REZULTATE PRIVIND STABILIREA CELOR MAI BUNI POLENIZATORI LA UNELE SOIURI NOI DE CIREŞ

RESULTS CONCERNING THE ESTABLISHMENT OF THE BEST POLLINATORS TO SOME OF THE NEW CHERRY CULTIVARS

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Abstract

The aim of this paper work is the rating of the pollen's quality, the study of the fertility indexes and the behaviour of the cultivars in the process of controlled pollination for some of the cultivars obtained at RSFG Iasi, for establishing the compatible groups on this criteria. The researches were made in 2011 and 2012 at RSFG Iasi, with 9 cherry cultivars as study material ('Ludovic', 'Cociu', 'Margo', 'Alex', 'Anda', 'Iosif', 'Andrei', 'Mihai' and 'Paul'). Following the data analysis concerning the cultivars behaviour in the pollination process, there are recommended the interfertile groups presented in table 3. To obtain good productions each year, it is necessary to provide optimal conditions for interpollination for the cultivars by their correct allocation in orchard, planting a row with pollinator cherry at 2 or 4 rows of cherry trees for pollination (the report of 2:1 or 4:1).

Cuvinte cheie: cireş, soiuri, polen, fertilitate naturală, polenizator
Keywords: cherry tree, cultivars, pollen, natural fertilization, pollinator

1. Introduction

Almost all the cherry cultivars are auto-sterile, being dependent for fecundation of crossed entomophily pollination. The relative fertility obtained by free pollination oscillates from 36.5% ('Kassis Fruhe') to 62.6% ('Hedelfinger'), (Blasse, Berhold, 1976, quoted by Budan & Gradinariu, 2000).

Today cherry culture technology requires the plantation in orchard of at least 3 cultivars to assure an efficient interpollination and a production with big fruits (Gradinariu, 2002).

To obtain safe and economic productions, besides respecting the agrotechnical rules, it is required the precise knowledge of each cultivar's biology, which refers to the degree of binding of the fruits with their own pollen or to establish the compatible groups for the auto-sterile cultivars.

This study was made to know precisely the degree of auto fertility, auto sterility and the behaviour of the cultivars in the controlled pollination process, to establish the best pollinator.

2. Material and methods

The researches were made in 2011 and 2012, with 9 new cherry cultivars as research material ('Ludovic', 'Cociu', 'Margo', 'Alex', 'Anda', 'Iosif', 'Andrei', 'Mihai' and 'Paul'), created at RSFG Iași, approved in 2010-2011, grafted on mahaleb.

For each variety there have been chosen 4 versions, followed for 2 years consecutive:

- free pollination with the help of insects and of the wind;
- pollination with own pollen (self-fertility);
- artificial pollination;
- the value of pollen's quality (the viability and the germination capacity).

The natural fertility has been determined on control branches by counting a minimum of 200 flowers for each variety (50 in all the 4 cardinal points), labeling the respective branches and counting the resulted fruits after binding (Cociu & Oprea, 1989; Botu & Botu, 1997).

The self-fertility has been determined by isolating the buds with mull sacks in the bud phase, counting the flowers from the isolated branches and writing on label, counting the resulted fruits (after 20-25 days after petals fall) and calculated in percent with the object of the number of bagging flowers (Cociu & Oprea, 1989; Botu & Botu, 1997).

To establish the best pollinator there have been made mutual crossings, pollinating without emasculation but with bagging before the start of flowering, 100 flowers to each pair of species. The pollination must be done before the maturation of the pollen of the pollinated variety (Cociu & Oprea, 1989).

The pollen germination has been made on solid environment, composed from 15% sucrose, 1.5% agar agar and 2% boric acid (Pirlak & Bolat, 1999). For the pollen germination, the boxes were maintained at a temperature of 20°C, humidity of 70-90%, in the dark for 4 hours after which the pollen tube growing have been stopped with chloroform. The evaluation was made with the optical microscope Motic with the objective 4 X and 10 X. The pollen tube length was evaluated with the camera soft and it was expressed in µm (Cociu & Oprea, 1989; Botu & Botu, 1997).

