ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES OF WINE PRODUCED TRADITIONALLY IN THE SOUTHEAST ALBANIA

Amilda BALLATA and Jonida CANAJ
Department of Industrial Chemistry, Faculty Natural Sciences,
University of Tirana, Albania

ABSTRACT
Variety, composition and treatment of grapes, along with wine production technology, fermentation process, wine must treatments, sulfidation, etc.,—all impacting the physico-chemical characteristics of wine. Consequently, different wines have different characteristics. The present paper assesses the physico-chemical parameters of traditionally produced wine. Samples were collected from the final packed product provided by the canteen in the southeast Albania and compared with the national standards. For commercial reasons, the name of canteen is not mentioned. The densitometry method was applied for the wine density. The Gibertini distiller expressed in v / v was used for the alcohol content. The method of determining the specific mass (direct method) expressed to gr / l was applied for the total extract. The blue bromothymol expressed in gr / l ac tartaric was used for the total titrated acidity, free sulfur dioxide and the total sulfur dioxide. Laboratory investigation was carried out at the Customs Laboratory in Tirana, Albania. Results reported that all the physico-chemical parameters were within the permissible limits and, could be considered of good quality.
***Keywords*:** total sulfur dioxide SO_2, red wine, white wine, alcoholic degree

1. INTRODUCTION

Wine is an alcoholic beverage obtained by the complete or partial alcoholic fermentation of fresh grapes or wine must. Wine consists of a large number of organic or inorganic compounds, some of which are present in the wine must, while some others decrease or increase during fermentation. As the physico-chemical characteristics of wine depend on many external and internal factors such as variety, composition, treatment of grapes, wine production technology, fermentation process, wine must treatments, sulfidation, etc., different wines appear to have different characteristics (Grainger and Tattersall 2005; Burns and Osborne 2013). The samples were collected from white and red wines produced in the traditional way for

personal use from grape varieties in the hilly area, southeast Albania (Muscat, Tokay and Tempranillo, etc.). Thus, our study focused on the evaluation of the physic-chemical parameters to see if these parameters comply with the standard used in the Albania Republic State and if these wines can be used. Based on the study of these characteristics we can obtain a database of physic-chemical characteristics and information about the method of production, applied techniques, packaging and storage conditions. Ethyl alcohol is the ingredient in the largest amount, its content is directly related to the amount of sugar must, from which it is related and the fermenting power of yeast (Burns and Osborne 2013). It is a very good solvent for aromatic substances and contributes to the aroma of wine. Ethyl alcohol has an important role in the preservation of wine from pathogenic microorganisms. Tartaric acid is resistant to bacterial activity, but some lactic acid bacteria can react with tartaric acid, to form acetic acid and lactic acid. In this case, the wine loses its fixed acidity. Sulphite components have antiseptic, selective, and acidifying properties, when preventing the microorganisms that cause the breakdown of malic and tartaric acid from development. In addition, they have clarifying properties when allowing the rapid clearing of cider, antioxidant properties, protects wine must and wine from oxidation, solvent properties help in the digestion of substances, found in the skin of grains (Standartet Shtetërore 1982). Wine acidity is one of the important qualitative indicators. Wine characteristics depend on grapes composition (The free encyclopedia of wine and winemaking).

2. MATERIAL AND METHODS

Description of the sample

Representing the final product, the samples were collected from white and red wine bottles— 4 bottles per each, respectively. White and red wine were synchronously produced in the southeast hilly area in Albania.

Methods

The present paper investigates the physico-chemical characteristics of wine produced for domestic use, and the results are compared to the national standards. Laboratory investigation was carried out at the Customs laboratory, Tirana. the remainder of this subchapter describes the physic-chemical parameters investigated and the methods applied per each parameter. Wine samples were taken to laboratory using a chemical glass 500 ml. The Anton Paar DM 500 densitometry was used for the wine density at 20^0C after immersing the probe in the glass. Determination of total sulfur dioxide (SO_2) is carried out in a100 ml flask where 25 ml NaOH 1 N and 50 ml of wine are added. The balloon is allowed to rest for 15 minutes to release the anhydride

