ORGANOLEPTIC CHRACTERISTICS OF EXPERIMENTAL SPARKLING WINES

CARACTERISTICI ORGANOLEPTICE ALE UNOR VINURI SPUMANTE EXPERIMENTALE

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Abstract. *There are two main production processes for the quality sparkling wines: traditional and „charmate" methods. In the traditional procedure, the second alcoholic fermentation of the base wine is carried out in sealed bottles. Some of the most popular sparkling wines, such as Champagne and Cava, are produced by the traditional method. Sensory and organoleptic characteristics are one of the most important indicators of sparkling wine quality for the acceptability of a product by consumers. So, this research is focused on the study of the influence of different yeasts strains on the organoleptic profile of the experimental sparkling white wines produced by traditional method. Therefore, a Muscat Ottonel grape must was used and passed by a reverse osmosis process. The obtained permeate was mixed with a calculated amount of the concentrate to generate a must with a potential of 10.5% (v/v) alcohol, in order to obtain the base wine for the second fermentation. The obtained, stabilized, sparkling wine was analyzed for oenological parameters and to determine the organoleptic characteristics. Following the organoleptic analysis, the significant differences in the sensory profile for the analyzed wine samples were confirmed.*
Key words: Muscat Ottonel grape, reverse osmosis, champenoise method, yeast strains, organoleptic profile

Rezumat. *Există două metode de producere pentru vinurile spumante de calitate: prin metoda tradiţională şi prin metoda „charmate". În procedura tradiţională, cea de-a doua fermentaţie alcoolică a vinului se efectuează în sticle sigilate în prezenţa unor levuri speciale. Unele dintre cele mai populare vinuri spumante, cum ar fi Champagne şi Cava, sunt produse prin metoda tradiţională. Caracteristicile senzoriale şi organoleptice sunt indicatori importanţi ai calităţii vinurilor spumante în sensul acceptării unui produs de către consumatori. Prin urmare, această cercetare se concentrează pe studiul influenţei diferitelor tulpini de drojdii asupra profilului organoleptic al unor vinuri spumante experimentale produse prin metoda tradiţională. Pentru experimente a fost utilizat must de struguri Muscat Ottonel ce a fost trecut printr-o instalaţie de osmoză inversă. Permeatul obţinut a fost amestecat cu o cantitate calculată de produs concentrat pentru a genera un must cu un potenţial alcoolic de aproximativ 10,5% (v/v), pentru a obţine vinul de bază pentru a doua fermentaţie. Vinul spumant obţinut, stabilizat, a fost analizat pentru a se stabili principalii parametri oenologici şi pentru a determina caracteristicile*

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organoleptice. În urma analizei organoleptice, au fost confirmate diferențe semnificative în profilul senzorial pentru probele de vin analizate.
Cuvinte cheie: Muscat Ottonel, osmoză inversă, metoda champenoise, levuri selectionate, profil organoleptic

INTRODUCTION

Sparkling wine are by definition wines (usually white) that are naturally carbonated by a second fermentation and can be obtained using two main production methods, namely: the traditional method and the charmant method, differentiated by the second fermentation process (bottle fermentation and the fermentation in large, stainless steel tanks).

Aroma is one of the most important factors determine the character and quality of a wine (Villanova *et al.,* 2007). Some of aroma compounds are released directly from the grape berries while others are formed during the fermentation and aging (Rapp, 1998).

Generally, the aroma of the wine depends on many factors such as: environmental and management practices, grape varieties, wine-making technique, etc (Falque *et al*., 2001). In the case of sparkling wines the majority of flavor compounds are arising from the fermentation process and a determinant factor in developing the sensorial profile are the selected yeasts used in the process.

Wine aroma can be perceived by nose or in the mouth via postnasal way (Francis and Newton, 2005) and is a direct function of the chemical composition of the wine. Perceived flavor is the result of complex interactions between all the volatile and non-volatile compounds present in wine (Fairbairn *et al.,* 2014). The diversity of aromatic compounds in wine is immense and ranges in concentrations from mg/L to a few µg/L (Zhang *et al.,* 2011).

Wine quality is closely related to microbial ecology of fermentation and especially to the yeasts that are producing volatile metabolites with different flavor profiles. The yeasts are responsible for the biotransformation process of the grape juice constituents into aroma or flavor-impacting components, for bringing enzymes that transform neutral grape compounds into flavor-active compounds and lastly for the novo synthesis of many flavor active primarily and secondary metabolites (Styger *et al.,* 2011).

