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INFLUENCE OF TEMPERATURE IN DORMANCY PERIOD IN YEARS 2016-2017 ON PEACH AND APRICOT SPECIES OFF SANDY SOILS

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ABSTRACT

The resistance to frost of the varieties studied depends on the species from which it originates and the place of origin, the duration of dormancy and winter temperatures, and, in addition to the genetic determinant of the variety, a different influence from year to year, also had the climatic conditions.

During the biological dormancy, the trees of the stone species can withstand minimum temperatures from -26°C to -28°C (apricot), -23°C to -24°C (peach). At these temperatures resist only trees that had good condition of vegetations, and have accumulated many spare substances.

According to the climatic data recorded at CCDCPN Dăbuleni and following the observations made, it was pointed out that the temperature oscillations, especially the low temperatures, had a negative impact on the fruit trees in the winter 2015/2016, reaching at frosbite flower buds at apricot and peach species more than 90 %.

The winter 2016/2017 was favorable for dormancy period of the fruit tree species, the minimum temperatures did not occur suddenly, and the late frosts did not cause any damage to the fruit species due to the preventive measures.

INTRODUCTION

The changes expected in the climate regime in Romania fall within the global context, but with particularities specific to the geographic region in which it is located. Compared to north-western Europe, for example, where the warmest heating is expected in winter, for Romania, warming is expected to be more pronounced during the summer. *(Sunley et coloab.,2006).* In dormancy period, the fruit trees in our country's climate, due to the hereditary properties, show different resistance, depending on the species, variety, age, rootstocks, climatic conditions of the year, applied agrotechnics. *(Baciu A.A.,2005)*

During the winter, the resistance of flowering buds and the entire plant oscilatted by degree of quenching. After every 5-6 days of cold weather, this resistance rises and vice versa, a few warm days may have the effect of lowering the resistance limit by 6-7 ° C. In the absence of these conditions, the trees are highly sensitized (*Tudor Al., 1989).*

Low temperatures from early winter, when they occur slowly are not dangerous, the quenching process is normal, and the trees can withstand for several days at such temperatures, in the case of apricot -20 -22 °C *(Popescu M., și colab 1993).* Due to the greenhouse effect, as a result of pollution, profound changes in air temperature have occurred since the 1980s, which has led to significant changes in plant phenology evolution in many regions of the world *(Cociu V. și colab.,1997).* The increase in the temperature caused by the greenhouse effect is manifested by diurnal and annual changes and even during the same day , which can cause phenological changes in plants. *(Baciu A.A.,2005; Burzo I., 2014; Chmielewski, et colab., 2004; Chuine, I., et colab 2003; Peiling, et colab., 2006; Anconelli S. et colab., 2004).*

Many tree species, especially stone, are sensitive to spring frosts during flowering. Climate warming outpaces both the date of the last spring frost and the date of flowering, while the risk of late frosts in floral buds remains unchanged *(Rochette, et. colab., 2004).*

The response of plants to major climate changes is accurately reflected by alteration of the phenological patterns known and attested by classical studies. Parameters that mark the phenological stages from the appearance of the buds to the fall of the leaves and the end of the vegetative cycle, associated with the corresponding physiological data, generate authentic data for the study of the effect of climatic changes (*Chitu, E. și colab., 2004).*

The buds freeze in some years to certain species is the most commonly encountered damage in our country. Vegetable buds rarely freeze, being more resistant. Flowering buds are easier to freeze, because they have a shorter rest period and come out of this state faster, which is affected both during the winter when excessive frosts are occurring and at the beginning of the spring when the trees have lost their quenching state. (*Tudor Al., 1989).*

Due to the early flowering of trees, in some region of Europe the risk of late frost damage has also increased, but also the deregulation of pollination processes and fruit binding. *(Anconelli S. et colab., 2004).*

MATHERIAL AND METHOD

The study was conducted at The Research-Development Center for Plant Crop on Sands Dăbuleni on the apricot species with five varieties grafted on two rootstocks and peach with nine varieties, also grafted on two rootstocks.

Experiences are polyfactorial with two factors, placed in randomized blocks in four repetition. The number of trees per variation is three trees / variety / rootstock, and fifty four trees in the parcel out repetition. The planting distance to the apricot species is four/four, the crown shape free flattened, and the peach species of four/three having the same crown shape.

