

STUDY OF THE USE OF GELATINE TO FIX WINE LIMPIDITY

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Abstract: *Limpidity is one of the essential characteristics of wine quality regardless of type, quality or its colour. For this reason wine degradation makes it unfit for consumption. To overcome this impediment a study about how to fix this flaw and to find the most effective and non-invasive method is necessary. Thus, the present work presents the method of remedying the defect of wine limpidity using gelatine as working method. Gelatine is a natural substance obtained by extracting collagen from raw material of animal origin. Due to its properties, gelatine can be successfully used during the operation of wine clarification, immediately after the fermentation in order to fix wine limpidity, a flaw which occurs during storage.*

Key words: *gelatine, limpidity, wine.*

1. Introduction

Since ancient times, wine was considered a divine gift, a miraculous liqueur, being an ongoing source of inspiration for artists and literati and still being a mystery not totally discovered by oenologists [1].

Wine fascinates by its complexity and its versatility, being basically one of those subtle elements present in sideline but with a major contribution to the progress of civilization in all its aspects. If we don't consider this statement exaggerated and we review, we can notice that wine is present in our lives since ancient times also as elements of religious rituals and as a main mean of living, and obviously as food and drink, especially for the soul [2]. At the same time it should be noted that the wine is used as food, with beneficial effects on the body with very good results in the treatment of heart disease and for the circulatory system.

Limpidity is one of the most important indicators of wines' quality. In addition to the harmony constituents, the aroma finesse and bouquet, consumers also appreciate the attractive side of wine - perfect limpidity. Turbid wines and with an inappropriate aspect are rejected by the consumer due to the unpleasant colour, but also due to a suspected disease or defect.

Therefore, wine limpidity is a very important task that we must solve with the utmost seriousness. Wine limpidity represents the process of elimination of the amorphous mass of substances, cells and particles in colloidal state, which produce wine turbidity [3].

Wine limpidity is characterized by its freshness, strong aroma if it is young or, on the contrary, a prominent bouquet when is when the wine is old. The processes of maturation and ageing takes place normally in clear wine, thus the transformations due to micro-organisms do not take place.

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As soon as the wine clarification took place, wine can retain its quality longer and could be better exploited, and it won't be sensitive to temperature changes and the action of microorganisms [4].

In order to fix wine limpidity appeared during storage we can use mechanical methods, if the level of flaw is at the onset but if wine limpidity is in an advanced state of flaw, clarifying substances can be used, which have the role of eliminating the particles found in slurry in the wine mass. From the substances mentioned above we can use egg-white, gelatine, blood, bentonite, etc., all those having the property of forming precipitates in contact with the substances found in slurry in the wine mass.

As a result of a theoretical study of the methods of fixing the defects of wine limpidity it has been concluded that clarification by means of gelatine is one of the most effective and easy-to-use methods.

Gelatine (in the form of powder or colourless or straw yellow sheets) is a protein consisting of a string of amino acids (glycine, proline, alanine, valine, hydroxyproline) with an average molar mass of 60,000. The gelatine is obtained by extracting collagen by boiling bones, skin or cartilage [5].

Due to the fact that gelatine has little or even no effect on the flavour, it being extremely easy to use, the protein substances precipitate very quickly in its presence and generally this gelatine is very cheap, thus it became a simple method for wine clarification and easy to control by anyone.

The mechanism of wine clarification using gelatine is based on the electrostatic properties of gelatine and the molecules of protein substances found suspended in the wine mass. Thus, the gelatine molecules being loaded with positive ions attract molecules of tannins, yeast or resins, charged with negative ions. The union process is called flocculation, from this

process resulting a precipitate that is deposited at the bottom of the bowl and which can be removed by basic operations of separation, such as decantation, filtration, or ultrafiltration.

2. Material and methods

In order to perform this study five samples of wines which displayed flawed limpidity have been used.

