AROMA ENHANCEMENT IN WHITE WINES DURING FERMENTATION AND STORAGE, DUE TO NEW ß-GLYCOSIDASE ENZYME ACTIVITIES

E. Huefner[1], M. Sobe[1], R. Amann[2], B. Roden[3]
[1]Erbsloeh Geisenheim AG, Erbsloehstrasse 1, Geisenheim D-65366, Germany
[2]Institute of Viticulture and Enology Freiburg (WBI), Merzhauserstrasse 119, 79100 Freiburg, Germany
[3]Pickering Winery Supply, 841 Jones St, San Francisco, CA 94109, USA

ERBSLÖH
Progress is our future

Introduction

A major portion of primary wine aroma compounds belong to the terpene group. They are primarily located in the grape skin as sugar-bound monoterpene precursors (glycosides). In this glycosidically bound form, they are neutral in smell, only the respective aglycone is an odorant. By enzymatic cleavage of the sugars, (monosaccharides, disaccharides) the corresponding monoterpene alcohol (such as linalool and geraniol) is liberated and becomes organoleptically ascertainable. Monoterpene alcohol and sugar residues are linked by a glycosidic bond, thus the enzymatic breakdown is carried out by ß-glycosidases. These enzymes are differentiated according to their specific activities, which depend on the type of sugar residue the terpenes are linked with (e.g. arabinose, rhamnose, apiose). In the course of this project, enzymes with new ß-glycosidase activities were evaluated. These enzymes are not inhibited by high glucose concentration and promote a significant increase in aroma release.

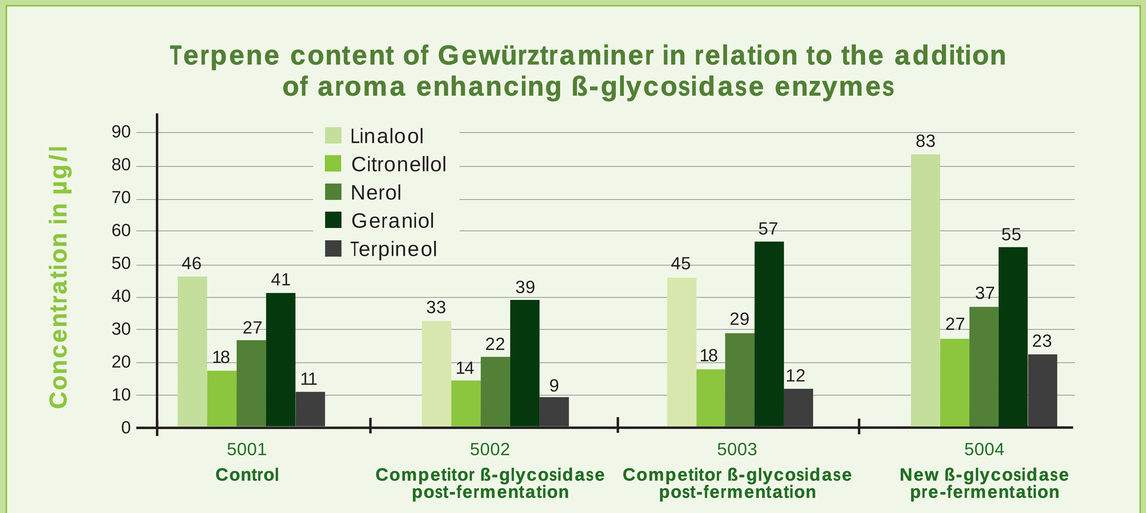

Fig. 1: *Terpene content of Gewürztraminer in relation to the addition of aroma enhancing ß-glycosidase enzymes (Federal Research Institute Freiburg)*