that is bound. Once is released, the anhydride is treated with 10 ml sulfuric acid (H_2SO_4) and 1 gram of starch. Once treated with H_2SO_4 and 1 gram of starch, it is placed in an electric blender to titrate with 0.02N Iodine solution. The free sulfuric anhydride is determined as following: 50 ml of wine sample is added to a chemical glass 250 ml and treated with 3 ml of H_2SO_4 (1: 4) and 1 gram of starch. Once treated, it gets titrated with Iodine N / 50 solution. Ethyl alcohol is determined based on the distillation wine method in the D.E.E Gibertini apparatus. 100 ml of wine sample is measured in the tarred flask of the apparatus which is placed in the bath at 20^0C for about 30 minutes. Once placed for 30 min. it is transferred to the distillation apparatus flask (after making sure that the discharge tap is completely closed). The tarred balloon is washed several times with distilled water (about 40 ml in total). Once washed, 5-10 drops of anti-foam and 5-10 drops of 2M lime solution are added in the distillation balloon. 2 ml of distilled water are added to the same flask which is placed in the same side where the distillate is taken. If 80% of the distillate is obtained, distillation process is automatically stopped. A quantity of distilled water not up to the mark is here subsequently added. The balloon is placed back in the bath at 20^0C for about 30 minutes. It is then brought finally it to the mark with distilled water and stirred prior to the measurement with the Anton Paar DMA 500M densitometer. The total acidity determined based on the neutralization of the sample with 1N sodium hydroxide solution in the presence of blue indicator thymol bromide. To this is added 10 ml of wine, 50 ml of distilled water and 0.5 ml of blue thymol bromide to an electric blender. It is then titrated with 0,1N sodium hydroxide until clear blue (with a single dot). The determination of the total extract is based on the determination of the specific mass of residue after distillation, carried to the initial volume with distilled water. 100 ml of wine is taken in a flask which is placed in the water bath until 20 ^{0}C is reached for about 30 minutes. The flask content is placed in a distillation flask which is filled with distilled water up to 1/3 of the flask. The balloon is montaged in the manual distillation apparatus which is switched on to allow the water enter in order to obtain 80-90 ml distillates. The distillation residue obtained after cooling is carefully poured into a 100 ml tarred flask, the distillation flask is rinsed several times with water and thrown into the same tarred flask, tossed with water at a temperature of 20^0C, mixed to homogenize and set specific mass of liquid in DMA densitometer 500 M Ant on Paar.

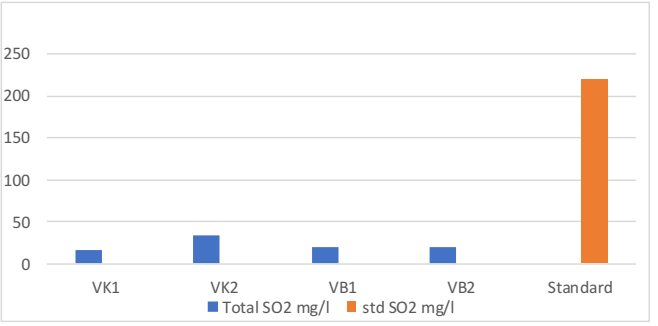
3. RESULTS

The Tables 1-4 provide the information about the physico-chemical parameters of wine, while the Graphs compare these data to the National

Standards (Standartet Shtetërore-1982). As it could be noted the parameters are within permissible data.

Table 1. Total sulfur dioxide mg/l results of red and white wine compared to standard.

Sample	Total SO_2 mg/l	Total SO_2 mg/l Standard
VK1	15.36	
VK2	33.2	
VB1	19.96	
VB2	20.03	
		Not more than 220 mg/l

