

# Wine microbial diversity and cross-over applications: emerging results and future perspectives

**AIM:** Cross-over applications are an emerging technological approach in food microbiology where a microorganism from one traditional specific fermentation process is used to improve quality and safety in another agri-food production/chain (Dank *et al.*, 2021). A complex microbial diversity is found in association with fermentation in wine, including *Saccharomyces*, non-*Saccharomyces* and malolactic bacteria, all microorganisms versatile in terms of enological utilisation (Tempère *et al.*, 2018). Here, we propose a systematic literature review highlighting the existing trends and possible future applications related to cross-over exploitation of wine-related microbiota.

**METHODS:** Systematic review of the scientific literature, including the evaluation of data from ongoing research projects ('INVIS PUBA', 'SPUMAPULIA' and 'BE^2R' projects, funded by Apulian Region throughout P.S.R. 2014/2020 -Misura 16.2).

**RESULTS:** For decades, a continuous effort has been carried out worldwide to preserve and exploit the microbial diversity associated with traditional wines and Geographical Indications, including studies on specific autochthonous grape varieties. The oenological significance of an impressive number of eukaryotic and prokaryotic strains have been assessed, including their effects on dessert, flor and sparkling wines. Often these biological resources are preserved in culture collections, favouring exchanges in food uses (De Vero *et al.*, 2019). The review proposes an overview of the phenotypic characteristics of wine microbes of potential interest for the design of cross-over strategies, with the desired modulation of 'food qualities' and safety enhancement. The application of wine strains as a sustainable driver of innovation in other fermented foods (e.g. bread) (Capozzi *et al.*, 2016), alcoholic beverages (e.g. bread and fruity wines) (Agarbatl *et al.*, 2020; Canonico *et al.*, 2021; Vilela *et al.*, 2020), and for the development of new fermented products is discussed.

**CONCLUSIONS:** The proposed overview of the scientific literature *i)* underlines a high potential of innovation related to wine 'microbiodiversity' and *ii)* emphasises the importance of culture collections in the light of cross-over applications. The review also underlines the chance to explore innovative regional paths exploiting the exchange of microbial resources from traditional fermented products to other agri-food chains.

**Authors:** Vittorio Capozzi – Institute of Sciences of Food Production, National Research Council of Italy (CNR) – Foggia, Nicola DE SIMONE, Department of Agriculture, Food, Natural Science, Engineering, University of Foggia, Mariagiovanna FRAGASSO, Department of Agriculture, Food, Natural Science, Engineering, University of Foggia, Giancarlo PERRONE, Institute of Sciences of Food Production, National Research Council of Italy (CNR) – Bari, Franco BIASIOLI, Research and Innovation Centre, Fondazione Edmund Mach, Giuseppe SPANO, Department of Agriculture, Food, Natural Science, Engineering, University of Foggia, Pasquale RUSSO, Department of Agriculture, Food, Natural Science, Engineering, University of Foggia, Maria TUFARIELLO, Institute of Sciences of Food Production, National Research Council of Italy (CNR) – Lecce, Francesco GRIECO, Institute of Sciences of Food Production, National Research Council of Italy (CNR) – Lecce

**Email:** [vittorio.capozzi@ispa.cnr.it](mailto:vittorio.capozzi@ispa.cnr.it)

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