Apricot

Factors studied: Factors A-Variety with five graduation:

a_1-Euxin
a_2-Tudor
a_3-Danubiu
a_4-Orizont
a_5- Fortuna

Factors B- Rootstock, with two graduation:
b_1- Mirobolan Dwarf
b_2- Cais Apricor

Peach

Factors studied: Factors A-Variety with nine graduation:

a_1-Florin
a_2-Purpuriu
a_3-Creola
a_4-Liana
a_5-Anemona
a_6-Monica
a_7-Catherine
a_8-NJC 105
a_9-Filip

Factors B- Rootstock, with two graduation:
b_1-Adaptabil
b_2-MC 5

The climatic conditions of the CCDCPN Dabuleni meteorological station were recorded during the study period, and the viability determinations of flowering buds were carried out at low winter temperatures and after late spring smaterrings,

OBTAINED RESULTS

Winter 2015/2016 began with average temperatures of 5.6°C in the first decade of December and with maximum at 16.1°C. In the last decade of the month the air temperature was maintained high during the day (4,3°C average), with maximum of 18,4°C, but began to decrease overnight to -11°C against the background of a layer of snow at ten-fifteen cm. These conditions were very good for entering the trees at dormancy period.

January 2016 was a typical cold winter month with an average of -3.11°C and a minimum of -20.4°C, in the last two decades of the month. Also, snow precipitations have been recorded that have exceeded 25 cm. These negative temperatures came after a relatively warm period and affected the viability of flowering buds in the fruit species grown on sandy soil in a different percentage depending on species resistance.

From the very low January temperatures, February began on the very high temperatures for this month. Winter 2016-2017 began with negative average temperatures as early as December, temperatures that gradually occurred with a minimum of -14.1°C in the second decade of the month but also with maximums of 18.0°C. These climatic conditions were normal for the quenching process of fruit trees. In January 2017 the air temperature was kept very low, with an average of -5.6 ° C, with a minimum of -21.1°C in the second decade of the month, but also the snow precipitations were consistent, the accumulated layer was 50 cm.

Fruit trees were not negatively influenced by these low temperatures that have gradually occurred, the viability determinations of floral buds showed a very good percentage in the year 2017.

Table 1

Climate condition in period December - April 2015-2017 recorded at the CCDCPN Dăbuleni weather station

Month	2015	2016				2016	2017			
	XII	I	II	III	IV	*XII*	*I*	II	III	IV
I	5,6	-3,6	5,3	9,4	16,0	1,3	-4,6	-1,5	*9,8*	*11,1*
II	2,4	-1,3	7,5	6,3	16,0	-1,0	-5,2	-1,5	*9,0*	*11,7*
III	4,3	-4,3	8,3	9,1	13,1	-0,1	-6,7	8,0	11,3	13,2
Monthly average(^{0}C)	**4,1**	**- 3,1**	**7,0**	**8,3**	**15,0**	**0,1**	**-5,5**	**1,7**	**10,0**	**11,1**
Monthly maximumn(^{0}C)	18,4	14,5	24,3	23,5	31,4	18,0	10,3	21,2	23,5	11,7
Monthly minimum(^{0}C)	**-11,0**	**-20,5**	-4,1	-3,1	0,8	**-14,1**	**-21,1**	-11,4	-2,0	13,2
Precipitations (mm)	26,2	81,4	40,2	113,2	60,2	11,2	75,4	86,47	54	62,8
The average monthly temperature, multiannual	0,51	-1,26	0,79	5,71	11,80	0,5	-1,33	0,81	5,9	11,8
The amount of monthly precipitation, multiannual (mm)	51,23	32,60	32,96	36,50	47,05	50,57	33,3	33,84	37,6	47,52

In February the average air temperature was comparable to the multiannual average, the minimum was -11.4°C but the maximum reached 21.2 °C, these high temperatures were recorded in March (10.°C temperature average, with 4.2°C higher than

the multiannual average and with maximum 23.5°C, conditions that were favorable for the early flowering of trees). On March 27, the minimum air temperature decrease to -20°C (from 4 am the air temperature decrease to 0°C, decrease to -2 ° C between 6 am and 7 pm and at 9 am still 0 ,8 °C).

As a result of high temperature oscillations of more than 30 ° C in just 4 to 5 days (December 25, 2015 - January 1, 2016 and January 14 - January 19, 2016), combined with very low temperatures below - 15, - 20 °C), as well as due to the late frosts of March 17 and 20, 2016, fruit buds of apricot and peach tree species in different phenological phases were affected.

On the peach species, in 2016 the varieties grafted on the adaptable rootstock were the percentage of fruits buds affected by the winter frosts of 66 % and 8% in 2017. As a result of late frosts, the percentage of affected buds was 24% in 2016, and in 2017 by 3%, reaching a total of buds affected in year 2016 at 90% , while in 2017 only 10% (Table 2).

On MC5 rootstock in 2016, the percentage of rod buds affected by winter frosts was 70%, and in 2017 2%, following late frosts of 22% in 2016, while in 2017 by 2% reaching a total of 92% affected buds in 2016 and only 9% in 2017.

In conclusion, we can say that the low temperatures in the dormancy period of the fruit trees under the resistance limits, as well as the late frosts in 2016, have led to the loss of fruit buds to peaches in percent over 90 %.

