RESEARCHES ON THE INFLUENCE OF THE DIFFERENT TECHNIQUES OF MACERATION ON THE COMPOSITIONAL CHARACTERISTICS OF THE BUSUIOACĂ DE BOHOTIN WINE

CERCETĂRI PRIVIND INFLUENȚA DIFERITELOR TEHNICI DE MACERARE ASUPRA CARACTERISTICILOR COMPOZIȚIONALE ALE VINULUI DE BUSUIOACĂ DE BOHOTIN

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Abstract. *This study pursues the influence that have various techiques of maceration (maceration fermentation, thermomaceration, cryomaceration - microwave maceration,carbonic maceration) on the compositional characteristics of the Busuioacă de Bohotin wine. This four techniques were applied to the two biotypes of Busuioacă de Bohotin variey, respectively dark violet biotype androse biotype. The main parameters that will be followed to determine the physico-chemical composition of the wine studied are : sulfur dioxide , volatile acidity, total acidity, density, concentration of alcohol , reducing sugars , total dry extract , non-reductive extract , phenolic compounds and chromatic characteristics.*
Key words: *physico-chemical analysis, maceration, thermomaceration, cryomaceration, microwave maceration, carbonic maceration.*

Rezumat. *In acest studiu se urmărește influența pe care o au diferitele tehnici de macerare (macerare-fermentare, termomacerare, criomacerare - macerare cu microunde, macerație carbonică) asupra caracteristicilor compoziționale ale vinului de Busuioacă de Bohotin. Cele patru tehnici de macerare s-au aplicat pe cele două biotipuri ale soiului Busuioacă de Bohotin, respectiv biotipul roz și biotipul vânăt.Principalii parametrii care se vor urmări pentru determinarea compoziției fizico-chimice ale vinului studiat sunt: dioxidul de sulf, aciditatea volatilă, aciditatea totală, densitatea, concentrația alcoolică, zaharurile reducătoare, extractul sec total, extractul nereducător, compușii fenolici și caracteristicile cromatice.*
Cuvinte cheie: *analiză fizico-chimică, macerație, termomacerație, criomacerație, macerație cu microunde, macerație carbonică.*

INTRODUCTION

The Busuioacă de Bohotin variety is one of the most valuable local varieties, but with limited ecological plasticity that is designed for obtaining

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aromatic wines, characterized by specific organoleptic qualities that gives a special note of originality (Rotaru *et al.,* 2011).

Busuioacă de Bohotin being an aromatic variety it is mandatory the maceration operation.

Maceration is a technological operation by which the marc is maintained for a time in contact with the juice for extraction of certain components from the solid parts of the grapes (Cotea *et al.,* 2012).A number of methods are available to the winemakerto adjust extraction levels during maceration. The various results obtained by applying different methods of maceration demonstrates the utility of a better chemical and gustatory understanding of the molecules involved in maceration phenomenon (Ribereau Gayon *et al*., 2006).

The main objective of this study is to evaluate the influence of different techniques of maceration on the physico-chemical composition of the Busuioacă de Bohotin wine.

MATERIAL AND METHOD

For this experiment there were used two biotypes of the Busuioacă de Bohotin variety, namely: dark violet biotype and rose biotype. The grapes were harvested at technological maturity in the year 2014, both biotypes being from Huși vineyard.

To obtain the wine samples taken in this study, there were applied four types of maceration processes, specifically:

V0-Control sample- it was applied a classical maceration.

V1-Maceration fermentation- this type of maceration it is similar with the control sample, with the difference that was added yeast and enzymes.

V2-Thermomaceration- for this variant of maceration, after the crushing and destemming operations, the juice was pumped over from the plastic can and heated to a temperature of 70ºC. After reaching this temperature, the juice was brought back into the plastic can and homogenized with the remained pomace.

