Fermentation of Aromatized Wine-Based Beverage with *Sambucus nigra* L. Syrup

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**ABSTRACT**

The sparkling wine based beverage with elderflower (*Sambucus nigra* L.) syrup presented improved sensorial characteristics. White wine used was Fetească regală variety, obtained in Micro winery of University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca. Elderflower syrup was prepared without thermal treatment, but was pasteurised before its addition to wine. Elderflower have many health benefits, such as diuretic, diaphoretic, or antioxidant activity. In this study it was used elderflower syrup both to improve the product’s sensorial properties, and for their multiple benefits to health. The sparkling wine based beverage with elderflower syrup was produced by fermentation in the bottle (after Champenoise method), with the addition of wine yeast. The novelty brought by this paper is the use of elderflower syrup in alcoholic-beverage industry.

**Keywords:** elderflower, *Sambucus nigra* L., Fetească regală, Champenoise method.

**INTRODUCTION**

 Romanian wines are increasingly appreciated lately. Several studies reported the autochthonous to Romania wines varieties and their by-products having beneficial effects to human health (Banc *et al*., 2014; Chedea *et al*., 2011; Coldea *et al*., 2014; Coldea and Mudura, 2015; Geana *et al*., 2014; Moldovan *et al*., 2015; Pop *et al*., 2015; Schmutzer *et al*., 2012; Vârva *et al*., 2015). International Organization of Vine and Wine (OIV) reported in 2014 an increased interest for aromatized wine-based beverages. According to OIV, wine-based beverages are drinks obtained from wine, with a possible addition of aromatisation, sweetening and colouring products. The characteristic ethanol content ranges between 3.5 % and 14.5 %. Addition of ethanol is not allowed. The minimum wine content in the final product must be of 50 %. When selling the product, it is not permitted to use the word wine; this must be replaced. The variety of these products is huge, both in terms of taste and quality. Producers already are selling wine-based creams, similar products to whisky liqueurs.

Different kinds of flavouring methods are used as ingredients in this category of beverages. Fruits or flower syrup are also added. Elderflower (*Sambucus nigra* L.) syrup is very appreciated by consumers due to its pleasant aroma and health benefits. Bud tree syrup has also many beneficial properties to health acting against bronchitis and anaemia. Fruit syrup represents traditional non-alcoholic beverage prepared in the area of Transylvania. Forest fruits, strawberries or sour cherries are often used to prepare fruit syrup. Lately, the properties of sea buckthorn syrup are increasingly appreciated.

Commercially, different kinds of aromatized wine-based beverages are available (Giga *et al*., 2011). Sangria is a drink usually produced in Spain or Portugal. It is obtained from wine, and can be flavoured by the addition of extracts or natural essences of citrus, with or without the juice of such fruit and with the possible addition of spices,
sweetened, with added CO₂. Ethanol content of these beverages exceeds 12% vol. This beverage may contain solid particles of citrus pulp or peel. No addition of colourings is allowed. Sangria is usually prepared from red wine, but the variant with white wine is also appreciated. Different wine varieties are used to prepare sangria, such as: Cabernet Sauvignon, Shiraz, Merlot, or even French wines - Beaujolais or Gamay, Italian - Lambrusco, Dolcetto, Freisa. Zurracapote, is another famous Spanish beverage, similar to Sangria. Kalte Ente is an aromatized base-wine beverage obtained from the blending of wine, petulant wine with or without carbon dioxide, with sparkling wine and natural citrus flavouring. The minimum sparkling wine contribution to the final product must be of 25%. Aperol spritz is a blending between sparkling wine and a traditional beverage originated from the Northern Italy. It has an ethanol content of 12% vol, and as ingredients are orange, gentian and rhubarb. Taste of this drink is bittersweet, similar to Campari. Fragolino is a base-wine beverage aromatized with strawberries. Passion fruit beverage was obtained from natural fermentation with the addition of tropical fruits juice. Colour is opalescent, orange, and similar to the colour of fruit from which was obtained, strong flavour and tastes similar to passion fruit.

Present research aimed the assessment of the first fermentation of Feteasca regala white wine variety, in order to be used as base wine in the production process of an aromatized fermented beverage with elderflower syrup.

MATERIALS AND METHODS

Sampling

For the production of this type of wine were used the following materials: base wine, wine yeast, the clarifying agent and elderflower syrup, obtained after a traditional method.

Elderflowers were subjected to cold maceration in water for 24 hours. For each litre of water, 1 kg of sugar was added followed by mixing until complete dissolution of the crystal sugar in water. Elderflower syrup was pasteurized and stored at refrigeration temperature until its addition in the technological process. Their dosages were two variants of 100 mL/bottle (AF100), and 200 mL/bottle (AF200), respectively.

The clarifying agent was bentonite, which was prepared in advance of 24 hours before performing the liqueur de tirag.

White grapes of autochthonous Feteasca regala variety received for base wine, were evaluated qualitatively and quantitatively. Raw material was analyzed regarding their health, total acidity, and sugar content. White grapes were declustered and crushed, then were pressed in a bladder press. The must obtained was then transferred to the fermentation tank. Here was inoculated with Saccharomyces cerevisiae yeast starter cultures Prime 10 (Essedielle, Italy), at a dose of 20 g/hL. Alcoholic fermentation took place at temperatures of 14-17°C for 3 weeks. Stabilization operations consisted of cold stabilization and two types of filtration - alluvial (using kieselguhr) and with the filter plates. White wine was then stored at 15°C in order to be used as base wine. Base wine used was autochthonous white wine Fetească regală variety produced in the Micro winery of the University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca.

