

# THE INFLUENCE OF THE CLIMATIC FACTORS OVER THE MATURATION PROCESS OF THE STRINGS OF THE MAIN VINE VARIETIES FROM THE COPOU WINE- GROWING CENTER

## INFLUENȚA FACTORILOR CLIMATICI ASUPRA PROCESULUI DE MATURARE A COARDELOR LA PRINCIPALELE SOIURI DE VIȚĂ DE VIE DIN CENTRUL VITICOL COPOU

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**Abstract.** *The vine strings' maturation is one of the growth phenophases with a special practical importance because the vine resistance at the low temperatures during winter depends on this stage. The maturation of the sprigs' tissues occurs through an ensemble of morphologic, anatomic and biochemical changes and represents the transition from the herbaceous to the lignification state. The factors that influence the sprigs' maturation are of biologic, ecologic and technologic nature. In the current paper the maturation degree of the wood at the main varieties Vitis vinifera from the Copou wine-growing center was assessed through the ascertainment of the spare matter content (sugar, starch) and of the humidity of the vine strings' tissues. The climatic factors' evolution in 2007 in the Copou vineyard ensured a proper maturation of the sprigs, the carbohydrate content of the strings ranging between 12.87% and 16.85%.*

**Rezumat.** *Maturarea coardelor de viță de vie este una din fenofazele de creștere cu o importanță practică deosebită, de această etapă depinzând rezistența viței de vie la temperaturile scăzute din timpul iernii. Maturarea țesuturilor lăstarilor se realizează printr-un ansamblu de transformări morfologice, anatomice și biochimice și reprezintă trecerea de la starea erbacee la starea lignificată. Factorii care influențează maturarea lăstarilor sunt de natură biologică, ecologică și tehnologică. În prezenta lucrare s-a apreciat gradul de maturare a lemnului la principalele soiuri Vitis vinifera din centrul viticol Copou prin determinarea conținutului în substanțe de rezervă (zaharuri, amidon) și a umidității în țesuturile coardelor de viță de vie. Evoluția factorilor climatici în anul 2007 în podgoria Copou a asigurat o maturare corespunzătoare a lăstarilor; conținutul în hidrați de carbon a coardelor variind între 12,87 – 16,85 %.*

The starch represents the most important polysaccharide as a spare matter ensuring the vital processes in the rest period of the vine, the resistance at the winter frost, the initial growth of the sprigs after the debudding, the slip rooting, and the formation of a callus at the grafted vines [2,5]. The starch accumulation begins at the end of July and ends in the autumn, at the leaf fall when the so-called „starch maxim” occurs within the sprigs [3,7]. According to some authors [4,5] the matured wood presents the following biochemical characteristics: carbohydrates minimum 12%, starch 6-8%, water over 41% (stock slips) and 44% (graft strings).

## MATERIAL AND METHOD

Between November and December 2007 it was ascertained the maturation degree of the wood at the main vine varieties from the Copou wine-growing center: Fetească albă, Aligoté, Muscat Ottonel, Fetească regală, Chardonnay, Sauvignon, Grasă de Cotnari and at the clones and varieties created at SCDVV Iași – Busuioacă de Bohotin cl 5 Is, Frâncușă cl 14 Is, Chasselas dore cl 20 Is, Golia, Gelu and Paula. The works were carried out on average samples which were harvested during the leaf fall period from 10 strings belonging to 10 different vine stocks. The ascertainments were carried out during the leaf fall period because the spare glucide deposits within the sprigs increase almost until the leaf fall, after which they undergo a small decrease and, again, an increase that exceeds the level before the leaf fall [4].

The strings' humidity was ascertained by drying them at the stove (105°C) until reaching a constant mass of transverse sections on the entire string length.

The carbohydrates were ascertained through the chemical method with the anthrone reagent [4], on three growing areas: the string basis (the 1-2 node area), the middle of the string (the 3-6 node area) and the top of the string (7-10 node area). The sugar was extracted in ethyl alcohol, the starch in perchloric acid. The colour obtain by the reaction between the resulted extracts and anthrone was determinated at UV-VIS spectrophotometer.

## RESULTS AND DISCUSSIONS

The water content, in correlation with the dry matter, is one of the characteristics of the maturation process of the vine strings. The values obtained at the ascertainment of the strings' humidity at the main vine varieties are graphically represented in figure number 1.

