Impact of the pre-fermentative addition of enological adjuvants on the development of UTA in wines

AIM During alcoholic fermentation and wine aging, indole-3-acetic acid (IAA) can degrade into 2-aminoacetophenone (AAP). The presence of reasonable amount of AAP in wines is regarded as the main cause of untypical ageing defect (UTA) described by aroma descriptors such as "acacia blossom", "furniture polish", "wet wool", "mothball", or "fusel alcohol" [1, 2]. This study aims to evaluate the effectiveness of different oenological adjuvants (ascorbic acid, glutathione, ellagic tannin, gallotannin and grape tannin) added to must in pre-fermentation for preventing the possible development of UTA. In addition, a high-resolution suspect-screening approach was performed to evaluate the kinetics of formation and consumption of metabolites formed during the oxidative degradation of IAA into AAP. METHODS Johannitter, Pinot Blank, Pinot Gris and Riesling musts were separately added with each of the 5 adjuvants (GrT, EgT, GaT, ASC and GSH), fermented and finally added of sulfur dioxide. The free and conjugated IAA forms were qualified or quantified in wine at the end of the fermentation and the AAP was finally quantified after a period of forced ageing (6 days at 40 °C). Quantification was performed using a HPLC coupled with a high-resolution mass spectrometer (UHPLC-HQOMS) using a biphenyl column (3×150 mm, 2.7 µm) with formic acid 2% and acetonitrile as eluents [3]. The quantification limits ranged from 0.25 to 2 µg/L, excepted for AAP that had a quantification limit of 0.02 µg/L. For qualitative analyses, homemade standards of indole-acetic acid-2-sulfonate (IAA-SO3H) and of metabolites produced by oxidative chemical reaction of IAA to AAP (radical cation, FAP, FAPOP and Ox-IAA) were prepared. The IAA-hexoside RT was studied with a full mass/all ion fragmentation/NL data dependent-MS2 (Full MS/AIF/NL dd-MS2) experiment in positive ion mode [4]. RESULTS Ascorbic acid has been confirmed as the most appropriate antioxidant adjuvant which can be used for UTA defect prevention. With an almost comparable effect, gallotannin also did not show AAP productions greater than 1 µg/L. Over 80% of the variability of potential AAP formation in wines was explained by an ANCOVA model, which was used to predict the possible AAP production considering the varieties, treatments and IAA content in young wine as known variables. CONCLUSIONS Thanks to high resolution mass spectrometry, we were able to qualify and quantify different precursors and metabolites that take part in the development of UTA, allowing a better understanding of the mechanisms of AAP formation and the adjuvants actions involved in the wine protection.

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