The determining of pollen viability was made using the coloring with carmin-acetic method, after which the fertile pollen gets coloured in red carmin and sterile pollen gets colored in weak pink or it remains colorless (Cociu & Oprea, 1989; Botu & Botu, 1997). For the statistical reading of the data it has been calculated the variation coefficient (S %) for which there are allowed arbitrary the next values:

- 0 – 10% - small variation coefficient;
- 10 - 20% - medium variation coefficient;
- 20 - 30 % - big variation coefficient.

3. Results and discussions

In 2011, in the flowering period (17.04-6.05), the average temperatures were between 7.7°C-15.8°C, the maximum absolute temperature was of 23.7°C and the minimum absolute temperature was of 1.5°C (fig.1). The relative humidity of the air was between 39% - 89%. About the rainfall, they have fallen in a single day (on 2nd of May), registering 8.4 mm (fig.2).

In 2012, the climatic conditions from the flowering period (14.04-3.05), have been favorable from the thermic point of view, so, the average temperatures on this period were between 7.9°C – 23.4°C, the maximum absolute temperature was 31.3°C (in the 3rd of May) and the minimum absolute temperature was 6.1°C (in the 18th of April) (fig.1). The relative humidity in the air, in the same period had values between 40% - 98% (fig.2). About the rainfall it can be said that it was for 8 days consecutive (full day) in the period 14-21 of April, the values being between 1.2 – 13.2 mm (fig.2). The rainfall from this period weren't favorable for pollination-fecundation, negative influencing the pollen germination and the flight of the pollinator agents.

The fertility coefficient by free pollination is the main item by which to appreciate the value of the pollinators.

The observations that have been made showed that at the cherry tree, there is considered that it exists species of big productivity, those of which index of fertility (respectively % of resulted fruits, determined at 25-30 days after the petals fall), registered minimum values of 30-35% (Cociu & Oprea, 1989).

The results registered at free pollination in 2011, for the 9 cultivars, were between 12.4% ('Ludovic') and 85% ('Paul') and in 2012 they were between 8.8% ('Iosif', 'Andrei') and 70.3 % ('Paul'), (tab.1)(fig.3).

At the majority of the cultivars ('Cociu', 'Margo', 'Alex', 'Anda', 'Mihai', 'Paul') the fertility index registered values of over 30% (fig. 3). The low values registered in those 2 years for the cultivars' Ludovic', 'Andrei' and 'Iosif' (below 30%) can be determined by the influence of the abiotic factors on the germination capacity of pollen.

The self-fertility is an important item of productivity, which got imposed as a distinct objective of breeding at the cherry tree.

The observations made, showed that at the cherry tree, it is considered they are species of big productivity, those of which index of fertility (respectively % of resulted fruits, determined at 25-30 days after petals fall), register minimum values of 20 – 25%, (Cociu & Oprea, 1989).

The results registered at self-pollination in those 2 years, shows that the majority of the cherry species are partially fertile, registering a low percent of fruits set (1.0 – 13.8%) (tab. 1). To these species it is mandatory the planting together with fit pollinators for each variety.

To determine the best pollinator there have been made mutual crosses. The obtained data analysis shows that the percent of the fruits set in the 60 combinations made is very different from a group of partners to another (tab. 2).

The pollinator cultivars which registered values of over 20% resulted fruits are the next ones (tab. 2):

The pollinator cultivar 'Cociu' registered the biggest values with 'Margo' (34.9%) and 'Alex' (35.2 %). The pollinator cultivar 'Margo' registered the biggest value with 'Alex' (27.1%).

The pollinator cultivar 'Anda' registered the biggest values with 'Cociu' (30.8%) and 'Margo' (26.2%).

The 'Iosif' cultivar is the best pollinator for 'Alex' (48.3%), 'Paul' (37.9%), 'Margo' (28%) and 'Mihai' (24 %).

The pollinator cultivar 'Andrei' registered the biggest values with 'Paul' (50.7%) and 'Alex' (25.6%).

The pollinator cultivar 'Mihai' registered the biggest value with 'Margo (45.8).

The pollinator cultivar 'Paul' registered the biggest value with 'Alex' (41.2%).

The pollinator cultivars which registered values of after 20% resulted fruits are presented in table 3.

The pollen must present a good viability, to be quality and to have high values of germination. The pollen viability was bigger than the germinability in the case of all the studied cultivars, result in accord with those obtained by other authors (Parfitt D.E. & Ganeshan, 1989).