V3- Cryomaceration - Microwave maceration-this technique of maceration is based on two types of methods. In a first stage it was applied cryomaceration method, where the whole grapes were slowly freezed at a temperature of -20ºC in 24 hours. The frozen grapes were manually destemmed and crushed. In the second stage the obtained pomace was iraddiated with microwaves at a power of 750 W for 15 minutes. Meanwhile, thepomace was homogenized from 3 to 3 minutes to equally heat the pomace.

V4-Carbonic maceration-it was conducted in a plastic can, where the whole grapes were introduced on a grill, situated at a height of about 10 cm from the bottom of the container.The carbonic maceration was done with the carbon dioxide eliminated in the process of alcoholic fermentation of the must, situated at the bottom of the can.

The maceration time for all the techniques used was seven days and it was added yeast- Fermactive Rouge Primeur and pectolitic enzyme-Zymovarietal Aroma G, both from Sodinal company.

RESULTS AND DISCUSSIONS

Analyzing the physico-chemical parameters from the table 1, it can be observed that there aren't significant differences between the values obtained for

the variants of maceration applied.Thus, in what concerns alcoholic concentration, the dark violet biotype of the Busuioacă de Bohotin variety registred an average value of 14.67 %. The maximum was reached by the V1-Maceration fermentation variant with 14.85 % in contrast with control sample V0 with 14.75 %, while the minimum was registred by the V4 variant-Carbonic maceration with a value of 14.5 %. In therms of reducing sugars content, all the wine samples prezented values situated below 4 g/l, with an average value of 2 g/l, therefore they can be included in the category of dry wines.

Observing table 2, it can be stated that for the rose biotype of the Busuioacă de Bohotin varietyit exists wide variations in what concerns total acidity parameter, the maximum value being registred by the control sample with 6.14 g/l and the minimum was reached by the V7-Carbonic maceration variant with 5.15.

In what concerns total dry extract (T.D.E) and non-reductive extract (N.E) parameters, it can be observed that almost all variants of maceration prezented higher values. The only exception was found at the V4 Carbonic maceration, which showed lower values with 19.3 T.D.E and 17.58 N.E. for the rose biotype and 19 T.D.E and 16.83 N.E for the dark violet biotype.

pH and conductivity parameters had similar values for all the variants of maceration applied to the both biotypes, with an average value of 3.82 for pH and 2.33 for conductivity.

Analyzing the parameters that describes the content in phenolic compounds, namely total polyphenol index IPT (D280) and Folin Ciocâlteu Index (IFC) there were observed wide variations on the values obtained for the techniques of maceration applied for both biotypes.

Thus, for the IPT parameter (Fig.1) the minimum was reached by V1 sample with 8.44 for the dark violet biotype and 6.16 (V4 variant) for the rose biotype, while the maximum was expresed by the control sample V0 of the dark violet biotype with 15.93 and V1 sample of the rose biotype with a value of 12.25.

In what concerns I.F.C parameter (Fig.2), the minimun was reached by V4 sample with 6.79 for the dark violet biotype and 8.79 (V3 variant) for the rose biotype, while the maximum was expresed by V2 variant of the dark violet biotype with 10.38 and V1 sample of the rose biotype with a value of 15.79.

By comparing these two biotypes regarding phenolic compounds content, it can be observed some differences. Thus, in therms of IPT parameter it can be showen that the highest values wereachieved by the dark violet biotype with an average value of 11.03, while the rose biotype had an average value of 9.52.

The IFC parameterhas higher values for the rose biotype with an average value of 11.49 in comparison with the dark violet biotype with an average value of 8.87.