In the winemaking industry it is desired to obtain a wine from extremely ripe grapes in order to create a wine with a developed sensory palette, but in this case occurs the problem of obtaining wines with a high alcoholic strength. Thus, in order to avoid this type of situations reverse osmosis is applied and in this way the level of alcohol is reduced without major changes on the fruit flavors and other elements in the wine.

Reverse osmosis (RO) is a technology that uses a semi permeable membrane to remove ions, molecules and larger particles from different liquids. In reverse osmosis, an applied pressure is used to overcome osmotic pressure a

colligative property that is driven by chemical potential differences of the solvent, a thermodynamic parameter (Ribereau-Gayon *et al.,* 2006; Tessier, 2003).

The main objective of the present study is to evaluate the influence of different type of yeasts on the sensorial features of the sparkling wines. The originality of the study consists in applying the reverse osmosis (RO) in order to obtain a base wine for the second fermentation with standard characteristics.

MATERIAL AND METHOD

Must and wine samples

The present study was carried out on five samples of sparkling wines obtained from Muscat Ottonel juice/must. The raw material-the must/ juice was obtained from grapes of Muscat Ottonel that were harvest in 2015 at full maturity from Iaşi vineyard.
Wine samples

The sparkling wine samples taken in the experiment were produced in the micro-winery belonging to the Oenological department of the University of Agricultural Sciences and Veterinary Medicine of Iasi.

It is a must to emphasize the fact that the samples covered by this scientific study were obtained by applying the classical method *champenoise.* This method consists of a secondary bottle fermentation of the wine raw material, followed by the removal of impurities by riddling and disgorgement operations.

The harvests of grapes along with the primary fermentation proceeds as with any still wine. The still wine produced becomes in this way the base-wine to be used in the next step. It is necessary to mention the fact that a reverse osmosis process mixing in a variable ratio of the permeate and concentrate was applied followed by the usual fermentation process.

After primary fermentation and bottling of the base wine, a second alcoholic fermentation occurs in the bottle. The second fermentation is induced by adding yeast and sugar (*liqueur de tirage*). The sugar added with the *liqueur de tirage* provides food for the yeast and is entirely consumed during the secondary fermentation and has no effect on the “sweetness” of the finished product. At this time the bottle is capped with a crown cap and stored in a cellar in the horizontal position to age.

After the completion of the aging process the bottle is submitted to removing the dead yeast, this process being known as riddling. At this stage the bottles are placed on special racks at a 45° angle with the cork pointed down. After six to eight months the position of the bottles are changed being pointed straight down with the sediment in the neck of the bottle.

The disgorging operation consists in a freezing process of the neck bottles that are still pointed down and after that the bottles are turned upright and the cap is removed. In this way the pressure in the bottle will eliminate the lees.

Immediately after disgorging and before corking, the wine levels from the bottles is completed with the “liqueur d'expédition”. Usually in this stage it is add a little quantity of sugar a practice known as dosage. The amount of sugar added in this step will determine the sweetness of the sparkling wine and in the end the cork is inserted.

Reagents for the fermentation process

For the fermentation process the most important factor is the type of the yeasts that were used. Thus, the yeasts are becoming the experimental factor helping to differentiate samples concerning the quality of the wine samples obtained such as:

aromatic compounds, metal content, acid content, color and the determination of the amino acids. The samples are: V0- the blank sample (no yeast used), V1- Ioc FIZZ yeast, V2- IOC DIVINE yeast, V3- IOC 18-2007, V4- LEVULIA CRISTAL. It is also necessarily to emphasize the fact that the yeasts that were used for this experiment are selected and recommended by the Oenological Institute of Champagne.

After the decarbonisation operation, each sample of wine was submitted to the following analyses: sulfur dioxide, volatile acidity, total acidity, alcoholic strength, reducing substances, total dry matter and non-reducing substances. The analyses were done according to OIV methods and the specific literature.

RESULTS AND DISCUSSIONS

The general physical-chemical parameters of the analyzed sparkling wine samples are presented in table 1. It is necessarily to mention the fact that in the obtaining process of sparkling wines was used the same raw-material-wine and possible differences could result from using different types of fermentation yeasts.

Table 1

Quality parameters of the wine raw-material and of the sparkling wines obtained

Samples	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Control sample	0.9921	6.2	0.33	10.3	17.2	70.7	3.2	15.2	2.8
Sample V1	0.9905	6.7	0.32	11.6	5.12	56.3	0.7	14.5	3.1
Sample V2	0.9908	6.9	0.29	11.3	5.12	48.6	1.9	13.3	3.0
Sample V3	0.9906	6.9	0.26	11.6	5.12	51.2	1.9	13.5	3.0
Sample V4	0.9907	6.6	0.31	11.3	7.68	64.0	0.7	14.3	3.0

1− density; **2**− total acidity (g tartaric acid/L); **3**− volatile acidity (g acetic acid/L); **4**− alcohol strength (%); **5**− free SO_2 (mg/L); **6**− total SO_2 (mg/L); **7**− reductive substances (g/L); **8**− Non-reductive extract (g/L); **9**− pH.