This indicator's values in 2011 varied between 81.51% ('Andrei') and 97.47% ('Margo') and in 2012, the values were between 75.33% ('Mihai') and 88.96% ('Andrei'), registering a small variation coefficient in 2011 (4.91%) and in 2012 (5.78%) (tab.4).

For the fruit bearing trees, the germinability and the growing rate of the pollen tube are the most important features for the evaluation of the pollen quality, because for the efficient fertilization it is necessary a big germination capacity of the pollen and a big growing rate of the pollen tube. This fact was observed by numerous researches that showed the most times, the pollen's capacity of germination and the environment conditions from the flowering period determine the degree of binding of the fruits (Beppu et al., 2005).

In 2011, the pollen germination capacity had values between 23.17% ('Iosif') and 89.70% ('Margo') and in 2012 the values were between 18.38% ('Iosif') and 76.02% ('Margo'), with a big variation coefficient both in 2011 (34.15%) and in 2012 (34.46%), which indicates a big variability for this feature (tab. 4).

4. Conclusions

The majority of the cherry cultivars are partially fertile and to obtain fruits it is necessary a foreign pollination.

To obtain good productions each year, it is necessary to assure optimal conditions of interpollination of the species and their correct allocation in the orchard by alternating the rows from the main variety with the pollinator variety (planting a row with pollinator cherry tree at 2 or 4 rows of cherry tree that must be pollinated, the report being of 2:1 or 4:1).

The obtained results highlight the fact that, from the point of view of the natural fertility and of the germination capacity of the pollen, the majority of the cherry cultivars are ones of big productivity and they can assure an efficient fertilization.

After the analysis of the data concerning the behaviour of the cultivars in the pollination process, there are recommended the infertile groups that registered values of over 20% resulted fruits, presented in table 3.

5. References

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Tables

Table 1. Data concerning the fertility indexes at cherry cultivars created at RSFG Iasi

Nr. crt.	Cultivar	% minimum of fruits resulted by:			
		Self-pollination		Free pollination	
		2011	2012	2011	2012
1.	Ludovic	0.5	2.4	12.4	10.1
2.	Cociu	0	0	27.2	30.1
3.	Margo	2.6	3.0	78.7	51.9
4.	Alex	2.1	1.0	50.8	38.5
5.	Anda	6.9	3.9	63.7	36.5
6.	Iosif	4.6	1.0	30.5	8.8
7.	Andrei	2.8	2.0	17.8	8.8
8.	Mihai	1.0	1.7	60.8	70.0
9.	Paul	13.8	6.8	85.0	70.3

Table 2. The behaviour of the cherry cultivars in the pollination process

The cultivar to be pollinated	The pollinator cultivar	% of resulted fruits	The cultivar to be pollinated	The pollinator cultivar	% of resulted fruits
Ludovic	Cociu	1.8	Alex	Margo	27.1
Ludovic	Margo	7.2	Alex	Iosif	48.3
Ludovic	Anda	4.5	Alex	Andrei	25.6
Ludovic	Iosif	6.6	Alex	Mihai	6.3
Ludovic	Andrei	7.1	Alex	Paul	41.2
Ludovic	Mihai	5.7	Iosif	Ludovic	8.6
Ludovic	Paul	0	Iosif	Andrei	12.1
Cociu	Ludovic	0	Iosif	Mihai	7.9
Cociu	Margo	8.9	Iosif	Paul	16.8
Cociu	Anda	30.8	Andrei	Ludovic	7.4
Cociu	Iosif	6.6	Andrei	Cociu	1.0
Cociu	Andrei	6.8	Andrei	Margo	16.7
Cociu	Mihai	4.3	Andrei	Anda	1.7
Cociu	Paul	3.2	Andrei	Iosif	15.3
Margo	Ludovic	11.6	Andrei	Mihai	7.0
Margo	Cociu	34.9	Andrei	Paul	8.5
Margo	Anda	26.2	Mihai	Ludovic	0.7
Margo	Iosif	28.0	Mihai	Cociu	7.4
Margo	Andrei	18.1	Mihai	Margo	4.7
Margo	Mihai	45.8	Mihai	Anda	12.6
Margo	Paul	2.1	Mihai	Iosif	24.0
Anda	Ludovic	8.3	Mihai	Andrei	14.0
Anda	Cociu	6.2	Mihai	Paul	6.2
Anda	Margo	4.2	Paul	Ludovic	35.1
Anda	Iosif	1.2	Paul	Cociu	14.9
Anda	Andrei	10.0	Paul	Margo	15.8
Anda	Mihai	7.2	Paul	Anda	15.1
Anda	Paul	10.9	Paul	Iosif	37.9
Alex	Ludovic	29.4	Paul	Andrei	50.7
Alex	Cociu	35.2	Paul	Mihai	13.9