In 2017 the situation was different, the minimum temperatures did not occur suddenly, the conditions being favorable for the resting period of the fruit trees.

The largest percentage of fruits buds affected in 2016 was determined in the varieties: Florin (100% on adaptable rootstock and 90% on MC5 rootstock), Creola (100-93%), Catherine (100-94%) and Liana (91-98%) (Table 2). For the varieties: Anemona, Monica and Filip, the percentage of affected buds was lower for the adaptable rootstock compared to MC5.

Table 2

Influence of temperatures on the dormancy period on fruit buds at peach species

Variety	Rootstock	Registration damage (percent of affected fruits buds %)					
		of winter frost		of late freezing		total affected buds	
		2016	2017	2016	2017	2016	2017
Florin	Adaptabil	54	5	46	1	100	6
	MC 5	58	10	32	2	90	12
Purpuriu	Adaptabil	57	5	30	2	88	7
	MC 5	60	4	38	0	98	4
Creola	Adaptabil	67	6	33	6	100	12
	MC 5	65	8	28	2	93	10
Liana	Adaptabil	70	11	21	2	91	13
	MC 5	83	0	15	0	98	0
Anemona	Adaptabil	62	4	21	2	83	6
	MC 5	71	11	23	6	94	17
Monica	Adaptabil	60	9	20	3	80	12
	MC 5	73	5	15	1	88	6
Catherine	Adaptabil	81	8	19	2	100	10
	MC 5	69	0	25	0	94	0
NJC 105	Adaptabil	78	12	10	4	88	16
	MC 5	81	15	9	5	90	20
Filip	Adaptabil	65	14	20	7	85	21
	MC 5	69	10	15	3	84	13
Average	Adaptabil	66	8	24	3	90	10
	MC5	70	6	22	2	92	9

The percentage of affected buds by frost in the climatic conditions of the winter 2015/2016 occurred after polynomial correlations with significant correlation factors for the MC5 rootstock (r = 0.71 *) and insignificant (r = 0.47), for the rootstock Adaptable (figure 1).

If measures are taken to protect the planting against late spring smattering, the percentage of rod buds affected by very low winter temperatures was lower for trees grafted on Adaptable rootstock (66%) and higher for MC5 rootstocks (70% %).

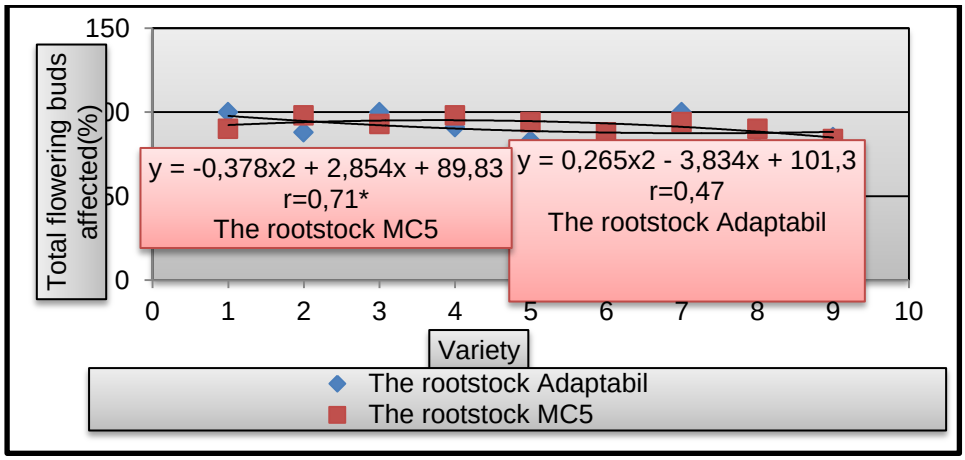

Figure 1 - Correlation between the variety and the percentage of fruit buds affected by frost and smattering at peach in the case of the two rootstocks in year condition 2016

At apricot species, the results obtained are presented in table 3. If on Fortuna the percentage of fruits buds affected in the year 2016 was 100%, indifferent of the rootstock used, for the varieties Euxin, Tudor and Danubiu, the percentage of affected buds it was higher for trees grafted on Cais Apricor, compared to those grafted on Mirobolan dwarf.

In the case of the Mirobolan Dwarf rootstock, the percentage of fruits buds affected by winter frosts in the year 2016 was 66% and in 2017 at 7%. As a result of late freezing in 2016, the percentage was 26%, and in 2017 at 4%, reaching a total affected buds of 92% in 2016 and only 13% in the following year.

On Cais Apricor rootstock the total percentage of affected buds was 95% in 2016 and only 15% in 2017. In both years, the percentage of affected fruits buds was higher for Cais Apricor rootstocks (95% in 2016 and 15 % in 2017) (table 3).

