THE EVALUATION OF POLLEN'S VIABILITY AND THE GERMINATION CAPACITY FOR SOME SWEET CHERRY CULTIVARS CREATED AT S.C.D.P. IAŞI

EVALUAREA VIABILITĂȚII POLENULUI ŞI CAPACITATEA DE GERMINARE LA UNELE SOIURI DE CIREŞ CREATE LA S.C.D.P. IAŞI

IUREA Elena[1], GRĂDINARIU G.[2], MORARIU Aliona[2], CORNEANU G.[1], SÎRBU Sorina[1]
e-mail: iurea_elena@yahoo.com

Abstract: *The aim of this paper was to evaluate the pollen's quality for some cultivars of sweet cherry tree (13 cultivars) obtained at SCDP Iaşi, to establish their posibility of use as pollinators. The pollen's germination was realised on solid nutritive medium. The pollen's viability was determined through the carmine-acetic method. The most sweet cherry tree cultivars (10 of 13 cultivars taken for study) had a high range of pollen germination of above 40%, a percent considered by other authors as satisfying for a normal fructification for the sweet cherry cultivars, so, from this point of view they can be recommended as potential genitors for future breeding works. The pollen's viability was higher than the germination concerning all the studied cultivars, the values of this indicator ranged between 80,56% for the 'Tereza' cultivar and 99,33% for the 'Oana' cultivar, so all the cultivars could be used from this point of view as genitors in breeding works.*
Key words: sweet cherry tree, hybrid combinations, cultivar, genitor, fruit.

Rezumat: *În această lucrare ne-am propus evaluarea calității polenului la unele soiuri de cireş (13 soiuri) obținute la SCDP Iaşi în vederea stabilirii posibilității lor de utilizare ca şi polenizatori. Germinarea polenului s-a realizat pe mediu nutritiv solid. Viabilitatea polenului a fost determinată prin metoda carmin-acetică. Majoritatea soiurilor de cireş (10 din 13 soiuri luate în studiu) au avut un grad ridicat de germinare a polenului de peste 40%, un procent considerat de către alți autori ca fiind satisfăcător pentru o fructificare normală la specia cireş, astfel, din acest punct de vedere pot fi recomandate ca genitori potențiali în viitoarele lucrări de ameliorare. Viabilitatea polenului a fost mai mare decât germinabilitatea în cazul tuturor soiurilor studiate, valorile acestui indicator au variat între 80,56 % la soiul Tereza şi 99,33 % la soiul Oana, toate soiurile putând fi folosite din acest punct de vedere ca genitori în lucrările de hibridare artificială.*
Cuvinte cheie: soiuri, cireş, polen, capacitate de germinare, viabilitate

INTRODUCTION

Fertility successfully can be done at sweet cherry tree only by use of cultivars shedding pollen within the quality of the period of flowering synchronized with the other cultivars period and producing a large quantity of

[1] Research and Development Station for Fruit Tree Growing of Iaşi, Romania
[2] University of Agricultural Sciences and Veterinary Medicine Iasi, Romania

viable and compatible pollen. To be sure the results of pollination will be positive, it is necessary to be known the intrinsic value of the pollen.

Evaluation of the quality pollen is realized, usually by tests carried out "in vitro" through morphological homogeneity which is to be determined, the viability and the pollen's germination as well as the rate of increase of the pollen tube.

The determination of the germinating capacity has an aim to know the biological value of the pollen used in hybridizations, the detection of disorders caused by diseases of gametes (moniliozǎ), and the determination of the pollen's viability has as aim the knowledge of one cultivar's value as shedding pollen in inter fertile combinations, pretesting the anomalies from the genotype, the appraisal physiological status, the pretesting of some factors that affect the pollen's quality (Cociu and Oprea, 1989).

In this paper we proposed to ourselves the evaluation of the pollen's quality at some sweet cherry cultivars obtained at SCDP Iaşi for establishing their posibility of using as pollinators.

MATERIAL AND METHOD

The vegetal material consisted in pollen from 13 sweet cherry cultivars ('Cetățuia', 'Cătălina', 'Maria', 'Ştefan', 'Radu', 'Oana', 'Iaşirom', 'Tereza', 'Paul', 'Iosif', 'George', 'Amar Maxut' and 'Amar Galata') created at SCDP Iaşi. The flowers have been harvested in the spring of 2011, at the stage of inflated bloom, from the bearer of the 19th year from planting.

Excised anthers were kept in Petri boxes 24 hours at room's temperature for releasing the pollen. The pollen germination got realised on a solid nutritive medium, composed of 15% sucrose, 1,5% agar-agar and 2% boric acid (Pirlak L.& Bolat I., 1999). Each Petri box contained 10 ml of medium, on which the pollen has been allocated as uniformly.

For the pollen's germination, the boxes were maintained at temperatures of 20^{o}C, the moisture of 70-90%, in dark for 4 hours after which the increasing of the pollen tube was stopped by the chloroform.

