RESEARCH ON THE RECOVERING CAPACITY OF FROST-INJURED GRAPEVINE

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Abstract

Field investigations conducted at Biharia farm between 2012-2016 were aimed at assessing the damage done to the varieties Feteasca regala grafted onto Kober 5 BB, by low temperatures in the winters of 2011/2012 (-22,8°C on January 13, 2012; -23,9°C on February 14, 2012) and 2013/2014 (-22,0°C on January 31, 2014; /16,2°C on March 6, 2014). Successive observations confirmed the high recovering capacity of frost-affected vines

Frost effects are felt only during one year, while there is a chance of obtaining larger grape productions in the following year.

One can speak about establishing a fruit-bearing alternance due to frost action, the low level of productions in the first year allowing for a better differentiation of crop buds for the following year.

In modern wine industries, technologies must consider the frequency of climate accidents, the recovering capacity of different varieties so as to take the most appropriate measures in order to minimize their effect.

Key words: grapevine, frost injured, recovering, climate accidents, production, years.

INTRODUCTION

Field investigations conducted at Biharia farm between 2012-2016 were aimed at assessing the damage done to the varieties Feteasca regala grafted onto Kober 5 BB, by low temperatures in the winters of 2011/2012 (-22,8°C on January 13, 2012; -23,9°C on February 14, 2012) and 2013/2014 (-22,0°C on January 31, 2014; /16,2°C on March 6, 2014). Successive observations confirmed the high recovering capacity of frost-affected vines.

As a result of frost damage, the share of water shoots per vine increased notably (33,3-51,7% in Feteasca regala). Consequently, the percentage of fertile shoots and the fertility indices had lower values in 2012 and 2014 as compared to the normal year of the period (2013-2015). An analysis of the grape production structure revealed that in Feteasca regala 26-57% of the total production was obtained from the secondary and water shoots.

After bud losses amounting to 60-70%, average productivity of 4-8 metric tons/ha were obtained by suitable pruning, while retaining fruiting

elements of lengths conducive to maximum viability. The effect of frost was felt only in individual year, without affecting the possibility of obtaining high grape crops in the following ones.

There also appeared to exist a mechanism of fruiting alternation due to frost action, the low productivity level in the first year resulting in better bud differentiation for the following one.

Besides several positive outcomes, recent extension of unprotected vine crops has also led to the increase of risk factors related to the influence of low temperatures, which are harmful during winters.

In modern wine industries, technologies must consider the frequency of climate accidents, the recovering capacity of different varieties so as to take the most appropriate measures in order to minimize their effect (Cheregi 2003, 2013, 2014,)

The study performed between 2012-2016 had the following objectives: determining the negative influence of low temperatures during the winters of 2011/2012 and 2013/2014, determining the production potential of plantations in the specific conditions of those years and the recovering possibilities of frost-affected vines.

MATERIAL AND METHOD

The studies were performed on the Feteasca regala variety grafted onto Kober 5 BB at Biharia farm, plantation distance of 2,5/1,2 mm, with a low-rise placement of vines, without protection during winter.

The plantation saw minimum temperatures of -22°C on January 13, 2012, -23,9°C on February 14, 2012, -22°C on January 31, 2014 and 16,2°C on March 6, 2014, the latter after a heat wave during the last two decades of February.

During the cuts in 2012 and 2014, low charges were attributed, such as 9, 12 and 15 buds/sq m, distributed in ropes of 5-7 buds, a length that corresponds to the zone with a maximum viability. During 2012 and 2015, the experimental options knew normal charges of 19,22 and 25 buds/sq m, distributed over crop ropes.

Observations and determinations performed were meant to determine the percentage of main and secondary buds viability in the specific conditions of 2012 and 2014, the fertility and productivity vines, the share of various categories of vine twigs, the share of production acquired on twigs of different origins, as well as the total grape production.

RESULTS AND DISCUSSION

Determinations regarding the bud viability for the Feteasca regala variety, both in 2012 and 2014, highlighted that the highest number of main and secondary viable buds are placed in the area of buds 1-3 from the base, while the percentage of bud viability was 57% in the main buds and 63% in the secondary ones.

In 2014, the first 3 buds from the rope base saw a viability of 87% main buds and 94% secondary buds.

Following the existence of non-viable buds in the areas that were not protected from the snow, considering rope parts with 1-6, 1-12 and 1-12 bud lengths, one can see an important decrease in bud viability.

