



## A MICROSCOPIC YEAST MAKES A BIG DIFFERENCE - HOW GEOGRAPHIC LIMITATIONS OF YEAST POPULATIONS CAN DETERMINE THE REGIONAL AROMA OF WINE

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### Abstract

**Aim:** Microbial biogeography contributes to regional distinctiveness of agricultural products and is important to determine for quality and marketing of wine products. We evaluated the microbial influence on wine characteristics by considering the microbial diversity of soil, plant, grapes, must and wine in grapegrowing regions across Victoria, Australia.

**Methods and Results:** We sampled soils, plant parts, grapes, must and wine across vineyards in Victoria. We extracted DNA for microbial diversity profiling of fungi and bacteria and used gas chromatography- mass spectrometry to separate and identify small molecules in the headspace of wine. At a large scale (~400km), we found that vineyard ecosystems are structured and distinguished by fungal communities, and that fungal communities were the strongest contributor to the aroma of wine. Further studies considered a smaller scale of microbial diversity and investigated the changes in fungal community composition and diversity during the annual growth cycle of the grapevine. We found that fungal ecology is dependent on the grapevine habitat (roots, leaves, flowers/fruit) and developmental stage during the annual growth cycle. The influence of microbial biogeographic patterns decreased during wine fermentation as the fungal populations were dominated by *Saccharomyces* spp. yeasts. Further investigation of the strain diversity of *Saccharomyces cerevisiae* showed that this yeast can determine geographic patterns at a small scale and determines regional distinctiveness to influence wine characteristics within a single region.

**Conclusions:** Our results show that microbial distribution patterns seen in vineyards in Europe, North America and New Zealand are also observed in Australia, but the composition of yeasts may be distinct. The ability to define a region based on microbial diversity and fermentative yeasts may assist the industry in more closely defining sub-regions in Australia.

**Keywords:** Fungal ecology, yeast, wine aroma