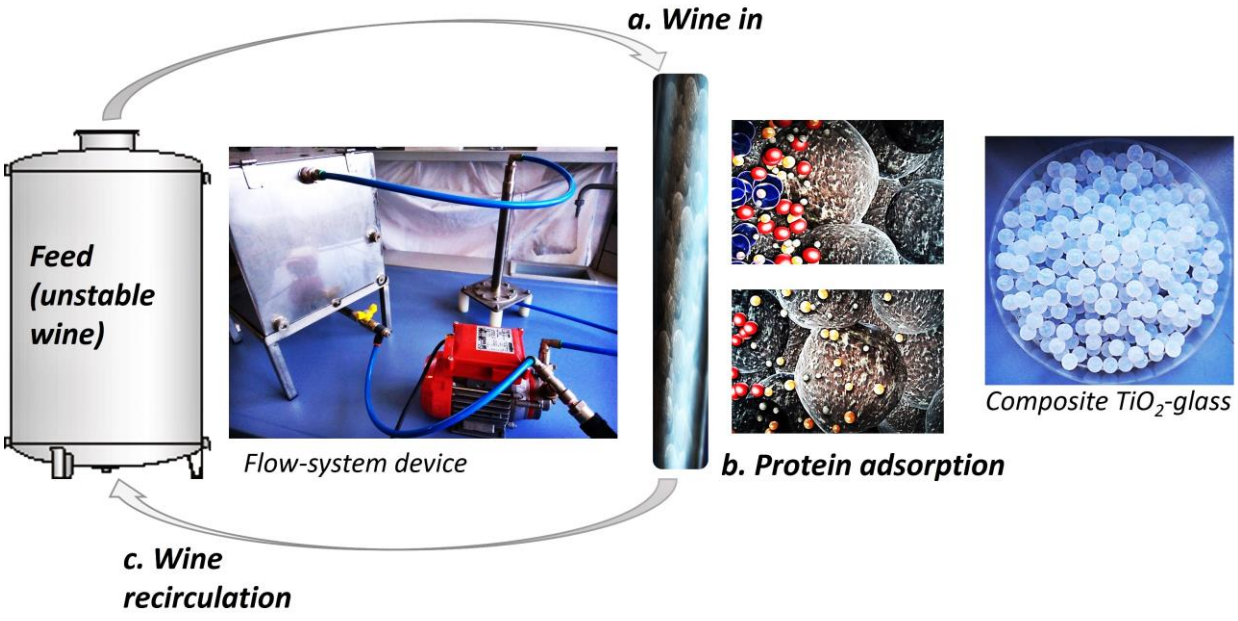
MI-WINE: QUALITY AND INNOVATION IN THE WINE INDUSTRY

Introduction

The MI-WINE Project pursued the objective to put in connection the sustainability needs of the wine industry and the quality expectations of wine consumers; it advantages of a multidisciplinary approach to develop new, industrially sustainable mild technology for wine stabilization.

Article body

The modern oenology is focused toward countering the wine instability by preventive strategies to be adopted or products/treatments to do in the cellar (pre-bottling refinement). The haze formation due to the denaturation of small, targeted proteins, and the oxidative decay are the most feared events by operators in the oenological industry, since these flaws can arise over time after the phases of bottling and wine trading. Protective strategies are currently managed as (a) discontinuous processes, with the addition of fining agents, i.e., adjuvants like bentonite, silica gel, tannins, which can bind and precipitate targeted molecules responsible for instability. These adjuvants need to be removed by racking and filtration, with an environmental impact in terms of production of wastes; (b) addition of proper dosages of antioxidants (primarily sulfur dioxide) to delay oxidation. Their concentration is progressively depleted under oxidative conditions with a time-limited effect in bottled wine.



Essentials of the MI-WINE Project: Graphical Abstract

The development of an in-line treatment system, operating in a continuous flow regime, seems to be the perfect approach to obtain stable wines in a fast time process and without compromising their quality; However, given the many laboratory-scale studies documented in the literature, so far it has not yet been possible to propose a solution suitable for the industrial transfer.

The MI-WINE project introduces an adsorbent/active material based on the nano-engineering of ceramic oxides, suitable for the food industry and able to provide a highly selective treatment, without depleting the wine of its fine components (volatile compounds, organic acids, polyphenols..). Based on previous studies, titanium oxide was proved to be particularly appropriate to produce mesoporous and nanostructured coatings through the deposition of nanoparticles as a dispersion and the application of thermal treatments (sintering). The application of the active coating was performed on glass, an inert hygienic and durable material, therefore particularly suitable for the needs of the food industry. This resulted in the production of an adsorbent composite material, which seems to withstand the stress of a dynamic process well, since the wine is flushed within a closed hydraulic circuit for a series of treatment cycles; under continuous exposure to the active material, the wine undergoes a removal of the fraction responsible for instability (proteins and metals catalysts) without releasing of undesirable substances, getting ready for the subsequent stages of filtration and bottling.

The MI-WINE Project is expected to:

a) Provide basic research aimed at supporting knowledge advancement in the field of wine and beverages stabilization and promoting the transition toward sustainable and high-quality organic beverage production;

b) Improve sustainability and resource efficiency in the industrial processes;

c) Enhance the EU cooperation and dialogue between scientific discipline: Food Science and Technology, Materials Technology; spreading the excellence and innovation potential;

d) Upgrade the device designed and validated in MI-WINE by advancing the technology and concept idea from lab-scale (TRL4) to system complete and validated (TRL8); this opportunity can be boosted from a correct involvement of the industry and an effective communication of the results of the Project.

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