All five samples were subjected to sensory analysis, and apart from an advanced stage of slurry for samples P3, P4, P5, an impairment of taste was also found. Samples P1 and P2 presented an early stage of flawed limpidity, and the taste was not impaired.

Besides the sensorial analysis of all samples, the alcoholic strength, density, ash content, total acidity, pH and refractive index were also determined.

In order to determine the values of the density, the alcoholic concentration and the ash content, a standard analytical method was used, and in order to determine the pH a digital pH-meter was used, and in order to determine the index of refraction, we used a portable refractometer [6]. For all the values obtained, corrections provided in the working methodology of actual standards were used.

The initial values of the specified indices are presented in Table 1.

After carrying out these analyses all five wine samples were subjected to a clarification treatment with the help of gelatine, thus we were testing the effects of adding 3 different quantities of gelatine 3 (3.5, 7.5 and 12.5 g/hl).

So that the gelatine could be used it is diluted with 1/1 cold water and it is left to melt for 15..20 minutes, after which it is heated at a temperature of 60°C. For heating we used an indirect heat source.

Gelatine prepared in this way is measured in accordance with the quantity

of wine subjected to the tests and is inserted in the wine mass which is in a continuous process of stirring, stirring that is maintained until the uniform distribution of gelatine microsample and before the precipitation process starts [7]. The limpidity process begins immediately after the gelatine is added and it can take place up to 20 days.

The sediment quantity deposits at the bottom of the bowl and it can be eliminated by decantation, filtration or ultrafiltration. In this particular case the separation was realised by taping the wine after 20 days since the gelatine had been introduced.

The initial characteristics of the wine samples submitted to wine clarification treatment by adding gelatine Table 1

Determinant parameter	Density [kg/m ³]		Alcoholic concentration [° vol]		Ash content [%]	Total acidity [g/l]		pH	Index of refraction [°Brix]
	Picnometer	Densimeter	Picnometer	Alcoholmeter		Tartaric acid	Sulphuric acid		
Sample 1	0.992	0.990	8.45	9.0	1.6	7.875	5.14	3.73	13.8
Sample 2	0.988	0.987	10.1	10	1	6.975	4.557	3.96	15.6
Sample 3	0.989	0.985	8.63	8.0	4.8	6.075	3.969	4.06	15
Sample 4	0.991	0.990	10.5	10.0	5.3	6.525	4.263	4.05	14.2
Sample 5	0.986	0.985	13.04	10.5	4.1	5.062	3.307	4.16	17.1

3. Results and discussions

At the end of the 20 days of treatment all 15 wine samples were subjected to laboratory tests and the results were recorded in Table 2.

Thus, the density of wines, the ash content, total acidity in tartaric acid and sulphuric

acid, the Ph and the content of dry substance were determined. The content value of dry substance remains constant which indicates that the clarification of wines with gelatine is a practice that does not influence the quantity of sugars in wine and the alcohol content.

The determined index values after the treatment clarification with the help of gelatine Table 2

The determined index	Density, [g/l]			Ash content, [g/l]			Total acidity of tartaric acid, [g/l]			pH-ul			Index of refraction, [°Brix]		
	3.5	7.5	12.5	3.5	7.5	12.5	3.5	7.5	12.5	3.5	7.5	12.5	3.5	7.5	12.5
The gelatine dose, [g/hl]															
sample 1	1	1	1.056	0.01	0.01	0.02	7.13	8	8.1	3.73	3.73	3.73	12.8	12.8	12.8
sample 2	1	1	1.065	0.12	0.09	0.2	5.63	6.225	6.3	3.96	3.96	3.96	18.2	18.2	18.2
sample 3	0.992	1	1.062	0.14	0.11	0.15	5.25	5.775	5.78	4.06	4.06	4.06	15.6	15.6	15.6
sample 4	1	1	1.058	0.22	0.13	0.21	5.27	6	6.1	4.05	4.05	4.05	13	13	13
sample 5	0.994	1	1.071	0.11	0.07	0.12	5.03	5.475	5.48	4.16	4.16	4.16	20.7	20.7	20.7