For each cultivar there were made three Petri boxes and quantifying the extent of germination has been achieved by counting to 5 random fields (number of quantified grains of pollen was of minimum 1000) for each Petri box. The examination was made at the light microscope Motic with the objective of 4X and 10X. The pollen tube length has been evaluated with the photo camera's software and it has been expressed in μm.

For the pollen's viability estimation it has been fixed in Carnoy fixer 12 hours, after which it was preserved in a fridge in alcohol 70%. The fixed pollen has been colored with acetic carmine and viewed in the light microscope. The viable pollen, colored in red carmine has been quantified in 10-15 visual fields (the number of quantified pollen grains was of minimum 1000) and each stage was done in three repetitions (Cociu and Oprea, 1989; Botu and Botu,1997).

For the statistic interpretation of the dates, it was calculated the coefficient of variation (s%) for which it is allowed arbitrary the next values:

- 0 – 10% - coefficient of low variation;
- 10 - 20% - coefficient of average variation;
- 20 - 30 % - coefficient of big variation.

RESULTS AND DISCUSSIONS

In the case of fruit growing species, the germinability and the increasing rate of the pollenic tube are the most important features for the evaluation of the pollen's quality, because for an efficient fertilisation it is necessary a high capacity of pollen's germination and a high increasing rate of the pollenic tubes. In the case of some fruit tree cultivars with an excessively small rate of germination or of increasing of the pollenic tubes it is possible a deficiency of tying of the fruit caused by the degradation ovule before the pollenic tube to reach the ovary (Cheung, 1996; Stosser et al., 1996; Sharafi and Bahmani, 2010) or it could be cause of some biotically or abiotic factors influence (Beppu et al., 2005).

In the case of our researches, we observed high differences between cultivars in what it concerns the germination capacity of the pollen (table 1), the values being between 9,63% at the cultivar 'Cătălina' and 74,36% at the cultivar 'Paul', at which even the pollen's viability was very high (95,27%) (table 2), the value of the variation coefficient indicating a high value of this feature (35,20%) (tab. 1).

Table 1

The capacity of germination and the length of the pollenic tube at sweet cherry tree (2011)

Cultivar	Provenance	The germination capacity %	-µm-	
			Average	Standard deviation
Cetățuia	SCDP Iaşi	56,74	58,52	±15,74
Cătălina	SCDP Iaşi	9,63	56,43	±13,29
Maria	SCDP Iaşi	70,04	78,24	±12,68
Ştefan	SCDP Iaşi	61,47	33,32	±10,90
Radu	SCDP Iaşi	61,90	68,93	±21,28
Oana	SCDP Iaşi	55,40	100,30	±20,81
Iaşirom	SCDP Iaşi	47,10	53,5	±15,36
Tereza	SCDP Iaşi	36,04	126,44	±16,20
Paul	SCDP Iaşi	74,36	76,83	±17,19
Iosif	SCDP Iaşi	23,17	57,53	±17,30
George	SCDP Iaşi	50,37	74,46	±12,12
Amar Maxut	SCDP Iaşi	44,39	64,44	±16,76
Amar Galata	SCDP Iaşi	56,09	68,21	±18,09
Average		49,75		
Standard deviation %		17,46		
Variation coefficient %		35,10		

The low results obtained at the cultivar 'Cătălina' (9,63%), 'Iosif' (23,17%) and 'Tereza' (36,04%) can be determined by the abiotic factors influence (the thermal fluctuations from the period of vegetative rest and the differences of temperature day-night of approximately -15^{o}C) on the pollen's germination capacity (fig. 1).

The majority of sweet cherry tree cultivars (10 of 13 cultivars kept in study) had a high degree of pollen germination over 40%, a percent considered by other

authors (Cheung, 1996; Sharafi and Bahmani, 2010) as satisfying for a normal fructification for the sweet cherry cultivars, so, from this point of view, they can be recommended as potential genitors in the future breeding works (tab. 1).

