

RESEARCHES ON GENETIC RESISTANCE TO APRICOT VARIETY 'BERGERON' TO FROST FROM WINTER

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Abstract

The research was conducted in an orchard of apricot aged 7 years, located at 50 km away from Bucharest. Trees planted at a distance of 4x4m were studied during the vegetation season paying particular attention to resistance to low temperature. In the winter of 2013, temperatures in winter decreased to -20 degree C and produced losses of flower buds. In the spring of 2014 the 'Bergeron' variety bloomed well, 100% of flower buds being resistant to negative temperatures from winter. In 2015 was a warm winter but the temperature decreased in January to -29 degree C and the trees suffered a thermal shock. Following, resistance to frost decreased and the percentage of flower buds affected was 98.2%. Production losses were very high and vegetative buds were not affected by frost and the trees were properly vegetated grew normally. In January of 2016 were recorded temperatures of -25 degrees C associated with very cold wind, the flower buds were affected in 100%. In 2017 'Bergeron' variety was not affected.

Key words: flower buds, temperatures, thermal shock.

INTRODUCTION

The apricot is a species appreciated for fruit quality and is grown successfully in areas with high temperatures (Cociu V. et al., 2000; Sestraș R. et al., 2004). In Romania, grows in the S part of the country and in the Plain of V. In Romania, the apricot, do not make the fruits every year because of the low temperatures that affect the flowers (Braniște N. et al., 2007). The 'Bergeron' is a new variety introduced in crop and has not been studied for resistance to low winter temperatures and temperatures during the flowering period (Ghena N., Braniște N., 2003).

We made a trial with 'Bergeron' variety to study resistance to winter cold, fructification and fruit quality.

As a result of the researches we were able to establish the resistance limit at low temperatures and I observed that the 'Bergeron' variety behaves differently from one year to another depending on the evolution of the temperatures. In cold winters associated with wind, production losses are very high, up to 100% (Păun C., 2017).

Researchers are concerned about obtaining apricot varieties that start late in vegetative and resist winter frost.

MATERIALS AND METHODS

Research and observations were made in an orchard set up in 2010, located at a distance of 50 km N, compared to Bucharest. The studies began in 2013, when the orchard was in the 3rd year of vegetation, and the trees began to fruit and continued until 2017. The biological material studied was the 'Bergeron' apricot variety produced in Romania, grafted on the Myrobolan 29 C rootstock. The trees were planted at a distance of 4 m between the rows and 4 m between the plants per row and were led as a vessel. The fructification cuts were made in August, after harvesting the fruit. Soil has been kept clean by weeds by manual and mechanical work. Were studied 50 trees in 5 rehearsals. To record the temperatures during winter and during the vegetation period we used our own thermometers and meteorological data from the nearby weather station. To determine the percentage of buds affected by low winter temperatures, we made observations in the laboratory where we analyzed at microscope the fruit buds and vegetative buds and in the spring we made observations on the field. Observations were made in November (before frost), in February, at the beginning of the vegetative period (March) and during the

vegetative period. After the flowering we determined the percentage of flowers formed to determine the influence of winter cold on fruit buds. During the vegetation period, we made observations on the percentage of fruit formed, the length of the shoots, the production of the fruit obtained and the qualities of the fruits. The shoots were measured at the end of July, after stopped of growth. The fruits were weighed in the laboratory and analyzed for determinate the average fruit weight, colour, pulp weight and kernel weight.

RESULTS AND DISCUSSIONS

In the 3rd year of vegetation, the 'Bergeron' variety went through the winter without losing the fruit buds. This year, the first fruit production was obtained.

Research into the resistance of fruit buds to winter cold began in the winter of 2014 when the trees were 4 years old.

The year 2014 was a normal year from the thermal point of view and the trees resisted very well during the winter.

In spring, the trees flourished normally without the loss of fruit buds.

Fruit buds resisted 100% and fruit production was normal (Table 1).

Table 1. Behavior of the 'Bergeron' variety in the winter 2014

Variety	Rehearsal	Nr. buds analyzed	% viable fruit buds	% affected buds
'Bergeron'	R1	380	100	0
	R2	300	100	0
	R3	420	100	0
	R4	200	100	0
	R5	470	100	0
Average		354	100	0

Table 2. Behavior of the 'Bergeron' variety in the winter 2015

Variety	Rehearsal	Nr. buds analyzed	% viable fruit buds	% affected buds
'Bergeron'	R1	500	1.4	98.6
	R2	347	2.7	97.3
	R3	289	1.6	98.4
	R4	320	1.5	98.5
	R5	415	1.8	98.2
Average		374.2	1.8	98.2

Table 3. Behavior of the 'Bergeron' variety in the winter 2016

Variety	Rehearsal	Nr. buds analyzed	% viable fruit buds	% affected buds
'Bergeron'	R1	620	0	100
	R2	514	0	100
	R3	387	0	100
	R4	427	0	100
	R5	489	0	100
Average		487.8	0	100