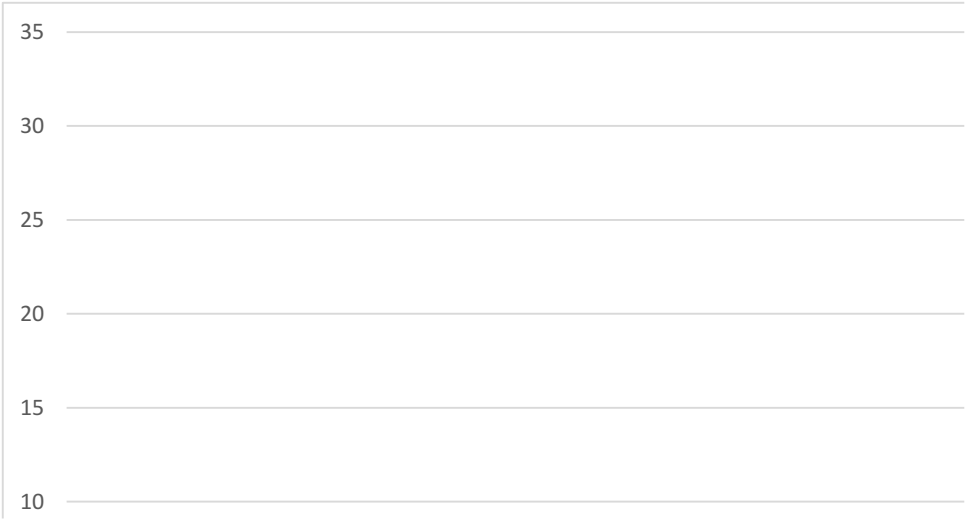


Graph.1. Total sulfur dioxide mg/l results of red and white wine compared to standard.

The Graph. 1 plots the values of total sulfur dioxide (SO_2) of the red and white wine varying 15.36-33.2 mg / l and 19.96-20.03 mg / l, respectively. The total values of sulfur dioxide (SO_2) for the analyzed wine samples vary from 15.36 to 20.03 mg / l, i.e., within the permissible values (not more than 220 mg / l).

Table 2. Free sulfur dioxide (SO_2) mg/l results of red and white wine compared to standard.

Sample	Free SO_2 mg/l	Free SO_2 mg/l Standard
VK1	5.76	
VK2	6.4	
VB1	7.89	
VB2	7.96	
		Not more than 30

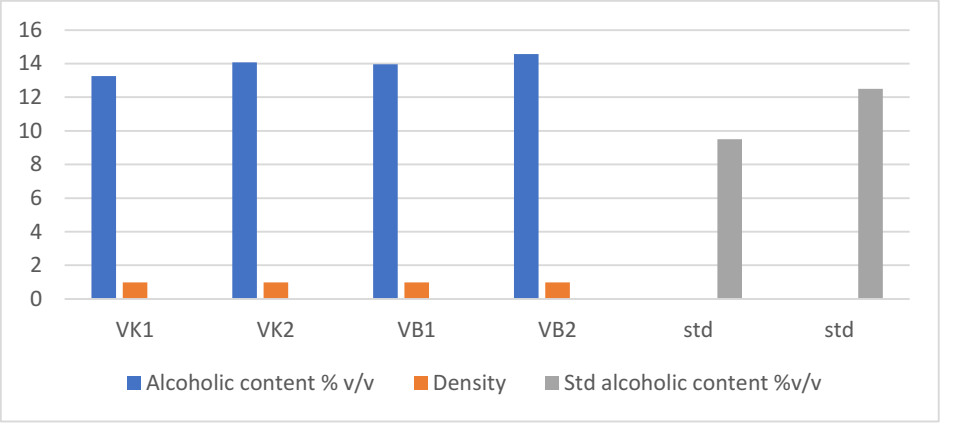


Graph. 2. Free sulfur dioxide mg/l results of red and white wine compared to standard.

The Graph. 2 plots the values of free sulfur dioxide (SO_2) varying from 5.76-6.4 mg /l and 7.89-7.96 mg /l for the red and white wine, respectively, i.e., within permissible limits.

Table 3. Alcoholic content %v/v and density results of red and white wine.

Sample	Alcoholic content % v/v	Density
VK1	13.26	0.9979950
VK2	14.08	0.980012
VB1	13.964	0.975220
VB2	14.562	0.977511

