development phase;
3. The pollen maturation went in normal and undisturbed conditions, in accordance with the evolution of the favorable weather condition;
4. Both peach and nectarine have the advantage that their microsporogenesis process starts much later (approx. 13 days later than the other species of fruit trees such as apricots for example) and therefore the possibility that microsporogenesis steps may be disrupted due to adverse weather conditions is much lower at peach and nectarines.

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