Table 4. Behavior of the 'Bergeron' variety in the winter 2017

Variety	Rehearsal	Nr. buds analyzed	% viable fruit buds	% affected buds
'Bergeron'	R1	382	98.7	0.7
	R2	417	98.4	0.6
	R3	354	99.7	0.3
	R4	472	99.4	0.6
	R5	395	99.3	0.7
Average		404	99.1	0.5

Table 5. Analysis of the influence of low temperatures on the percentage of fruit formed

Variety	Rehearsal	2014 % fruit formed	2015 % fruit formed	2017 % fruit formed
'Bergeron'	R1	31	58	27
	R2	28	60	31
	R3	38	62	25
	R4	37	58	28
	R5	35	55	24
Average		33.8	58.6	27

In 2014 and 2017, winter temperatures decreased to -25°C , but the temperature drop was gradual, and the buds were resistance and was achieved a normal production. In 2015 the heat shock destroyed the buds, and in 2016 the very cold wind from the winter period amplified the cold and destroyed all the fruit buds (Table 2 and Table 3). Observations regarding the genetic resistance of flowers at low temperatures during bloom showed that the 'Bergeron' variety very well tolerates low temperatures. In years with high production, when winter frost did not destroy fruit buds, the flowers were not affected by low temperatures during the flowering period. In 2014 and 2017 during the bloom when the flowers were opened, during the night were temperatures of $-3 \dots -4$ degree C, and the apricot flowers were

not affected (Table 4). The results regarding the influence of low temperatures on the percentage of fruits formed are presented in table 5.

During the vegetation period observations were made on the length of the shoots, number of shoots/tree, number of vegetative buds/shoots and number of fruits buds/shoot (Table 6).

The fruits were analyzed morphologically and was determined the production on the tree

(Table 7). At the end of the growing season (July), the shoots were measured in length and the number of vegetative and fruit buds was determined on each shoots for estimate the production of the following year.

The correlation between fruit weight and pulp weight is presented in figure 1, and the correlation between fruit weight and pulp weight is presented in figure 2.

Table 6. Observations on the growth of shoots

Variety	Year	The length of shoots (cm)	Nr. of shoots/tree	Nr. of vegetative buds/shoots	Nr. of fruit buds /shoot
'Bergeron'	2014	62	120	58	121
	2015	58	134	49	102
	2016	50	119	47	94
	2017	45	143	38	84
Average		43	102.4	38.4	80.2

Table 7. Observations on characteristics fruits and productivity

Variety	Year	Average fruit weight (g)	Weight of pulp (g)	Weight of kernel (g)	Fruit production (kg/tree)
'Bergeron'	2014	86	80.2	5.8	14
	2015	90	84.3	5.7	2
	2016	0	0	0	0
	2017	92	85.9	6.1	21
Average		89.3	83.4	5.8	12.3

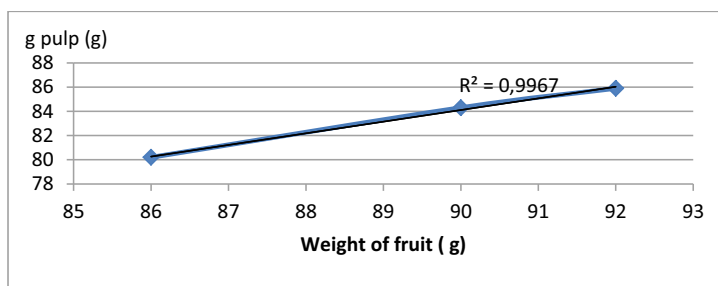


Figure 1. The correlation between fruit weight and pulp weight

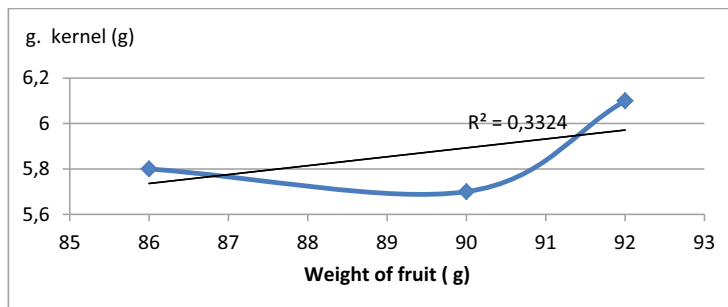


Figure 2. The correlation between fruit weight and pulp weight

CONCLUSIONS

'Bergeron' variety is a relatively resistant variety to low winter temperatures and resistance depends on how low the temperature is.

For protect the 'Bergeron' variety to low temperature from winter, the orchard must be established in areas where the wind does not blow.

Under thermal shock, fruit buds can be affected to 98.2%, and cold wind causes 100% fruit bud losses.

If the fruit buds are not affected during the winter, the 'Bergeron' variety fructify

normally, being resistant to low temperatures during the flowering period

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