Table 3. The pollinators of the cherry cultivars

Nr. crt.	Cultivar	Pollinators
1	Cociu	Anda
2	Margo	Cociu, Anda, Iosif, Mihai
3	Alex	Ludovic, Cociu, Margo, Iosif, Andrei, Paul.
4	Mihai	Iosif
5	Paul	Ludovic, Iosif, Andrei

Table 4. The viability of the pollen at cherry tree in 2011 and 2012

Nr. Crt.	Cultivar	The viability of pollen (%) in the years:		The capacity of germination of the pollen (%) in the years:	
		2011	2012	2011	2012
1.	Paul	95.27	76.74	74.36	64.79
2.	Iosif	90.77	80.66	23.17	18.38
3.	Andrei	81.51	88.96	66.23	56.19
4.	Cociu	94.25	81.46	35.78	33.15
5.	Margo	97.47	78.62	89.70	76.02
6.	Alex	91.44	88.11	53.13	43.54
7.	Mihai	89.35	75.33	67.35	56.98
8.	Ludovic	89.34	84.09	54.89	46.24
9.	Anda	87.45	76.67	43.78	36.73
Average		90.76	81.18	56.49	48.00
Variation coefficient %		4.91	5.78	34.15	34.46

Figures

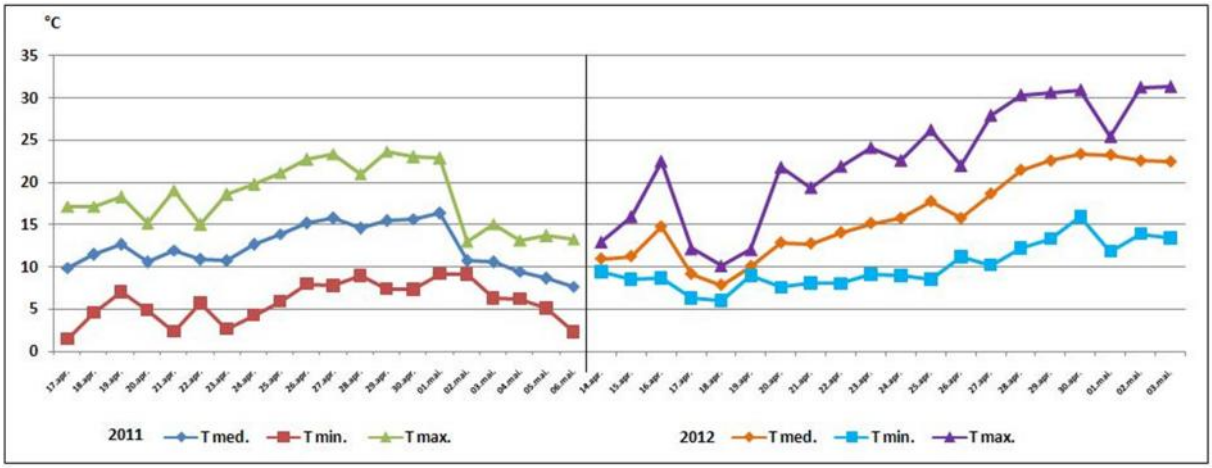


Fig. 1. The evolution of temperature in flowering period (April-May) in 2011 and 2012

