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The use of aspergillopepsin-I in winemaking

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The present work summarizes different research carried out over the past years on using acid aspergillopepsins-I (AP-I) in winemaking. These endopeptidases cleave non-terminal amino acid bonds of proteins and represent an interesting alternative to bentonite addition for protein stabilization of wines. The combination of must heating and AP-I supplementation ensured the protein stability of wines, already at the end of the alcoholic fermentation. Not only did this treatment increase the amino acid content in grape musts, but it also enhanced some yeast-derived aroma compounds found in wines, both on a lab scale and at semi-industrial conditions. In fact, fatty acids and acetate esters were positively influenced by AP-I supplementation in combination with flash-pasteurization. At lab conditions, thiols were also increased with a statistical significance. However, the necessary heat shock applied presented harmful side effects on terpenes and norisoprenoids, for which concentration was reduced by over 40% in comparison to control wines. Despite AP-I treated wines were preferred by winemakers after one-year storage in bottle, to limit varietal aromas depletion in young wines the effect of temperature (from 20°C to 70°C) on the di/tripeptide composition of musts was explored. Oligopeptides were studied both as an index of the endopeptidases efficacy and to evaluate the potential consequences on aroma production by yeasts. Based on these compounds, 55°C is due to active modification must composition.

To overcome the effects on varietal compounds, it was further investigated the synergistic effect of power ultrasound (US) and AP-I on PR-proteins, as an alternative to must heating, both in model solution and on a protein-unstable Gewürztraminer wine. Sonication at 20 kHz and 100 % amplitude were performed, in the presence or absence of AP-I (100 mg/L). Two different sonication times were adopted, leading wine to different temperatures due to the batch treatment. The wines were evaluated for the concentration of PR proteins and several indices related to protein instability (i.e.: turbidity, protein charge neutralization, ζ potential, and mean particle size). Based on these findings, experimental conditions were further optimized with variation in US amplitude and AP-I dosage. Results showed that only in the lowest energetic conditions, total PR-proteins were negatively correlated with the AP-I dose applied indicating a synergic effect.