THE BEHAVIOUR OF SOME GRAPEVINE VARIETIES FOR WINE AT LOW TEMPERATURES ON 2009/2010 WINTER IN VINEYARD AREA OF IASI

COMPORTAREA UNOR SOIURI DE VIŢĂ DE VIE PENTRU STRUGURI DE VIN LA TEMPERATURILE SCĂZUTE DIN IARNA 2009/2010 ÎN PODGORIA IASI

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Abstract. *The absolute minimum temperatures recorded during the 2009/2010 winter destroyed the winter buds and injured the ligneous elements of the vines. Because of these damages at some sensible grapevine varieties its necessary to restore the permanent vine structure with the canes from the base of the trunk, that were protected of frost by ridging. In this paper is presented the frost resistance of some wine varieties during the 2009/2010 winter, in the Jassy vineyard conditions.*
Key words: frost, winter buds, grapevine varieties, vineyard, Jassy.

Rezumat. *Temperaturile minime absolute înregistrate în iarna anului 2009/2010 au distrus mugurii de rod la soiurile de viţă de vie, afectând chiar şi elementele multiuanuale ale butucului. De aceea la unele soiuri este necesar refacerea elementelor de schelet, din coardele rezultate din cepii de siguranţă de la baza butucului. Lucrarea prezintă comportarea unor soiuri de vită de vie pentru struguri de vin admise în cultură pentru arealul podgoriei Iasi, la gerurile înregistrate în iarna anului 2009/2010.*
Cuvinte cheie: ger, mugure de rod, soi de viţă de vie, podgorie, Iaşi.

INTRODUCTION

The high- and semi high trunk trellising forms, introduced in the last decades in the vine plantations, require for each wine-growing centre and vineyard, to establish some new technologies and to select the varieties that shown enough resistance to frost.

In the last time the grapevines from north-eastern part of Moldavia were frequently affected by the frosts. The most damaging was the frost from 1996 - 1997 winter, when the trunk and others ligneous elements of the vines were totally destroyed, having as result the loss of the yield in 90-100 % (Ţârdea C. and al., 1997).

As a ligneous perennial plant, grapevine has a weak frost resistance: the table varieties resist up to $-16^{\circ}C$ . . . $-18^{\circ}C$, and vine varieties to $-20^{0}C$ . . . $-22^{0}C$. The buds has a lower frost resistance, the minimum limit begin to $-8^{0}C$ (Cotea V. and al., 1996).

MATERIAL AND METHOD

During the 2009-2010 winter, the minimum negative temperatures, harmful for grapevine were registered in the second and the third decade of December, and in the final part of January. The lowest temperature in the air was –25.3^{0}C and temperature at the soil level of -32.4^{0}C. For establishing the destructive frosts effects, we have done the observations on the buds. The samples of canes were taken from 2% of the vines from the parcel for each variety. The vines were representative for the entire surface being dispose on the diagonal of the parcels. To appear the color differences between the viable and the destroyed tissues of the buds, the canes were maintained 48 hours with their base in the water at 20… 24^{0}C. The viability of the buds were determined with a magnifying glass, used for observations on the longitudinal buds sections. The observations regarded also the ligneous diaphragm of the cane' knobs.

The biologic material was represented by the grapevine varieties from the Jassy vineyard. The climatic data were provided by the Jassy weather station.

RESULTS AND DISCUSSIONS

The temperature as a climatic factor influence the grapevine by its level and its amount. The temperature level can be optimum, minimum and maximum for each vegetation phase. The harmful level depends on: specie, variety, the organ of the vine, the stark reserves accumulated during the vegetation and the technology (Ilie E. and al., 2002).

Climatic conditions and especially the air temperature influence direct on the bud viability. The minimum harmful temperature for the principal burgeon of the bud registered this year in December and January (tables 1 and 2).

Table 1

Absolute minimum temperatures of the air, for 2009/2010 winter, in Jassy vineyard

Month	Dec.	Sum and number of days with temperatures of:				Absolute minimum
		-15... -20^{0}C	-20...-25^{0}C	-25... -30^{0}C	> -30^{0}C	value/data
December	I	-	-	-	-	+4.0/ 10.12. 09
	II	-33.3/2				-17.0/19.12.09
	III	-16.5/1	-	-	-	-16.5/21.12.09
January	I	-	-	-	-	-7.4/05.01.10
	II	-	-	-	-	-10.4/19.01.10
	III	-37.7/2	-68.1/3	-25.3/1	-	-25.3/25.01.10
February	I	-	-	-	-	-13.0/08.02.10
	II	-	-	-	-	-4.5/16.02.10
	III	-	-	-	-	-2.3/22.02.10

The first thermal shock registered in the second decade of December, when the temperature descend to -17.0 $^\circ$C, after a period with positive temperatures in the air (the absolute minimum temperature in the first period was +4.0^{0}C. The second frost period affected grapevine in the last decade of January, when six successive days the air temperature was extremely low, the sum of negative temperatures being -131.1°C. At the soil level the temperature were most harmful because eight successive days the absolute minimum was under -15°C with a sum

of negative temperatures by -175.6 °C. As a consequence, the bud was affected in very different ways (figure 1 and 2).

