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THE INFLUENCE OF AMINO ACIDS ON THE ALCOHOLIC FERMENTATION OF GRAPE MUST

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Abstract

In the article the role of amino acids in alcoholic fermentation of grape must was discussed. Amino acids have a great influence on the color, bouquet and taste of wine. For the experiment was taken a Georgian grape variety Rkatsiteli. One part of the grape was fermented with culture yeast IOC, the second part was fermented with spontaneous yeast, and the third part was fermented with cultured yeast, and also added amino acid B phenylalanine. Higher alcohols, aldehydes and esters in the obtained wine samples were analyzed by gas chromatography. Analysis of the results showed that the greatest number of higher alcohols was found in the sample to which amino acids were added together with cultured yeast.

Keywords: amino acid, alcoholic fermentation, higher alcohols, gas chromatography

1. INTRODUCTION

Grape must and wine have a very complex chemical composition, both inorganic and organic compounds are found in it. Some of them are often given in small quantities, but they have a great importance for the quality of grape must and wine.

In the process of alcoholic fermentation grape must have a great change. Sugar breaks down mainly into alcohol and carbon dioxide, some acids are precipitated in the form of salts, some are even newly formed, both the composition and quantity of amino acids change.

A part of amino acids is used for the production of higher alcohol, a part of pectin substances is decomposed, and the decomposition products are transferred to the wine, a part of tannins and coloring substances is oxidized and the oxidation products have a special effect on the wine [1].

The transformation of nitrogenous substances, first of all amino acids, has a great influence on the color, bouquet, taste properties of wine, determines the stability of wine against protein turbidity. If the grape must is poor in nitrogen, the yeast slows down its activity, and in such a case, ammonium salts are added to the must, which significantly increases the intensity of fermentation and the multiplication of yeasts. When all the necessary amino acids are given to the yeast, then the yeast uses the amino acid more energetically and the cell grows as much as possible. If the yeast is deficient in any amino acid, it deaminates the amino acid in the area and synthesizes the required amino acid. It is known that amino acids have a great influence on the formation of the taste and aroma of wine. During alcoholic fermentation, the amino acids in the fermentation area combine with the higher alcohols and form ethers, aldehydes, and acetals [2].

Based on the above, amino acids are very important for alcoholic fermentation and aroma formation.

Therefore, the actuality of the topic is the influence of amino acids on the alcoholic fermentation of grape must and the quality of wine.

Organic forms of nitrogen in grapes and wine are present in the form of amino acids, amides, peptides and some other nitrogenous substances [5].

About twenty amino acids of the plant world can be found in grapes. The most common in all varieties of grapes are proline and arginine. Proline is an indicator of ripeness, because its content in grapes, unlike other amino acids, increases strongly about two weeks before ripening. Aminobutyric acid is an amino acid unique to grapes [4].

The content of amino acids in grapes is different and depends on their variety, climatic conditions, place of origin, agrotechnical measures, as well as the degree of maturity and diseases. Amino acids make up about 10-25% of total nitrogen. Two sulfur-containing amino acids are found in grapes: cysteine and methionine [3].

2. THE OBJECTS AND METHODS OF STUDY

To perform experimental work, we selected the Georgian white grape variety - Rkatsiteli.

The selected grape variety was harvested in Sagarejo, from the east part of Georgia, Kakheti region. Wine was fermented without hard part of grapes.

In order to conduct the alcoholic fermentation Rkatsiteli grape must we divided into three parts:

1. One part of must we added pure yeast culture IOC;
2. Second part was fermented with spontanoues yeasts,

3. Third part was added the amino acid β phenyl α alanine together with cultured pure yeast.

3. EXPERIMENTAL PART

Grape must and wines were analyzed chemically. The results are given in the tables 1 and 2.

Table 1. Chemical composition of Rkatsiteli grape must

Parameter	Grape must of Rkatsiteli
sugars %	18,0
Titrable acidity g/l	6,2
PH	3,6

Table 2. Chemical composition of wines

Sample name	Alcohol %	Titrable acidity g/l	Volatile acidity g/l	Reducing sugars g/l	pH
Wine with spontaneous fermentation	10.2	5.4	0.52	1.35	3.5
Wine with cultural yeast fermentation	10.2	5.2	0.50	1.32	3.5
Fermentation with cultural yeast and amino acid	10.2	5.1	0.54	1.25	3.5

Table 3 presents the composition of higher alcohols, ethers and aldehydes in the study samples

Table 3. Composition of higher alcohols, ethers and aldehydes in the study samples

No.	The parameter name	Spontaneous fermentation	Fermentation with IOC	Fermentation with IOC + amino acid
1	Methyl alcohol (g/l)	0.05	0.10	0.12
2	Acetaldehyde (mg/100 cm³ a.a.)	20.1	29.4	33.4
3	Ethyl acetate (mg/100 cm³ a.a.)	19.8	22.3	25.7
4	2-butanol (mg/100 cm³ a.a.)	0.14	0.21	0.24
5	n-propanol (mg/100 cm³ a.a.)	9.1	22.7	25.4
6	Isobutanol (mg/100 cm³ a.a.)	15.2	24.3	26.2
7	1-butanol (mg/100 cm³ a.a.)	0.08	0.12	0.14
8	Isoamyl alcohol (mg/100 cm³ a.a.)	191.3	251.20	264.1

4. CONCLUSIONS

The process of sugar decomposition was not the same in each sample, as spontaneous and cultured yeast fermentation ended in 11 days. In the sample, where the amino acid was added along with the cultured yeast, the fermentation ended in nine days.

Chromatographic analyzes were performed on the research wine samples. The results of the analysis showed, that the amount of higher alcohols was different in each sample. Sample 1, which was fermented with spontaneous yeast, had relatively lower amounts of isoamyl alcohol, ethyl acetate, methanol, n-propyl alcohol, isobutyl alcohol, n-amyl alcohol than sample 2, which included cultured yeast.

The highest amount of higher alcohols was found in sample 3, to which we added amino acid together with cultured yeast. As can be seen from the results of gas chromatographic analysis, the quantitative content of aromatic components in given wine samples differs from one another.

The amount of aromatic components of the wine samples that were fermented with the addition of yeast and amino acid exceeds the aromatic components of the wine fermented with couture yeast, which allows us to conclude that the addition of amino acids became the reason for reducing the duration of wine fermentation and also for increasing the aromatic substances in the wine.

5. REFERENCES

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