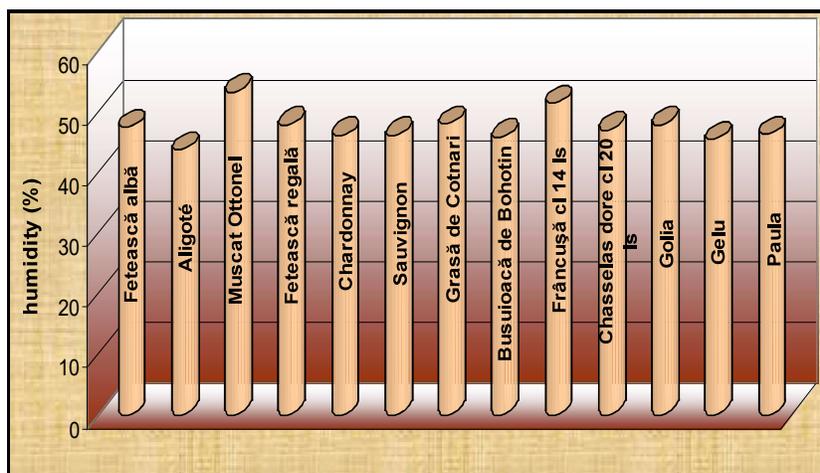


Fig. 1. Humidity at the main vine varieties from the Copou wine-growing center

At all the analyzed varieties, the strings' humidity registered values of over 40%, a humidity value which is considered the limit at which a planting material can be accepted for reproduction. The humidity' minimum value was

registered at the Aligoté variety 43.63%, and the maximum one at the Muscat Ottonel variety 53.26 %. An important coefficient for the assessment of the maturation degree of the sprigs is the carbohydrate content (sugar and starch).

Table 1

The carbohydrate content at the main vine varieties

No.	Sample		Starch %	Sugar %	Average on string %
1.	Fetească albă	basis	10,00	7,42	16,09
		middle	8,78	7,57	
		top	8,01	6,48	
2.	Aligoté	basis	6,66	7,40	13,88
		middle	6,36	7,69	
		top	6,28	7,26	
3.	Muscat Ottonel	basis	5,83	7,50	12,87
		middle	5,64	7,02	
		top	5,49	7,13	
4.	Fetească regală	basis	9,00	6,90	15,43
		middle	8,74	6,57	
		top	8,33	6,74	
5.	Chardonnay	basis	9,05	6,62	14,67
		middle	8,38	6,14	
		top	7,85	5,98	
6.	Sauvignon	basis	9,20	7,24	15,61
		middle	8,60	7,21	
		top	8,05	6,52	
7.	Grasă de Cotnari	basis	7,60	10,21	16,85
		middle	6,79	9,80	
		top	6,43	9,72	
8.	Busuioacă de Bohotin cl 5 Is	basis	7,73	6,83	14,18
		middle	7,51	6,47	
		top	7,44	6,57	
9.	Frâncușă cl 14 Is	basis	9,62	6,98	16,32
		middle	9,57	6,9	
		top	9,37	6,53	
10.	Chasselas dore	basis	8,19	7,45	14,79
		middle	7,75	6,90	
		top	7,45	6,62	
11.	Golia	basis	7,89	7,64	14,52
		middle	7,44	6,92	
		top	6,93	6,75	
12.	Gelu	basis	7,87	6,02	13,14
		middle	7,87	5,43	
		top	7,18	5,05	
13.	Paula	basis	8,55	6,93	14,74
		middle	8,33	6,36	
		top	8,18	5,86	

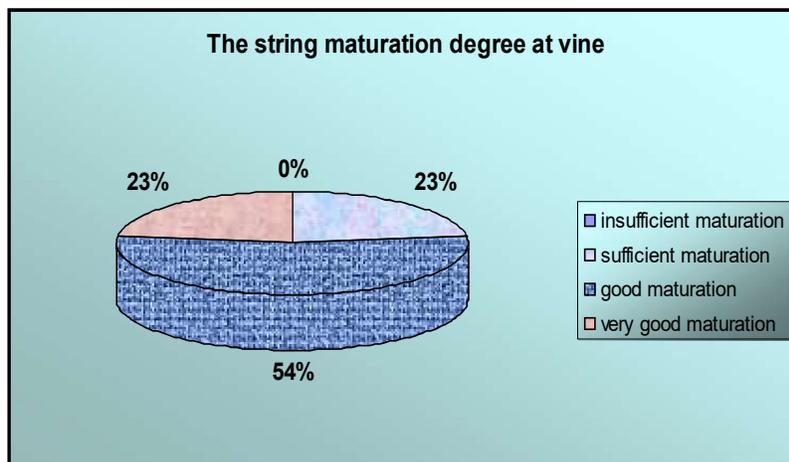
Table number 1 presents the data regarding the starch content (the most important spare matter) expressed in percents, as well as the total amount of carbohydrates from the vine strings, on the three sectors – basis, middle, and top.

At all the studied varieties, the starch content varies on the length of a vine string, with bigger values at the string's basis which slightly decrease then towards the string's top. Thus, the starch content from the strings' basis varies in the interval 5.83 %, a value which was registered at the Muscat Ottonel variety and 10 % at Fetească Albă variety. The lowest starch content from the strings' top was 5.49 % registered at the Muscat Ottonel variety. The average per string of the starch content varies quite enough, and thus the inferior limit is 5.65 % registered at the Muscat Ottonel variety and the superior one 9.52 % obtained for the Frâncușa vine variety.