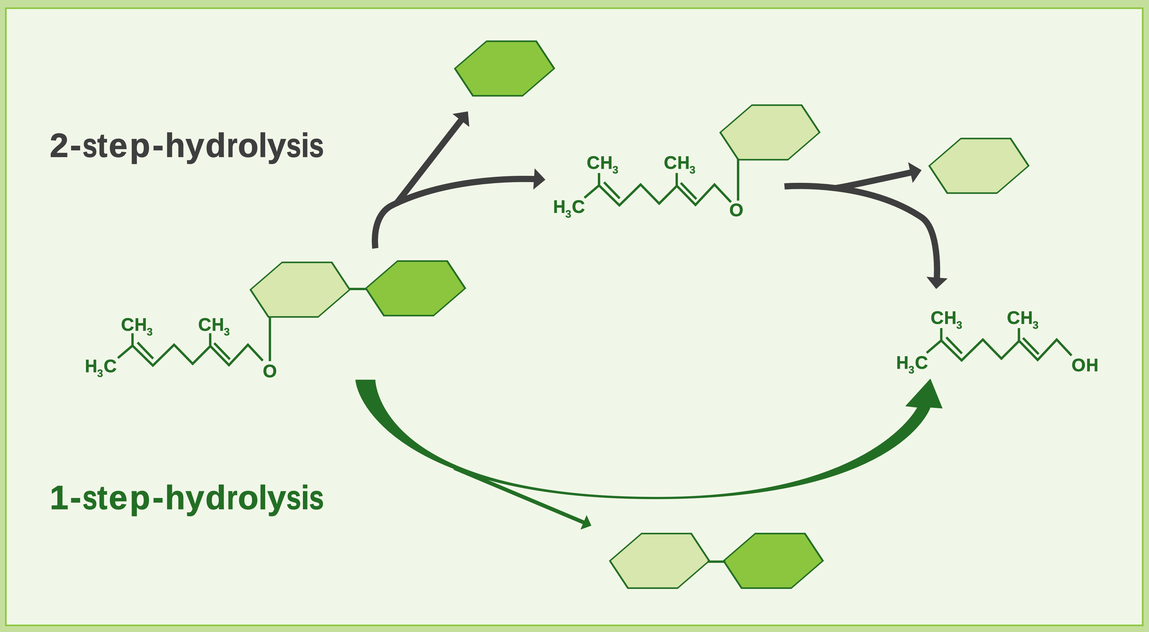

Fig. 2: *1-Step and 2-Step Hydrolysis*

Characteristics

The diglycosidase activity of the new enzyme composition cleaves disaccharides directly off the volatile aglycones (Fig.2). Trials of the Federal Research Institute Freiburg prove a significantly higher liberation of monoterpenes (Fig.1) and Damascenon. Also increased levels of aromatic substances like 1-Hexanol, cis-3-Hexenol, Benzylalkohol, 2-Phenylethylalkohol were determined. (unpublished Data, Erbsloeh Geisenheim AG).

Further characteristics:

- Non-GMO
- pH-range: pH 3,0 - pH 7,5; pH-optimum: 5,5.
- Temperature range: 15 - 65 °C; temperature optimum: 50 °C
- Alcohol tolerance: up to 14 % Vol. without activity loss

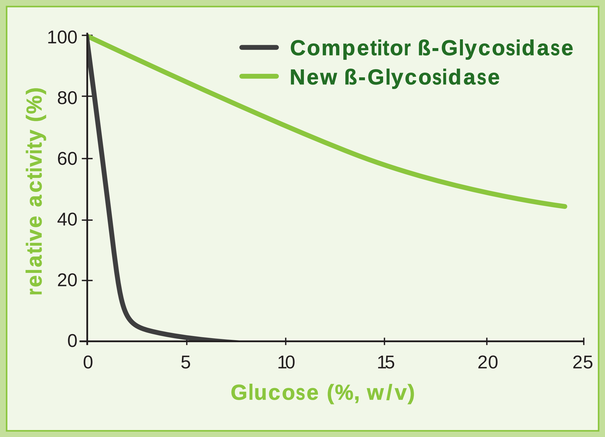

Fig.3: *Glucose-repression of the enzyme activity.*

Glucose-repression

In winemaking, the use of aroma enhancing enzymes is limited to the end of the fermentation process, due to the glucose-repression of the enzyme activity. The new ß-glycosidase formulation exhibits a significant lower glucose-repression, in comparison to conventional ß-glycosidases (Fig 3.). Therefore a pre-fermentation application is possible, which has the advantages of an extended enzyme reaction time and intensified aroma development in consequence of the yeast metabolism during fermentation. The low glucose-repression offers the possibility for an early addition to juice, or to wines with residual sugar.

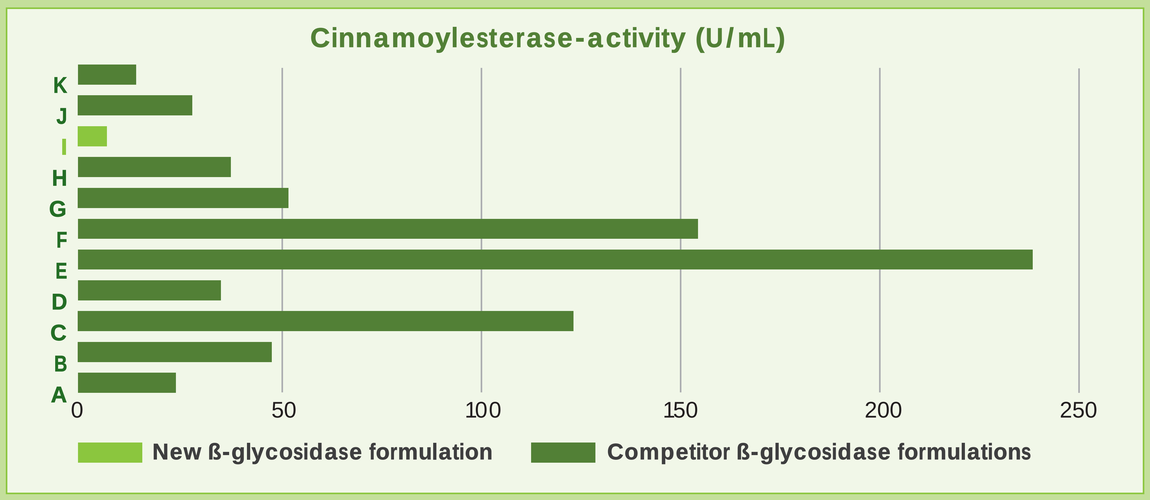

Fig.4: *Cinnamoylesterase activity of different aroma enzymes*

Cinnamoylesterase

Cinnamoylesterase is an ester cleaving activity that may naturally occur in enzyme preparations as a side activity. The presence of Cinnamoyl esterase encourages the formation of volatile phenol substrates responsible for aromatic deviation. The formation of volatile phenolics depends on the concentration of free phenolic acids, like caffeic acid or coumaric acid. In the process of fermentation these acids can be converted into volatile phenolic derivatives by the decarboxylase activity of the yeast. Depending on the concentration of volatile phenolic substances like 4-vinyl guaiacol and 4-vinyl phenol, they are perceived as spicy and contribute positively to wine bouquet or can cause off-flavor that are often described as medicinal. In contrast to all commercial wine aroma enzymes tested, the new ß-glycosidase is free from cinnamoyl esterase activity.