Table 2

Absolute minimum temperatures at the soil level, for 2009/2010 winter, in Jassy vineyard

Month	Decade	Sum and number of days with temperatures of:				Absolute minimum
		-15... -20°C	-20...-25°C	-25... -30°C	> -30°C	value/data
December	I	-	-	-	-	-1,0/05.02.09
	II	-19,6/1	-49,2/2	-	-	-24,8/20.12.09
	III	-34,6/2	-	-29,0/1	-	-29,0/21.12.09
January	I	-	-	-	-	-2,7/06.01.10
	II	-	-	-	-	-9,5/19.01.10
	III	-48,2/3	-43,0/2	-52,0/2	-32,4/1	-32,4/26.01.10
February	I	-62,9/4	-	-	-	-16,0/10.02.10
	II	-	-	-	-	-8,0/15.02.10
	III	-	-	-	-	-3,8/22.02.10

The research effectuated in France by Oliver B., Barka A. and Ledet O. (1997), established that harmful effect is a result of ice crystals appearance in the bud (Rotaru L, 2008). The low temperatures action very different because of the biological heterogeneity of the tissues that constitute the winter bud, some parts of it freezing quicker than others: the first, at -10 °C . . . -12 °C, when ice crystals begin to affect the cells on the base of the principal bourgeon of the winter bud; the second, at –15 °C . . . -20 °C, when the phenomenon extends progressive along the axe of the principal bourgeon, while the secondary and tertiary bourgeons remain untouched; the third, between -25°C ... -30°C, when the ice crystals affect the entire principal bourgeon in the winter bud, that is finally destroyed. The base of the bud is also affected and destroyed. These minimum negative temperatures affect the diaphragms from the knob levels and also the secondary wood tissues of the bark. The result is the harm of the canes and of the ligneous skeleton of the vine.

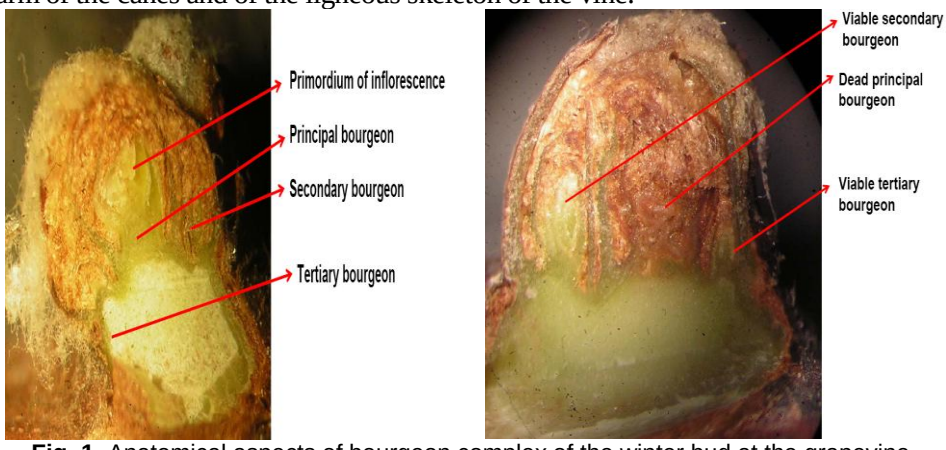

Fig. 1. Anatomical aspects of bourgeon complex of the winter bud at the grapevine

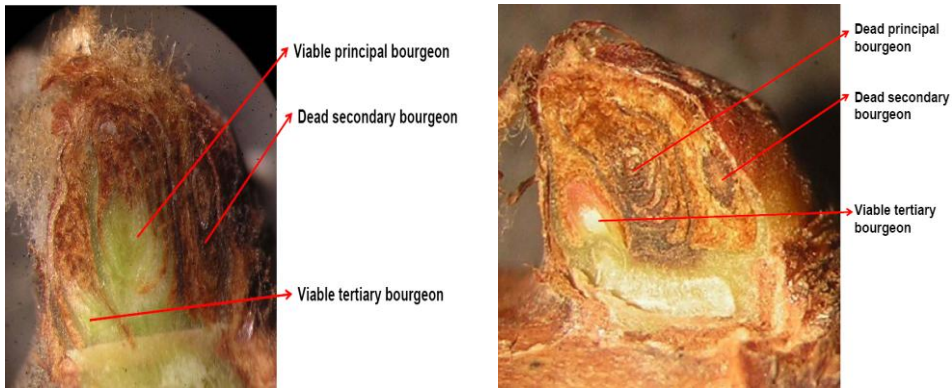

Fig. 2. Different harmful levels of the bourgeon complex of the winter bud at the grapevine

Table 3

The viability and the fertility of vine varieties, from Jassy vineyard in 2009/2010 winter

Variety	Number of examinated buds	Viable buds %	Viable principal bourgeon %	Fertile bourgeons %
Aligoté	384	61	51	37
Aromat de Iaşi	335	17	12	2
Chardonnay	218	51	40	21
Fetească albă	421	49	43	29
Fetească regală	444	30	23	15
Muscat Ottonel	408	53	45	39
Pinot gris	327	66	56	37
Riesling italian	314	45	37	18
Sauvignon	390	77	70	42
Cabernet Sauvignon	259	39	29	16
Fetească neagră	326	42	35	10
Merlot	247	28	18	7

The values from table 3 show that bud lost registered in 2009/2010 winter are significant. So the percent of viable buds is between 17% at Aromat de Iaşi variety and 77% at Sauvignon.

