

Valorisation of hybrid grape variety into processing of red sparkling wine

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Abstract

Red sparkling wine was obtained in the Winery pilot plant of the Faculty of Food Science and Technology within UASMV Cluj-Napoca. The base wine has been produced from a hybrid grape variety and one local grape variety – Fetească neagră. The technology used for obtaining the product has been adapted by the *méthode champenoise* - natural fermentation in bottle. Research focused the obtaining of a value added product derived after the blending of a hybrid red grape variety must with Feteasca neagra grape must. Quality assessment has been carried out on the entire technological flow, through monitoring of the fermentative process, completing the assessment of the quality of the sparkling wine. It was established a way of valorising the hybrid grape must – having low alcohol content, unsuitable for quality wine making - into a value added product, still keeping the local character.

Keywords: Feteasca Neagra (Black Maiden), hybrid grapes variety, yeast starter culture.

1. Introduction

Sparkling wine produced by traditional method – fermentation in bottle *méthode champenoise* - has carbon dioxide of exclusive endogenous origin, obtained by the secondary fermentation of base wine or by natural fermentation of fresh grapes that develop inside the bottle, as final product, a minimum pressure of 3 bars at 20°C. When opening the bottles and pouring, the sparkling wine produces a strong effervescence and long recess due to carbon dioxide in the form of fine bubbles, producing an abundant foam that continuously restores at the surface of glass wine [1,2].

The most appreciated method for the obtaining of sparkling wine is the traditional method (*méthode champenoise*) - bottle fermentation of wine, which was also proved to have the highest volatile compound concentration [3].

Second fermentation of base wine is followed by ageing process in contact with yeast cells (lees), which autolyze while ethanol and carbon dioxide are formed in bottles (Fig.1).

Lees releases different aroma compounds responsible for the organoleptic properties of the wine [4]. The second fermentation begins after the bottling of base wine and the addition of the amount of *liqueur de tirage*, composed of sucrose and a significant concentration of yeast capable to referment the mixture, in order to produce the right CO₂ level in bottle. The active dried yeast available on the market should be able to ferment wines with high acidity, low pH, and high ethanol content and under carbon dioxide pressure [5].

As demonstrated by [6], red wines and hybrid grape wines have similar composition, especially in terms of polyphenols content, which are of great value for

producing wines with an alternative source of bioactive compounds. In Brasil, for example, the valorisation of hybrid grapes into sparkling wines gains more and more interest, due to their typical aroma and flavor [7].

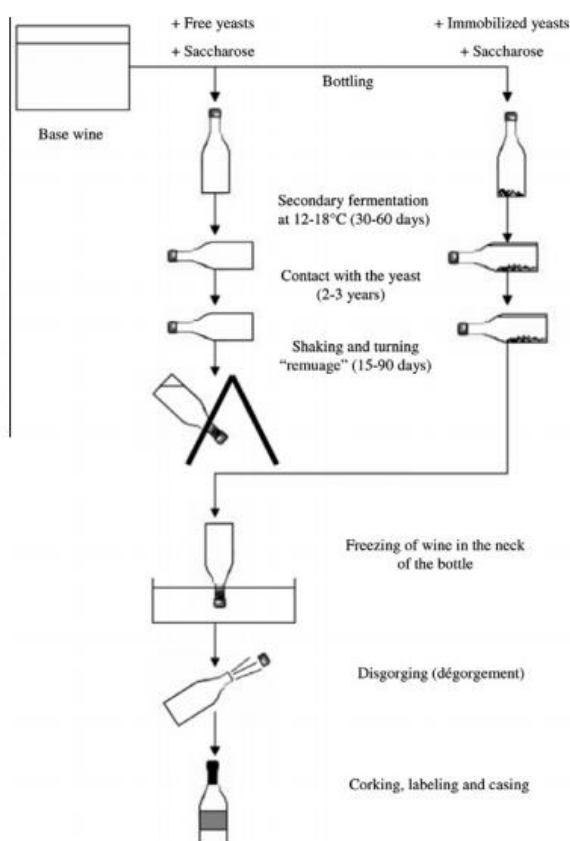


Figura 1. Process scheme for sparkling wine by traditional method and with immobilised yeast [2]

Differentiated products linked to local identity is becoming of stroger interest in Europe in all segments of food industry. Within this specific niche market, consumers are more interested of traditional, table wines with higher valorisation. In parallel, research is focusing the increasing productive hybrids for winemaking, addapted to changeable climate and considering higher polyphneols, increased level of sugar content and high producing capacity.

The main objectives were the establishment and optimisation of the process for red sparkling wine production, analysis of base wine, the monitoring of the second fermentation of red sparkling wine and evaluation of the quality of final product.