Dosage of the wine yeast - Saccharomyces cerevisiae Prim 10 (Essedielle, Italy) consisted in an amount of 20 g/hL in the primary fermentation, and 0.3 g/bottle (750 mL capacity) (REG. 1622/2000) in the secondary fermentation, respectively.

Technology for producing bottle-fermented sparkling wine implies the following two stages: base wine production (as raw material wine) and sparkling wine production itself (Fig. 1). In the present study, the final product will be called aromatized fermented wine-based beverage (AF).

Monitoring the fermentation process

Microbiological analysis. The yeast cell number was analyzed by using the Thoma camera. Yeast viability was assessed according to standardized method, using methylene blue solution.

Fermentation monitoring. The process of fermentation was assessed by the ethyl alcohol content, original proof extract, relative density and temperature according to the methods developed in our previous studies (Coldea et al., 2014; Moldovan et al., 2015).

Physicochemical analysis

Total acidity, total dry extract, ethyl alcohol content and pH were investigated on both variants AF100 and AF200. There were used common standardized methods.

Senzorial analysis

Hedonic test with 19 untrained participants was applied for senzorial analysis of both variants AF100 and AF200.
RESULTS AND DISCUSSION

Table 1 presents the results obtained for the analysis of the Feteasca regala grapes.

The fermentation process (first fermentation) was daily monitored for 21 days considering ethanol content, total acidity, pH, total extract, relative density and must temperature (Tab. 2).

The number of yeast cells and the degree of fermentation are two analytical parameters directly correlated. Due to the multiplying yeast \(1.6 \times 10^6\) viable cells in first day of fermentation (spontaneous yeast cells) at 154.3 \( \times 10^6\) in day 15, the degree of fermentation reaches its high level of 92.38\% indicating that almost all of the sugars contained in the must were transformed by yeast cells into ethyl alcohol. The fermentation was conducted at 13oC. At the end of this process, white wine was subjected to filtration. This process influenced the ethanol content of the product.

Before continuing the second fermentation process of aromatized beverage with elderflower syrup, several parameters were evaluated (Table 3).

Two experimental batches, AF100 and AF200, were evaluated after 30, and 60 days after the addition of liqueur d’expédition (Table 4).

Sensory analysis was developed on both samples AF100 (coloured in blue) and AF200 (coloured in red) (Figure 1-2) at 60 days after the addition of liqueur d’expédition. Hedonic test involved the grading with 1 to 9 marks, where 1 represented “extremely unpleasant” and 9 meant “extremely pleasant”. As it can be observed, AF100 was more appreciated by consumers to test AF200, especially in terms of taste and aroma. Significant differences were seen regarding the aspect, smell, colour and clarity.

Considering the general acceptance of the product, sample AF100 recorded on hedonic scale, 8.15 points, and AF200, 6.89, respectively.

### Tab. 1. Sugar content and total acidity of Feteasca regala grapes

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values obtained for the raw material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar content, g/L</td>
<td>210</td>
</tr>
<tr>
<td>Total acidity, g H(_2)SO(_4) / L</td>
<td>3.7</td>
</tr>
</tbody>
</table>

### Tab. 3. Quality parameters of the base wine

<table>
<thead>
<tr>
<th>Analized parameter</th>
<th>Obtained value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total acidity, g/L H(_2)SO(_4)</td>
<td>2.98</td>
</tr>
<tr>
<td>Ethanol content, % vol. alc.</td>
<td>11.9</td>
</tr>
<tr>
<td>pH</td>
<td>3.22</td>
</tr>
<tr>
<td>Total dry extract, g/L</td>
<td>15.2</td>
</tr>
</tbody>
</table>

### Fig. 1. Process flow diagram of the aromatized fermented wine-based beverage
CONCLUSION

The reasons considered for using the elderflower syrup were both to improve the sensorial properties and benefits on the human body due to the high content in valuable bioactive compounds derived from elderflower. Evaluation of quality parameters of the finished product was achieved considering the analysis of chemical parameters monitored in the fermentation process and on the final product. Sensorial analysis was also performed in order to assess the consumer’s acceptance.

REFERENCES


Tab. 4 Evaluation of ethanol content, total acidity, total dry extract and pH at 30 and 60 days after the addition of liqueur d’expédition

<table>
<thead>
<tr>
<th>Analized parameter</th>
<th>30 days AF100</th>
<th>30 days AF200</th>
<th>60 days AF100</th>
<th>60 days AF200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethanol content, % vol. alc.</td>
<td>11,17</td>
<td>13,25</td>
<td>14,37</td>
<td>18,06</td>
</tr>
<tr>
<td>Total acidity, g/L H₂SO₄</td>
<td>2,940</td>
<td>2,744</td>
<td>3,822</td>
<td>3,528</td>
</tr>
<tr>
<td>pH</td>
<td>3,69</td>
<td>3,60</td>
<td>3,59</td>
<td>3,47</td>
</tr>
<tr>
<td>Total dry extract, %</td>
<td>4,6</td>
<td>4,4</td>
<td>4,9</td>
<td>4,6</td>
</tr>
</tbody>
</table>

Fig. 1 Hedonic scale in 9 point - sensorial characteristics analyzed

Fig. 2. Acceptance using the 9 points hedonic scale