Visible differences can be observed between the control samples and the samples treated with specific yeasts. Thus, in the case of alcoholic strength the values of the analyzed samples ranged between a minimum of 10.34 % vol. for the control sample and a maximum of 11.6 % vol. for the sample V1 and V3. This variation pattern could be explained by the inoculation with specific yeasts in the second fermentation stage.

The volatile acidity didn`t vary in large limits: from a minimum of 0.26 g/L acetic acid for the sample V3 to a maximum of 0.33 g/L acetic acid for the control sample. Low values of the total acidity were determined for the control sample and the sample V4.

The charts of organoleptic features are presented in figure 1 and in figure 2. These two charts describe the evolution of the sensorial profile of the analyzed sparkling wines since the analysis was conducted at six months and at twelve months.

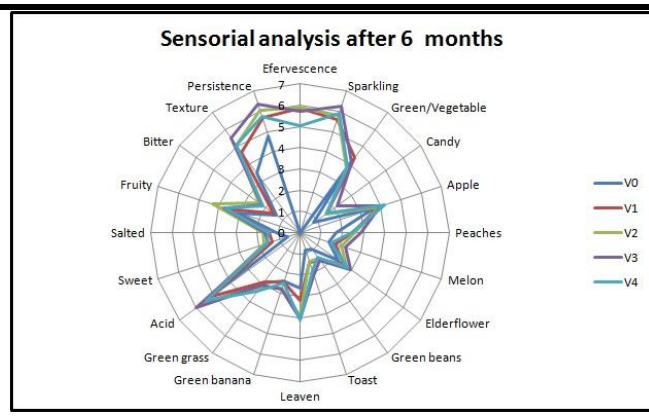

Fig.1 Organoleptic chart of the analysed sparkling wines after 6 months

The wines are equilibrated from the sensorial point of view. For example at six months in the case of the control sample, differences regarding the persistence, apple flavors and green-vegetable flavors were observed. So, in this case the organoleptic features were less developed. In addition, it is necessary to mention the fact that sparkling is very low by comparison with the other samples.

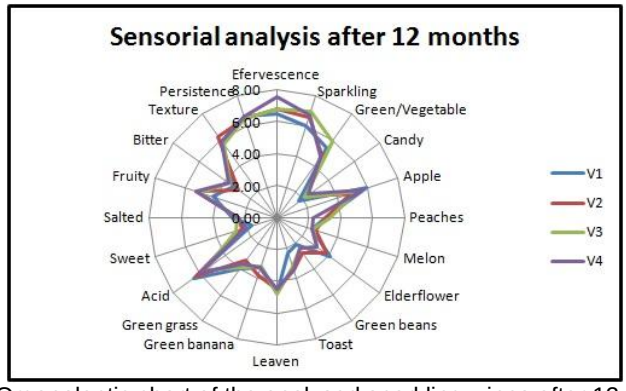

Fig. 2 Organoleptic chart of the analysed sparkling wines after 12 months

Concerning the samples treated with different types of yeasts the sample treated with IOC-18 2007 yeast revealed higher persistence and acidity and the sparkling phenomenon and the texture was better distinguished.

The sample V2 treated with IOC DIVINE yeast expressed better the fruity flavors and the sample V4 treated with LEVULIA CRISTAL yeast revealed more intense apple flavors and leaven flavors.

After twelve months another organoleptic chart was develloped with notable differences by comparison with the sensorial analysis obtained at six months. So, it can be observed from figure 2 that the effervescence and the sparkling phenomenon were better expressed.

The acidity level of the samples maintained constant and the green-vegetable flavors developed more. For V2, the texture was more elaborated after twelve months and the fruity flavors were better expressed. Nevertheless, for the same sample, the persistence and the effervescence suffered an important decrease.

CONCLUSIONS

1. Following the results of the physico-chemical characteristics, the considered samples could be included in the category of 'brut'sparkling wines.

2. The use of specific yeasts influenced the physico-chemical features especially the alcoholic strength (%).

3. Concerning the influence of the yeasts on the sensorial features of the wine samples important differences were observed. So, the employment of yeast determined the increase of the persistence, of the effervescence and the occurrence of the sparkling phenomenon.

4. The aging process influenced positively the sensorial profile of the samples by the development of the green-vegetable and the fruitiness flavor.

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