Grape seed powder as a novel and sustainable bentonite alternative

Elia Romanini1,2, Donato Colangelo3, Milena Lambri3, Jacqui M. McRae2

1 Università Cattolica del Sacro Cuore, Dipartimento di Scienze e Tecnologie Alimentari per una filiera agro-alimentare Sostenibile - DISTAS, Via Emilia Parmense 84, 29122 Piacenza, Italy.
2 The Australian Wine Research Institute, Waite Precinct, Hartley Grove cnr Paratoo Road, Urrbrae (Adelaide), PO Box 197, Glen Osmond, SA 5064, Australia.

Presenting author’s e-mail: elia.romanini@unicatt.it

Background

Grape pathogenesis-related (PR) proteins, specifically chitinases (CHI) and thaumatin-like proteins (TLP), are the main proteins responsible for hazes forming due to their heat sensitivity. First protein unfolding than begin to aggregate; finally forming a visible haze. Bentonite is used to remove proteins that are a potential source of haze in wines but it has some disadvantages such as the cost related with waste disposal, it is not a renewable resource, it has a poor settling and that it may reduce aromas and flavor compounds. These disadvantages amount to an estimated annual cost of U.S. $ 1 billion to the world wine industry.

Grape seeds are a renewable resource and readily available to wineries during vintage but today are waste products and the total extractable phenolics in grape are present at 60–70% in the seeds. Tannins have a high propensity to bind proteins.

Aim of the work: assess the use of grape seed reduced to powder as a novel and renewable bentonite alternative.

Methods

- Four heat-unstable white wines: Sauvignon Blanc (SAB1), Fiano (FN), Marsanne (MR) and a blend of Semillon and Sauvignon Blanc (SEM/SAB).
- Two heat-unstable juices: Semillon (SEM) and Sauvignon Blanc (SAB2).
- Grape seeds were isolated from frozen Chardonnay grape and prepared by either directly to grinding into a powder or by grinding into powder after first roasting at 180°C for 10 min. Bentonite was included as a positive control.
- The potential for the wine samples to become hazy was measured using a heat test (McRae et al., 2018). 2h at 80°C, 3h at 10°C.
- The composition and concentration of haze-forming proteins in juices and wines were assessed in solution using HPLC (Culbert et al., 2017).
- The evolution of wines colour was measured using CIELAB and total colour difference (ΔE) and phenolic compounds were estimated with UV absorbance (280nm).

Results – Addition of grape seeds powder

GSP addition to juices and wines is effective in producing heat-stable wine on a lab scale.

- GSP addition reduced protein concentration after 1-h contact in all selected wines.
- Longer contact time (2 hours) did not improve the efficacy of protein removal.
- Roasting also did not consistently change the protein-binding capability of GSP.
- The wines were heat stable with high doses (25–32 g/L).
- GSP addition on wine was changing other factors in the wine matrix such as polyphenols concentration and colour.

- Roasted GSP addition on juices reduced protein concentration in all selected wines after fermentation.
- Lower doses of GSP was needed for heat-stability on juices (5 g/L).
- Less changing in colour was measured after fermentation compared to controls.

Future research will include large-scale fermentations and sensory assessment.

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References