

## **BIOGENIC AMINES IN OENOLOGY**

### **INTRODUCTION**

Amines are molecules characterised by the presence of trivalent nitrogen atoms linked to one or more carbon atoms (R<sub>3</sub>-NH<sub>2</sub> primary amine; R<sub>2</sub>-NH secondary amine; R<sub>3</sub>-N tertiary amine).

Biogenic amines are synthesized by microorganisms through decarboxylation of amino acids. The main biogenic amines are tiramine, histamine, putrescine and cadaverine, synthesized by the decarboxylation of the amino acids tyrosine, histidine, ornithine and lysine.

These compounds have been linked to allergic reactions to foods and beverages in sensitive individuals.

### **MICROORGANISM INVOLVED IN BIOGENIC AMINE SYNTHESIS**

It has been verified by analysis that the concentration of biogenic amines in wine at the end of the alcoholic fermentation is always quite low. This indicates that the yeasts are not involved in the biosynthesis process for these compounds.

On the other hand, biogenic amine concentrations can increase after malolactic fermentation (MLF). Wines that undergo spontaneous MLF often have higher biogenic amine concentrations than those in which the MLF is conducted by selected malolactic bacteria. During spontaneous MLF, several strains of lactic acid bacteria grow in the wine, each with a different decarboxylation capacity. When selected bacteria are used, the MLF is carried out by strains with a low decarboxylation capacity. This characteristic must be taken into account when strains of *Oenococcus oeni* are selected for winemaking.

## **CONCENTRATIONS OF BIOGENIC AMINES IN WINE**

Biogenic amines can be present in wines in various concentrations. Concentrations at 15-20 ppm are high, while concentrations lower than 2-3 ppm are unlikely to cause problems. Concentrations of 5 ppm can cause symptoms in sensitive individuals.

Characteristics of the bacteria that grow in wine cause variation in the concentration of biogenic amines. Variation in other factors also has an impact. Some of these effects are well known, while others are not fully understood.

Factors that increase the presence of biogenic amines include MLF, insufficient hygiene during the winemaking process, long lees contact time, high fermentation temperature, elevated concentration of free amino acids and high pH values.

The mechanisms of the correlation between biogenic amine formation and variations of pH and alcohol content are not clear. It is quite well known, however, that low pH inhibits amino acid transformation to amines.

Wine aging does not have any effect on biogenic amine concentration.

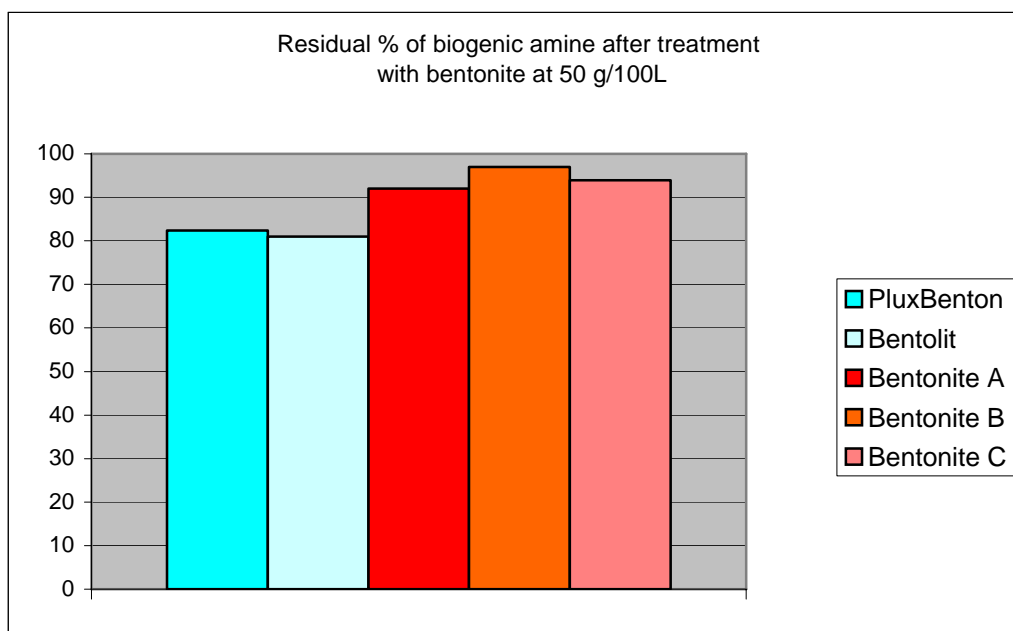
## **FIELDS OF INVESTIGATION**

Analysis of amines requires an extraction phase, followed by purification of the extract. Determination of the amine content of the extract is then carried out using inverse phase HPLC, which is considered to be the most reliable and sensitive technique.