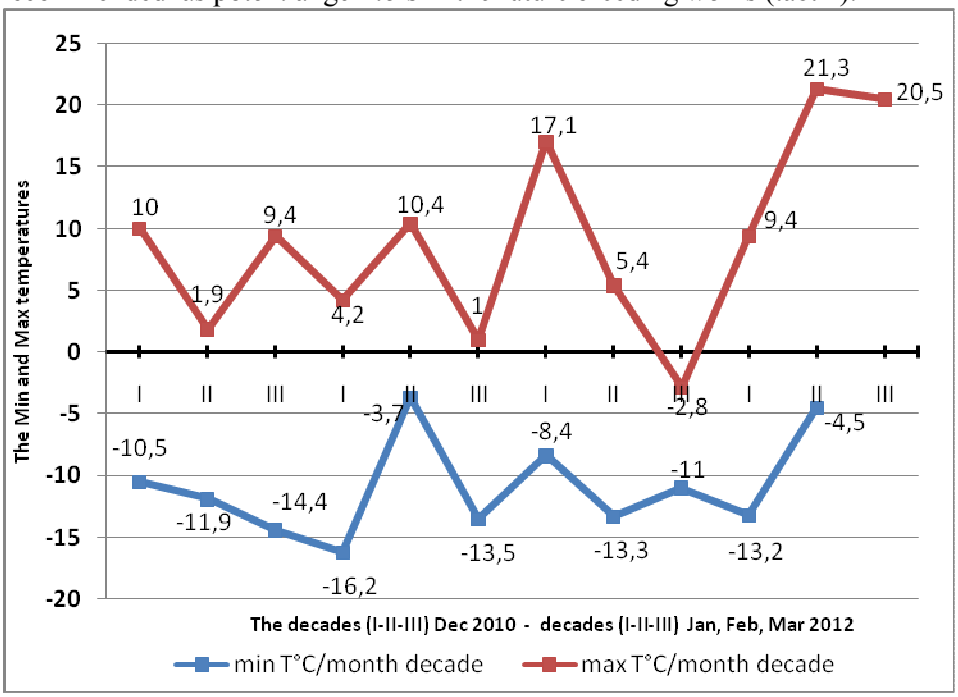

Fig. 1 – The dynamics of air temperature on decades in the period December 2010 – March 2011

At cultivars with a very high germination it wasn't obligatory observed a high rate of increasing of the pollenic tube. The cultivars 'Tereza' (126,44 µm) and 'Oana' (100,30 µm) had the highest length of pollenic tube and the cultivar 'Ştefan' had the smallest one with only 33,32 µm (table 1).

Fig. 2 – The pollen germination 'in situ' at the cultivar 'Cetățuia'

The pollen grains go through a stage of hydration in the interior of the anthers at the final of the maturation stage (Lord and Russell, 2002). Although normally the pollen doesn't germinate before reaching other flower pestle's stigma, in the literature there are presented germination cases 'in situ' (in the interior of the anther) at some fruit growing cultivars as apple tree or peanut tree (Koul et al., 1985). In the case of our researches, a similar phenomenon was observed at the cultivar 'Cetățuia' (fig. 2).

The pollen viability was higher than the germination in the case of all the studied cultivars, result which is in agreement with those obtained by other authors (Pearson and Harney,1984; Parfitt and Ganeshan,1989).

Table 2

The pollen viability at sweet cherry tree (2011)

Cultivar	Provenience	Pollen viability %
Cetățuia	SCDP Iaşi	96,31
Cătălina	SCDP Iaşi	89,75
Maria	SCDP Iaşi	91,11
Ştefan	SCDP Iaşi	87,5
Radu	SCDP Iaşi	90,79
Oana	SCDP Iaşi	99,33
Iaşirom	SCDP Iaşi	98,47
Tereza	SCDP Iaşi	80,56
Paul	SCDP Iaşi	95,27
Iosif	SCDP Iaşi	90,77
George	SCDP Iaşi	96,69
Amar Maxut	SCDP Iaşi	98,99
Amar Galata	SCDP Iaşi	99,21
Average		93,44
Standard deviation %		5,41
Variation coefficient %		5,79

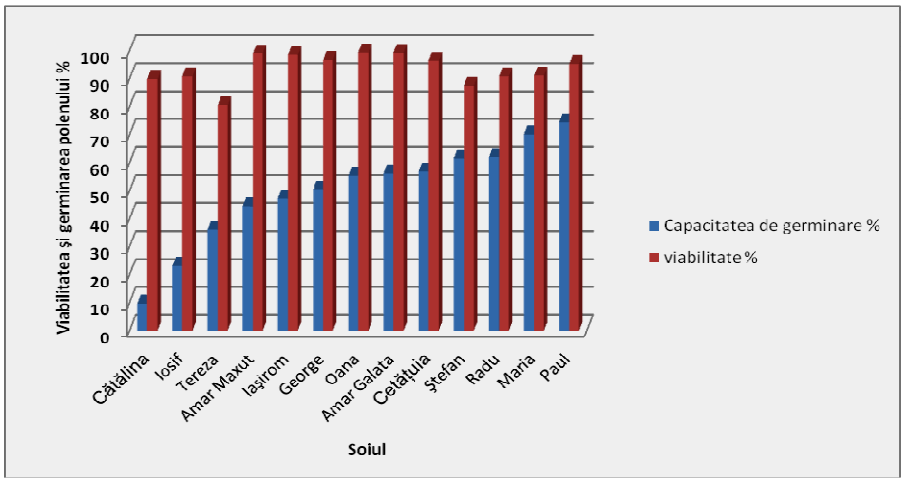

Fig. 3 – The dynamics of the pollen viability and of the germination capacity at 13 cultivars of sweet cherry tree

This indicator's values have varied between 80,56% at the cultivar 'Tereza' and 99,33% at the cultivar 'Oana'. The obtained results showed that the pollen viability had very high values, all the cultivars can be used as genitors from this point of view in papers of artificial hybridisation (tab. 2), (fig. 3).

CONCLUSSIONS

1. The obtained results highlight the fact that the majority of sweet cherry cultivars can be used successfully as potential genitors in future amelioration papers.

2. As a result of the fluctuation of minimum and maximum registered temperatures in March (minimum -13,2^{o}C, maximum +21,3^{o}C), the cultivars 'Cătălina', 'Iosif' and 'Tereza' can be considered as cultivars with low resistance to frost.

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