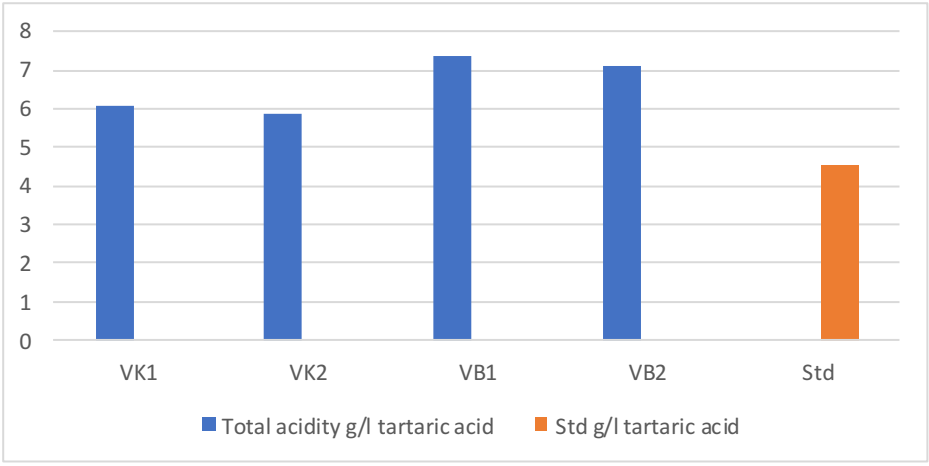


Graph. 3. Alcoholic content %v/v and density results of red and white wine.

In general, for all samples the results of the alcohol content are within the standard 9.5-12.5% v / v. Alcoholic content values in red wine vary from 13.26-14.08% v / v, in white wine vary from 13.964-14.562% v / v. Density is an indicator of fermentation performance. Density in red wine varies from 0.97990-0.980012. In white wine it varies from 0.975220-0.977511.

Table 4. Total acidity g/l results of red and white wine compared to standard.

Sample	Total acidity g/l tartaric acid	Total acidity g/l tartaric acid Standard
VK1	6.075	
VK2	5.853	
VB1	7.364	
VB2	7.100	
		Not less than 4.5

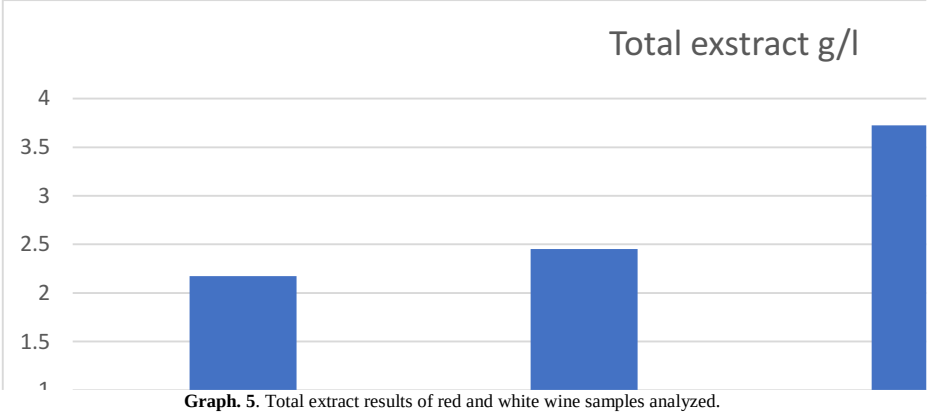


Graphic 4. Total acidity g/l results of red and white wine compared to standard.

Results report that the level of total acidity is within permissible limits. In red wine it ranges from 5.853-6.075 g / l tartaric acid. In white wine it varies from 7.100 to 7.364 g / l tartaric acid.

Table 5. Total extract results of red and white wine samples analyzed compared to standard.

Sample	Total extract g/l
VK1	2.173
VK2	2.452
VB1	3.725
VB2	2.998



Graph. 5. Total extract results of red and white wine samples analyzed.
The extract values appear to be 2.173-2.452 g/l and 2.998- 3.725 for the red and white wine, respectively g/l.

4. CONCLUSIONS

The following conclusions could be drawn:

The density varies from 0.975220-0.980012 showing a whole fermentation process.

Alcoholic content for the analyzed wine samples ranges from 13.26-14.562% v / v, which is within permissible limits as based on the national standards.

The total acidity values range from 5.853- 7.100 g /l tartaric acid —within the national standard values (not less than 4.5g /l) —proving their unmodified content and being undiluted with water.

The values of free sulfur gas vary from 5.76 to 7.96 mg / l, which are within the standard values (not more than 30 mg / l).

The total SO_2 for the analyzed wine samples results to be within permissible limits, preventing wine from oxidation and bacterial diseases (spoilage by bacteria). The values of total sulfur dioxide vary from 15.36-20.03mg /l (not more than 220mg /l).

The general extract is a specific indicator of grape cultivation and shows the content of organic matter of grapes and the wine produced from contain. The content of the extract is also related to the agrotechnics used for grape cultivation and the type of pruning that significantly affects the structure of the wine obtained. The total extract ranges from 2.173 to 3.725 g /l, proving that both red and white wine are naturally produced.

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