Unlike the other vine varieties, at the Aligoté, Muscat Ottonel and Grasă de Cotnari varieties the starch values are lower as compared with those of the sugar. This can indicate a maturation in process, namely the transformation of the sucrose into polysaccharides. After it is synthesized within the leaves, the sucrose is conveyed through the free vessels towards the strings, vine stocks, sprigs, where, in the presence of the specific enzymes, is deposited in the shape of polysaccharides among which we can include the starch as well [3].

For the interpretation of the obtained data, the string maturation was considered to be insufficient for a content under 12 % carbohydrates, sufficient at a content of 12-14 %, good, with 14-16 % carbohydrates and very good at over 16 % carbohydrates. By analyzing the values obtained for the total carbohydrate content we can ascertain that most of the varieties from the Copou wine-growing center had an appropriate string maturation.

In figure 2 the string maturation degree from the Copou wine-growing center is graphically represented.



**Fig 2.** The string maturation degree at the varieties from the Copou wine-growing center

Thus, 54 % of the analyzed varieties' strings have a good maturation. As a result of the analyses for the ascertainment of the carbohydrate content, no insufficient wood maturation was tracked down at the vine varieties. These carbohydrate values represent the premise of a good production in the viticultural year 2008.

The values of the water and carbohydrate content were largely influenced by the meteorologic parameters in 2007, which occurred during the vegetation period and especially in the phenophases of ripening and maturation of the grapes and then of the fruit elements. Table 2 presents the data registered by the weather-station located within the vine plantation of the Copou wine-growing center between January and December 2007.

Table 2

The values of the main climatic elements registered in 2007

Month	Temperature °C, air			Temperature °C, soil			Quoted hygrosco pes %	Rainfalls mm	Insolation no hours
	average	maximum	minimum	average	maximum	minimum			
I	4,1	16,9	- 10,5	2,3	6,7	- 4,6	69	21,5	78,2
II	0,8	16,6	- 19,6	0,3	22,4	- 25,0	76	30,1	71,1
III	7,3	20,2	- 0,8	7,7	33,0	- 4,2	62	25,6	203,5
IV	10,2	22,6	1,6	12,7	46,8	- 2,5	50	25,1	201,8
V	18,9	34,5	0,5	25,3	61,0	- 1,8	51	28,0	276,5
VI	22,8	37,5	11,6	30,0	61,0	10,9	49	15,4	290,6
VII	25,0	42,3	11,0	32,3	66,0	9,0	40	40,3	311,2
VIII	22,0	38,3	11,6	26,3	58,9	8,4	65	91,3	215,1
IX	15,3	26,7	4,8	16,6	39,0	2,8	70	83,5	196,1
X	10,5	21,0	1,6	10,8	29,5	- 1,6	75	58,7	127,8
XI	2,5	11,8	-5,5	2,1	15,5	-8,2	78	50,5	92,3
XII	-0,9	9,4	-11,8	-1,1	7,0	-11,7	87	53,5	12,5

By analyzing the values of the climatic elements (table 2), we can notice that in 2007 we had a warm winter and the maximum temperature registered in the air was of 16.9°C. However, at the end of February (23 – 25 February), we had very low temperatures of -19.6°C in the air and of -25.0°C at the ground, which affected both the bud complex and the one-year-old strings and the belts to a very high extent, as a result of the annealing phenomenon of the vine stocks under the influence of the high temperatures from the previous period. The warm spring, with monthly average temperatures of 7.3°C (March), 10.2°C (April) and 18.9°C (May) and the excessive heat from the summer months when temperatures of 37.5°C, 42.3°C and 38.3°C were registered several days favoured the subsequent maturation of the vine strings.

The insolation assessed through the number of hours of sun brightness registered higher values, superior to the multianual average. The rainfall amount from January – July 2007 was under the normal one by a long chalk and the rainfall deficit was of 108 L/m<sup>2</sup>. The abundant waterfalls from July, August,

September and October caused the partial retrieval of the ground humidity and of the air hygroscopicity, which increased from 40% in July to 75% in October.

## CONCLUSIONS

The climatic conditions registered during the vegetation period of the vine in 2007 favoured the maturation process of the strings, thus 54% of the total number of varieties studied had a good maturation and 23% a very good maturation.

The strings of the vine varieties studied had a humidity higher than the inferior limit, namely values of over 44%, and the Muscat Ottonel variety even registered a humidity of 53.26%.

The starch content, the main spare matter of the vine strings, decreases from the basis to the top of the string and registers values of over 7%, which shows a proper maturation of the strings. The total carbohydrate concentration determined at ten vine varieties and three vine clones was ranges between 12.87 and 16.85%.

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