The red wine varieties were also brutally affected, the percent of viable buds being of 39% at Cabernet Sauvignon with only 29% principal bourgeon viability; at Fetească neagră variety the viable buds were %, with only 35% principal buds viability. The most affected in this grapevine varieties group was Merlot; the viability of the buds at this variety was 28% with 18% principal bourgeon viability.

The reduced potential fertility of these varieties will affect significantly the grapes yield of 2010. The lowest fertility has Merlot with 7%; Fetească neagra variety has 28% viable buds with only 10% of inflorescence primordiums because of reduced genetical fertility of this variety. At Cabernet Sauvignon the yield will be only 16% from the normal one, according to the potential fertility of the bourgeons.

At the white wine varieties the viability of the buds is different, being influenced by the high resistance at frost of these varieties. So the best resistance at frost revealed Sauvignon that has 77% viable buds, with 70% viable principal bourgeons; the potential fertility is also high, many of 42% bourgeons presenting inflorescence primordiums. The most resistant white grapevine varieties at 2009/2010 winter frosts were: Pinot gris and Aligoté with more than 50% viable buds; Chardonnay, Fetească albă and Muscat Ottonel with more than 40 % viable buds (figure 3). The lowest viability of the winter buds (17%) registered Aromat de Iaşi variety; this variety has also the lowest potential fertility, by 2%.

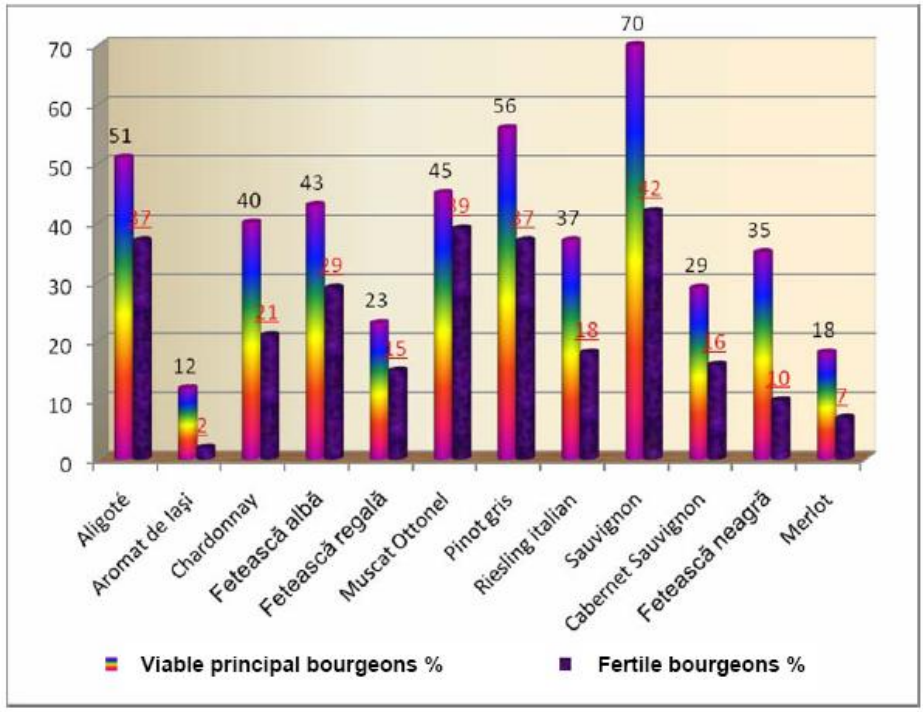

Fig. 3. The viability and potential fertility of principal buds at the grapevine varieties from Jassy vineyard, in 2009/2010 winter

CONCLUSIONS

1. The absolute minimum temperatures registered in Jassy vineyard during the 2009/2010 winter affected grapevines by their cumulative effect, that determined important loss of winter buds viability.

2. Between the white wine varieties the most resistant are Sauvignon, Pinot gris and Aligoté; the lowest resistance at frost are Aromat de Iaşi, Fetească regală and Riesling Italian that suffered major damages of the winter buds.

3. At red wine varieties the destructive effect of the frost affected especially Merlot variety, that has only 18% viable principal bourgeons.

4. The fertility of the bourgeons, influenced by genetically nature of the varieties and by the efficiency of the technology reveal the perspective of obtaining reduced yields, by only 2% to 39% comparing with the ones obtained in climatically normal years in Jassy vineyard.

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