Table 1

Physico-chemical analysis of the Dark violet biotype

Analyzed wines	SO_2 mg/L		Vol. Acidity (g/L $C_2H_4O_2$)	Total acidity (g/L $C_4H_6O_6$)	Rel. density	Conc Alc. (% vol.)	Red. subst. (g/L)	TDE (g/L)	NE (g/L)	pH	Conductivity mS/cm²
	free	total									
BBV - V0	50.78	147.09	0.35	5.23	0.990	14.75	2.14	24.5	22.36	3.86	2.29
BBV - V1	43.66	134.70	0.36	5.30	0.990	14.85	2.14	25	22.86	3.88	2.37
BBV - V2	33.75	130.68	0.32	5.36	0.991	14.51	1.94	25.5	23.56	3.93	2.49
BBV - V3	41.18	131.92	0.37	5.84	0.989	14.75	1.96	22.9	20.94	3.89	2.22
BBV - V4	40.56	123.87	0.62	5.55	0.988	14.50	2.17	19	16.83	3.77	1813 µS/cm

Table 2

Physico-chemical analysis of the Rose biotype

Analyzed wines	SO_2 mg/L		Vol. acidity (g/L $C_2H_4O_2$)	Total acidity (g/L $C_4H_6O_6$)	Rel. density	Conc Alc. (% vol.)	Red. subst. (g/L)	T.D.E (g/L)	N.E (g/L)	pH	Conductivity mS/cm²
	Free	Total									
BBR - V0	40.25	112.10	0.41	6.14	0.991	14.15	2.04	24	21.96	3.83	2.48
BBR - V1	43.04	133.47	0.35	5.84	0.990	14.31	2.18	22.9	20.72	3.80	2.37
BBR - V2	34.99	114.27	0.33	5.94	0.990	14.01	2.10	23.5	21.4	3.78	2.45
BBR - V3	27.39	102.72	0.33	5.45	0.990	13.88	1.69	21.1	19.41	3.82	2.35
BBR - V4	23.51	104.09	0.41	5.15	0.989	13.88	1.72	19.3	17.58	3.72	2.02

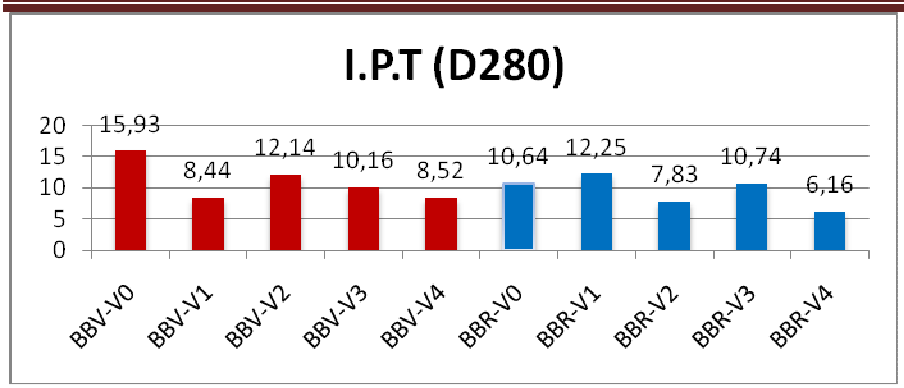

Fig. 1- Total poliphenolic index (I.P.T) for the dark violet and rose biotype of Busuioacă de Bohotin variety.

Where:
BBV- is the dark violet biotype
BBR-is the rose biotype

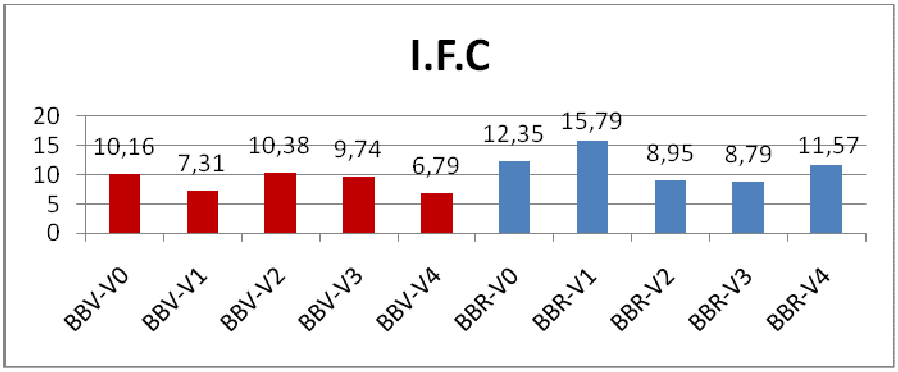

Fig. 2 - Folin Ciocâlteu Index for the dark violet and rose biotype of Busuioacă de Bohotin variety.