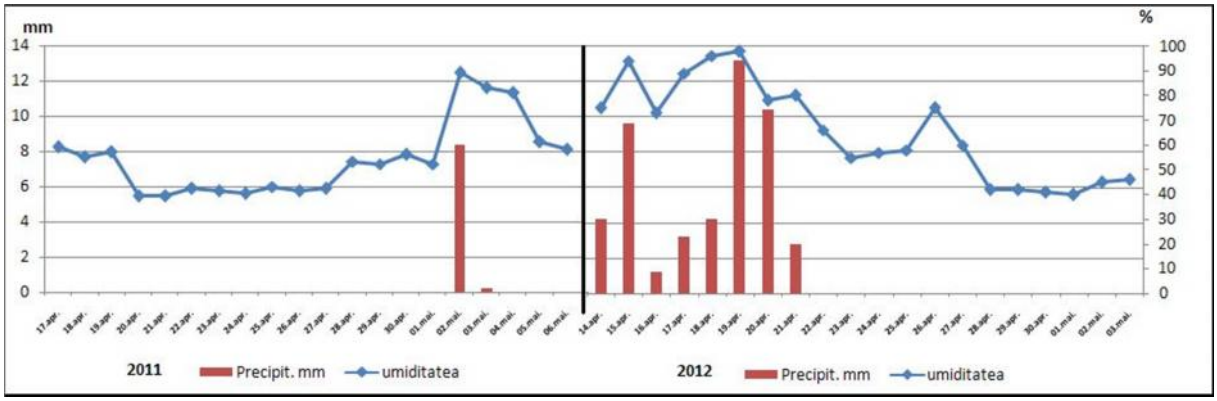


Fig. 2. The evolution of the rainfall and of the relative humidity of the air in the flowering period (April-May) in 2011 and 2012

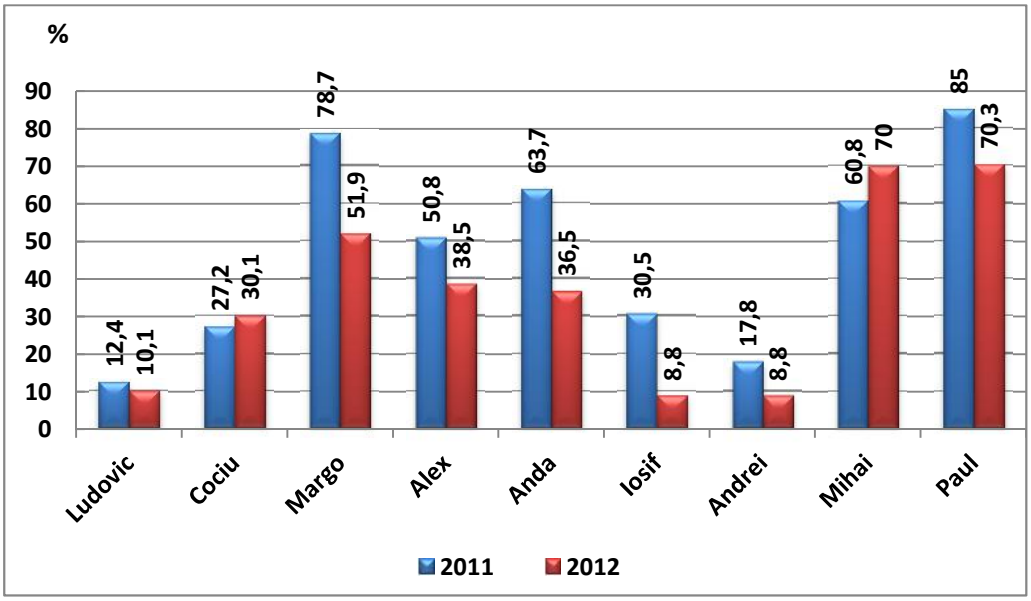


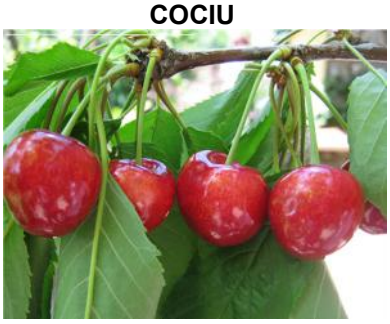
Fig. 3. The behaviour of the cherry cultivars in free pollination conditions (Iasi 2011 and 2012)

Pictures with the studied cherry cultivars

ANDREI

ANDA

COCIU



ALEX

PAUL

IOSIF

MIHAI

MARGO

LUDOVIC