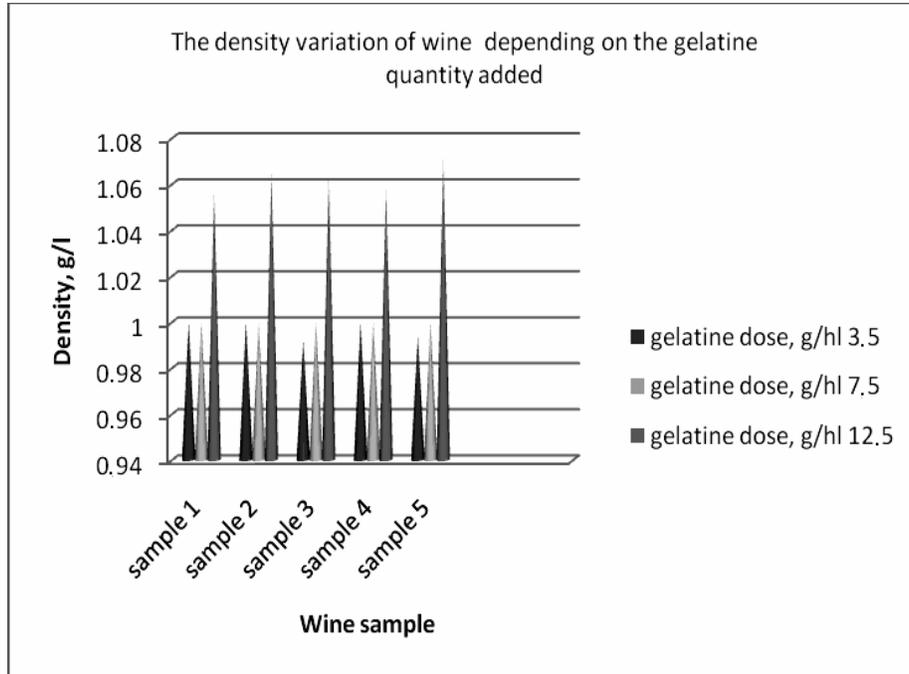


Fig. 1. *The variation density of wine samples studied according to the dose of gelatine added*

If we look at the values recorded above we notice a variation of density, of ash content and of acidity. All these are graphically interpreted in the following figures.

If we analyse the values of the obtained density after the clarification process with the specified gelatine doses, we observe according to the graphic from Figure 1, that:

- there is a slight increase of density values for all the 5 wine samples subjected to the treatment;
- when we use a dose of gelatine of 12.5 g/hl we get the maximum value of density.

An analysis of the values of ash content and their variation is represented in the

graphic from Figure 2, and we receive information on the effectiveness of the clarification operation, pointing out the fact that as a result of clarification, the ash content significantly declined compared with the initial values, which proves the fact that most of it has been removed

Comparing the values of the ash content for all samples subjected to wine clarification with gelatine, we noticed that the smallest amount of ash found in the sample of wine was clarified with 3.5 g/hl of gelatine. Thus, it may be noticed that the dose of 3 g/hl is insufficient to remove the greatest amount of protein substances.