Analyzing the wine samples obtained, from a chromatic point a view it can be observed that the best values for the both biotypes were obtained for the V2 variant where was applied thermomaceration technique, these samples having the most intense color (Table 3 and 4).

Thus, for these samples, the value of L parameter (clarity) was the lowest, predominating shades of red (+a) and yellow (+b), the level of saturation (C) being higher for these samples.

At the opposite pole lies the wine samples obtained from carbonic maceration (V4), where the shades of red and yellow were fade, a-parameter having even negative values for the rose biotype, prevailing green shades.

Table 3

Chromatic parameters of the dark violet biotype

Analyzed wines	CieLab-76							Digital Colour Atlas 3.0
	Tristimulus			Crome (C)	Tonality (H)	Lighteness	Hue	
	L (clarity)	a	b					Colour
BBV -V0	89.06	10.05	12.67	16.17	51.58	0.50	1.41	
BBV -V1	93.81	5.03	9.01	10.32	60.81	0.29	1.65	
BBV -V2	87.77	10.81	15.07	18.54	54.33	0.57	1.47	
BBV -V3	90.93	7.42	11.10	13.35	56.21	0.41	1.55	
BBV -V4	97.42	1.02	5.05	5.16	78.50	0.14	2.25	

Table 4

Chromatic parameters of the rose biotype

Analyzed wines	CieLab-76							Digital Colour Atlas 3.0
	Tristimulus			Crome (C)	Tonality (H)	Lighteness	Hue	
	L (clarity)	a	b					Colour
BBR - V0	98.29	0.76	6.66	6.71	83.42	0.12	3.10	
BBR - V1	96.21	2.69	11.21	11.53	76.48	0.23	2.39	
BBR - V2	95.63	2.47	11.85	12.11	78.20	0.26	2.34	
BBR - V3	97.91	0.25	6.34	6.35	87.73	0.13	3.02	
BBR - V4	98.65	- 0.56	5.06	5.09	-83.65	0.10	4.10	

CONCLUSIONS

1. Analyzing the main physico-chemical parameters of the wine samples obtained there weren't found significant differences between the techniques of maceration applied on compositional characteristics. However, it was observed that the carbonic maceration technique presented the lowest values in what concerns alcoholic concentration, total dry extract and non-reductive extract for both biotypes used.

2. By comparing the two biotypes used regarding phenolic compounds content, it was observed that in what concerns total phenolic compound index, the highest values were achieved by the dark violet biotype and in terms of phenolic compounds with reducing proprieties, the rose biotype obtained the highest values.

3. From a chromatic point of view, it was pointed out that the wine samples obtained by thermomaceration technique had the most intense color and those obtained by carbonic maceration were the most fade in color.

REFERENCES

1. **Cotea D. Valeriu, 2012**- *Tratat de Oenologie vol.I Vinificația și biochimia vinului,* Editura Tipo Moldova, Iași, p. 479.
2. **Ribereau-Gayon, P., Dubourdieu, D., Doneche, B., Lonvaud, A. , 2006**.- *Handbook of enology. Vol. 1: The microbiology of wine and vinifications*. 2nd ed. – Chichester: Wiley, p. 348.
3. **Rotaru Liliana, Stoleru Vasile, Petrea Gabriela, 2011** - *Agrobiological and technological value of Busioacă de Bohotin grapevine variety in ecosystem of IASI Vineyard*. Analele Universității din Craiova, seria Agricultură – Montanologie – Cadastru Vol. XLI 2011/1.