Table 3

Influence of temperatures on the dormancy period on fruit buds at apricot species

Variety	Rootstock	Registration damage (percent of affected fruits buds %)					
		of winter frost		of late freezing		total affected buds	
		2016	2017	2016	2017	2016	2017
Euxin	Mirobolan dwarf	35	**11**	53	**5**	**87**	**16**
	Cais Apricor	58	19	38	6	93	25
Tudor	Mirobolan dwarf	61	**7**	31	**4**	**92**	**11**
	Cais Apricor	71	9	27	4	98	13
Danubiu	Mirobolan dwarf	81	**15**	9	**8**	**90**	**23**
	Cais Apricor	67	7	28	2	95	9
Orizont	Mirobolan dwarf	87	**9**	5	**3**	92	**12**

	Cais Apricor	72	11	15	7	87	18
Fortuna	Mirobolan dwarf	68	**5**	32	**2**	100	**7**
	Cais Apricor	60	8	40	5	100	13
Average	Mirobolan dwarf	**66**	**7**	**26**	**4**	**92**	**13**
	Cais Apricor	**65**	**10**	**30**	**6**	**95**	**15**

The percentage of affected fruitd buds was much higher after the winter frost, and the intensity of the process was very significant in the case of trees grafted on the Mirobolan dwarf (r = 0.99 **) and significant in the Cais Apricor rootstock (r = 0 , 88 *) (Figure 2).

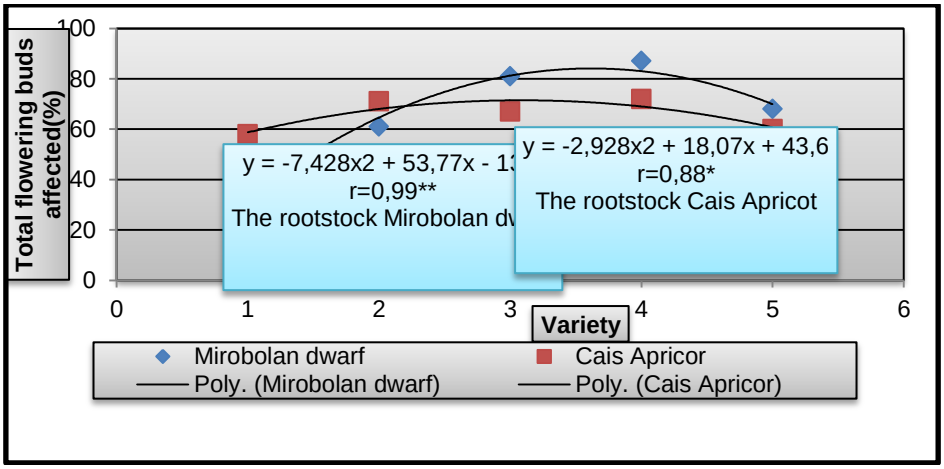

Figure 2 - The correlation between the variety and the percentage of affected fruits buds by frost at apricot in case of the two rootstocks in year condition 2016

After smattering effect the percentage of affected fruits was higher in trees grafted on Cais Apricor and smaller in those grafted on the Mirobolan dwarf.

CONCLUSION

1. The effects of low temperatures as well as the oscillations of the dormancy period of trees in 2016 led to the degeration of fruit buds at apricot and peach species in the proportion of over 90%.
2. The largest percentage of fruits buds affected in 2016 was determined to varieties: Florin (100% on adaptable rootstock and 90% on MC5 rootstock), Creola (100-93%), Catherine (100-94%) and Liana (91-98%). To varieties: Anemona, Monica and Filip, the percentage of affected buds was lower for the adaptable rootstock compared to MC5.
3. The percentage of fruit buds on peach was very high in the climatic conditions of winter 2016 and very low in 2017, and the total percentage was higher in grafted trees on the MC5 rootstock with 2% compared to the adaptable rootstock.
4. In the Fortuna variety, the percentage of fruits buds affected in the year 2016 was 100%, indifferent of the rootstock used, and for the varieties: Euxin, Tudor and Danubiu, the percentage of affected buds was higher for trees grafted on Cais Apricor, compared to those grafted on the Mirobolan dwarf.
5. The percentage of affected fruit buds was much higher after the winter frost, and the intensity of the process was very significant in the case of trees grafted on the Mirobolan dwarf (r = 0.99 **) and significant in the Cais Apricor rootstock (r = 0 , 88 *),

and after smattering effect the total percentage was 95% for Cais Apricor rootstock and 92% for Mirobolan dwarf.

6. Minimum temperatures in 2017 on sandy soils were propitious to species in the experimental field, these have not occurred suddenly as it did in the previous year, with 15% of the buds being affected. , the fruit buds being affected by 15%.

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