Following the distribution of the various vine twigs (Table 1) in 2012, one can notice that the greatest share is that of the greedy twigs, followed by the main ones (39,1%) and the secondary ones (9.2%). In 2014, the main twigs have a 60% share, followed by the greedy twigs (33%) and the secondary ones (6,6%). During the years with regular winter conditions (2013 and 2015), the main twigs were at 63,9% and 71,7% of the total, the greedy twigs made up a 14,7% and 21,8% share, while the secondary ones were at 21,4% and 6,5%.

Table 1

The Distribution of Various Twig Vines in the Feteasca Regala Variety (2012-2016)

Variety	Year	Twig Category						Total No.
		Main		Secondary		Greedy		
		No.	%	No.	%	No.	%	
Feteasca regala	2012	9.7	39.1	2.3	9.2	12.8	51.7	24.8
	2013	37.8	63.9	12.7	21.4	8.6	14.7	59.1
	2014	13.5	60.0	1.5	6.6	7.5	33.3	22.5
	2015	42.4	71.7	3.8	6.5	12.9	21.8	59.1

As the bud load attributed to the cutting rises, the number of greedy twigs that show up on the vine decreases. In the Feteasca regala variety, their number is higher and the growth tendency is more underlined. The percentage of fertile main twigs in the 2012 and 2014 is lower compared to the regular values recorded in this variety in 2013 and 2015, due to the fact

that the first ones to lose viability are the inflorescence primordia buds (Table 2). The percentage of fertile secondary twigs is between 22.4% (2012) and 73,6% (2013).

The fertility coefficient values are also differentiated depending on the twig category taken into account. Lower values have generally been obtained in 2012 and 2014, compared to 2013 and 2015, lower in the secondary twigs compared to the main ones (Table 3).

Table 2

Percentage of Fertile Twigs on Crop Elements

Variety	Year	Twig Category	
		Main	Secondary
Feteasca regala	2012	51.3	22.4
	2013	82.4	73.6
	2014	66.7	58.0
	2015	70.0	66.3

Table 3

Values of Fertility Coefficients

Variety	Year	Absolute Fertility Coefficient		Relative Fertility Coefficient	
		Main Twigs	Secondary Twigs	Main Twigs	Secondary Twigs
Feteasca regala	2012	1.44	1.12	0.74	0.25
	2013	1.71	1.18	1.41	0.87
	2014	1.54	1.14	1.03	0.87
	2015	1.68	1.25	1.40	1.07

The observations regarding the average weight of grapes depending on the twig category on which their position also appears on the twig, highlighted important differences.

Smaller grapes are generally obtained on secondary twigs, compared to the ones on the main ones (Table 4). On average, grapes from the greedy twigs reach to approx. half of the maximum dimensions, while the ones on the secondary ones are the smallest, at about 20-40 grams. In the Feteasca regala variety, the first grape on the main twig reaches the maximum dimensions with 2 grapes.

Table 4

The average weight of different types of grapes (g)

The layout of grapes on the sprout	Year				Average
	2012	2013	2014	2015	
Feteasca regala					
-Primary with one grape	86.2	87.7	65.6	90.1	82.4
-Primary with two grapes					
➢ 1	107.8	113.4	70.4	117.5	102.2
➢ 2	92.7	103.3	67.1	95.7	89.7
-Primary with three grapes					
➢ 1	-	83.9	76.0	121.6	93.8
➢ 2	-	106.5	50.0	73.3	76.5
➢ 3	-	102.8	10.0	100.0	70.9
-Secondary with 1 grape	66.9	96.1	49.3	74.2	71.6
-Secondary with 2 grapes					
➢ 1	97.0	87.8	60.0	95.8	85.1
➢ 2	77.7	91.5	56.6	80.0	76.4
-greedy	52.4	36.2	60.0	52.3	50.2
- pruned (breaking the sprout)	27.8	38.3	73.3	20.5	39.9

Analysing the structure production for each hub, in 2012, Feteasca regala has got outturn of 41.5% on the main sprout, 23% on the secondary sprout, 34% on the greedy ones and only 1,5% on the pruned (breaking the sprout), of total production. In 2013 Feteasca regala had the following behavior : the production percentage obtain on the main sprout from total production exceeded 2/3, it was 23-24% on the secondary ones and 4-6% on the greedy ones. The production of grapes was substantially increased, according to the eye load, attributed to the cutting in 2013, as a result of the climate conditions from previous year, favorable for the differentiation on fruit buds.

CONCLUSIONS

Following a loss of approx. 60-70% in the buds through an adequate cutting, with the keeping of the crop elements with a length that corresponds to the maximum viability, one can get even 4t/ha in the Feteasca regala variety.

Frost effects are felt only during one year, while there is a chance of obtaining larger grape productions in the following year.

One can speak about establishing a fruit-bearing alternance due to frost action, the low level of productions in the first year allowing for a better differentiation of crop buds for the following year.

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