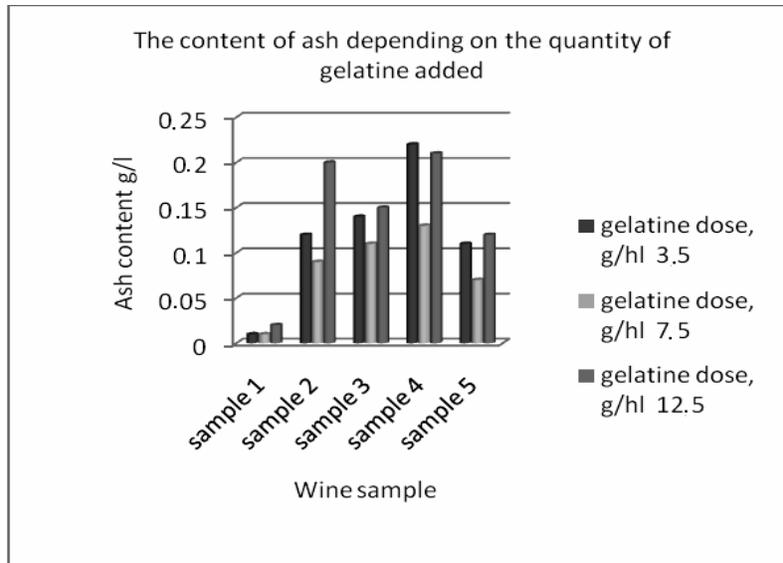


Fig. 2. The variation of the ash content from the wine samples depending on the gelatine dose added

In the graphic from Figure 3 the total acidity in tartaric acid is represented, thus we detect an increase of this, in the case the wine which was clarified with a dose of 12.5 g/hl of gelatine. In this case, mass particles found in suspension which did not

deposit even after 20 days of treatment were discovered in the wine. This phenomenon is called overclarifying and it appears due to a large amount of gelatine and a precipitation of some substances that should not be removed.

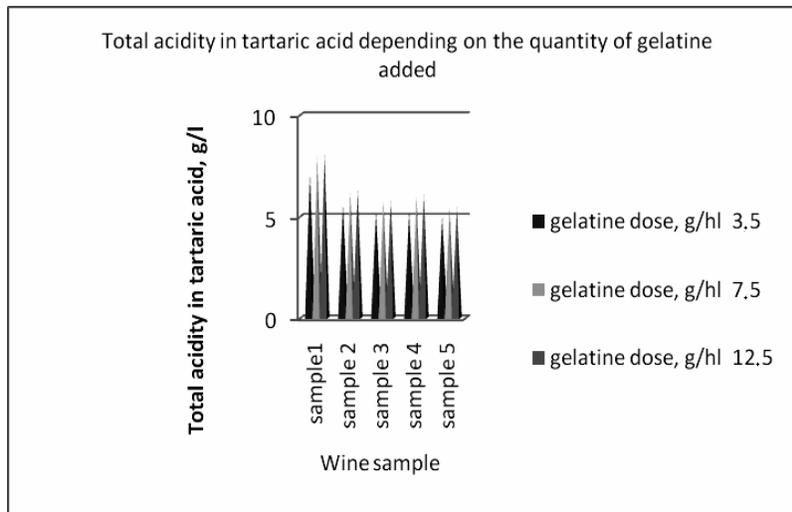


Fig. 3. The total acidity variation in tartaric acid

Overclarifying can be overcome by using natural tannins and bentonite, this method being the subject of future research.

If we follow the total acidity values in the tartaric acid, we can see that for all the five samples studied, the value obtained by a clarification with 7.5 g/hl quantity of gelatine is the closest to the standard value. Because of this it can be concluded that the optimal dose that can be used for clarification of wines with gelatine, in the present case is of 7.5 g/hl.

The wine samples were clarified with 3.5g/hl of gelatine, and at the end of the treatment they still presented a slightly greasy aspect, which denotes the fact that the gelatine dose was insufficient.

If we added a dose of 12.5 g/hl gelatine we notice that the greasy aspect dissipates, but in the wine mass we can still find, in suspension, large floaters of precipitate.

Wine samples which correspond from the organoleptic point of view (clear aspect, shiny color, pleasant flavour) are those for the clarification of which a dose of gelatine of 7.5 g/hl was used.

4. Conclusions

As a result of the present study we can draw the following conclusions:

- wine limpidity is an important property, a quality characteristic which offers to the consumer the guaranty of a superior

qualitative product, with a pleasant and distinguished color, taste and flavour;

- wine clarification with the help of gelatine is a method easy to use, with good results and with an obvious improvement of the wine;

- by using gelatine for wine clarification, the acidity is slightly corrected, and it brings wine to its initial color, and it does not influence the taste and the aroma.

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