## USEFUL METHODS FOR THE REDUCTION OF BIOGENIC AMINES IN WINE

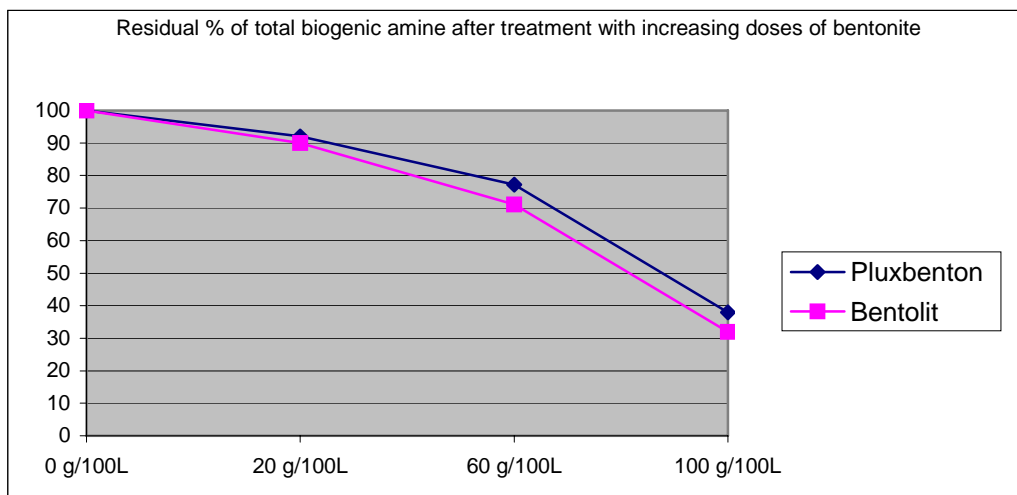
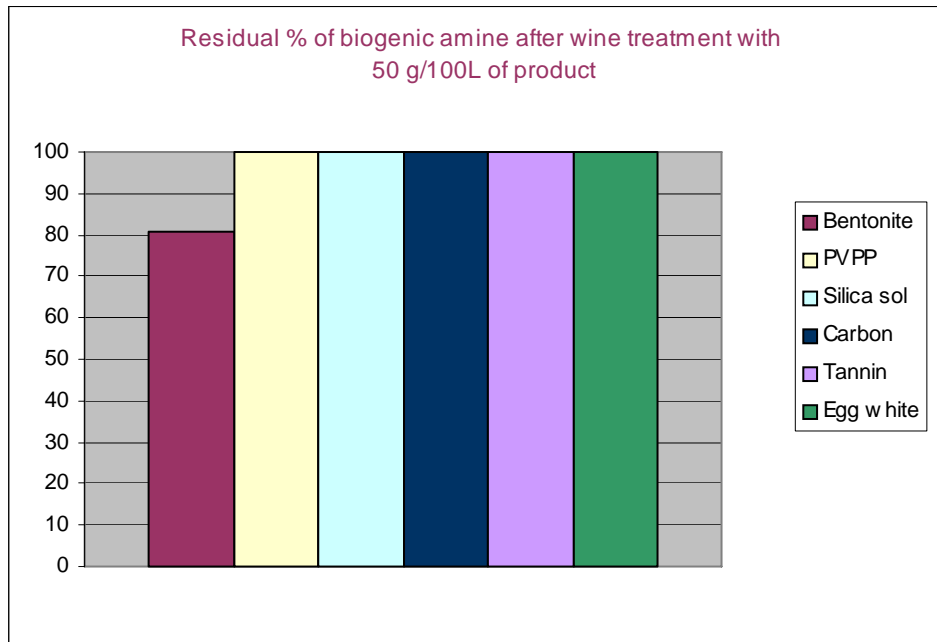
The first effective control mechanism to limit the formation of biogenic amines is selection of the strain of bacteria for MLF. As well as considering activity and organoleptic characteristics, lactic acid bacteria choice should also be made with due regard to decarboxylation capacity. When bacteria with low decarboxylation activity are used, there will be no significant difference between the biogenic amine concentration before and after MLF.

The second control mechanism is the use of winemaking materials that are able to reduce the content of biogenic amines. Through laboratory tests, Enartis has investigated the removal of biogenic amines by various clarification agents. These tests have shown that bentonite can remove biogenic amines from wine, as indicated in the following diagram.



There are differences in effectiveness between commercially available bentonites. BENTOLIT and PLUXBENTON have a greater ability to reduce the concentration of biogenic amines than some other products:

It has also been verified that removal is proportional to the dosage of bentonite:



Our sales support team is at your service to supply further details on the analysis and control of biogenic amines.

The concentration of biogenic amines is a key issue in ensuring that wines are suitable for a wide range of consumers. This study is an example of the strong interest shown by Enartis in this area, which is an activity of key strategic importance for our company.

Technical staff Enartis