2. Material and methods

Sampling. The biological material used in this research consisted on Feteasca Neagra red grapes autochthonous to Romania and hybrid red grapes variety (2015 production year) cultivated in the vineyard of University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, respectively. The red sparkling wine was obtained in the Winery Pilot Station of the University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Romania. The blending musts was in ratio 30% v/v Feteasca neagra grape must and 70% v/v hybrid grape must.

Production of red sparkling wine. Both grapes varieties were evaluated qualitatively and quantitatively, and were introduced in production line. The grapes were declustered and crushed, then were transferred to maceration tank. Classical maceration was conducted over a period of 9 days at a temperature of 15-17°C. At the end of this operation, pomace was subjected to pressing in a pneumatic press De Franceschi mo 20 capacity 20 hL (Italy) and obtained must was then transferred to the fermentation tank. Here was inoculated with *Saccharomyces cerevisiae* yeast starter cultures Prime 10 (Essedielle, Italy), at a dose of 25 g/hL. Alcoholic fermentation took place at temperatures of 15-17°C. When fermentation ended, was prepared the *liqueur de tirage* (500 g/L sugar content) 10 % v/v. Clarifying agent used was bentonite. Yeast starter culture *Saccharomyces Cerevisiae* sp. *Bayanus* Vinoferm® basic Bayanus (Essedielle, Italy), at dosage of 20 g/hL was used for the second fermentation of base wine. This process lasted for 6 weeks at 12°C. After the remuage and *dégorgement* procedures, sparkling wine was stored at 15 °C before analyzing.

Fermentation monitoring. The process was assessed considering fermentation parameters by using a Fermentostar analyzer (Funke Gerber, Germany) [8].

Analysis on the final product. Ethanol content was monitored by ebulliometry using a Dujardin-Salleron ebulliometer (Dujardin-Salleron Laboratories, Arcueil, France) and sugar content, by Schoorl method. For pH measurement was utilized a pH meter type pH 315i (WTW GmbH, Weilheim, Germany).

Total acidity and total dry extract were also analyzed by common analytical methods [8]. All the analyses were performed in triplicate and the mean value was considered.

3. Results and Discussion

Analyses made on raw grapes revealed a sugar content of 162 g/L and 230 g/L for hybrid (HB) and Feteasca neagra grapes (FN), respectively. Total acidity determined for the blended must was of 5,212 g/L tartaric acid (Table 1).

Table 1. Chemical parameters determined on raw materials – hybrid and Feteasca neagra grapes

	Hybrid grape juice	Feteasca neagra grape juice
Sugar content, g/L	162	230
Total acidity, g/L tartaric acid	5,212	

Alcohol content of the blended must at the end of maceration fermentation was of 10,5 % vol. alc. The higher sugar content of grapes, the higher alcohol content wine will have. Usually, maceration-fermentation of grapes is in the presence of spontaneous microflora, which gave also its character to wine, in terms of specific bouquet formed by certain volatile compounds [9, 10]. Recent studies proved that grapes spontaneous microflora is not important only technologically, but as an indicator of wine authenticity, too [11], contributing to its unicity and specificity of wine's region of provenience. Still, some studies reflected that spontaneous microflora can damage the action of selected yeast, and some treatments, such as thermal treatment applied to must in order not to rival with selected yeast [12].

Ethanol content measured ebulliometrically registered 10,85 % vol. alc. and 12,3 % vol. alc., for base wine, after the first fermentation, and red sparkling wine at the final second fermentation, respectively. Value for pH measured for red sparkling wine was 3,78.

Sparkling wine had a total acidity of 4,687 expressed as g/l tartaric acid, similar to other values reported in red wine [13]. Total acidity of wine is an essential parameter for quality assuring of wine [14], knowing that alcohol and tanins are responsible of longer storage and ageing of wine.

Sugar content of red sparkling wine was of 23 g/L, which can be classified as dry.

4. Conclusion

Researches focused the blending of two grape juices - hybrid red grape variety and *Feteasca neagra* grape must - for the producing of a red sparkling wine, after *champenoise* method. It was established a way of valorising the hybrid grape must – having low alcohol content, unsuitable for quality wine making - into a value added product, still keeping the local character. Research focused both the fermentative processes in term of chemical parameters monitoring and the evaluation of the final product. In our knowledge, this is the first study where proposed this alternative for local hybrid grapes valorising.

Compliance with Ethics Requirements. Authors declare that they respect the journal's ethics requirements. Authors declare that they have no conflict of interest and all procedures involving human / or animal subjects (if exist) respect the specific regulation and standards.

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