

The complex microbial community of withered berries of cv. Corvina as revealed by metagenomic analysis

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UniVR, UniPD, Microbion s.r.l.

Abstract

Corvina is the most important of Verona's red grape varieties and forms the basis for the production of unique wines, such as Amarone and Recioto of the Valpolicella area (Italy). The distinctive features of such wines are linked to the peculiar winemaking techniques and especially to the post-harvest grape withering process, when the grapes are partially dried in attics for three/four months to concentrate sugars up to about 27% (w/v). Dehydration increases the concentration of constituent substances in berries, determining also specific expression of grape genes. During this process, grapes are colonized with a complex microbiota to an extent which depends on environmental temperature and humidity.

In this study, a whole metagenome sequencing (WMS) approach was used to analyse the microbial consortia present on Corvina berries at the end of the withering process performed in two different conditions ("traditional" or "fast").

Representative berry samples were collected and washed to avoid grapevine DNA contamination. Bioinformatic analyses, performed on reads and scaffolds, revealed that traditionally withered berries were dominated by *Clostridiales* and *Pseudomonadales*, while the fast procedure determined the presence of *Enterobacteriales* and *Lactobacillales*. On the contrary, few consistent differences characterized the eukaryotic fraction, dominated by *Aspergillus* and *Penicillium* for both samples. Interestingly, the "binning" procedure revealed 15 most abundant genomes characterizing the two conditions.

These results provide insights into the microbial community of Corvina withered berries and reveal relevant variations attributable to environmental withering conditions. Further studies will be performed to determine whether the different microbial compositions could lead to significant chemical variations of the musts, with an impact on the organoleptic properties of wine.

This study underlines how novel technologies, like WMS, could open novel perspectives in the knowledge and management of traditional processes as the withering process of Corvina, with an impact on the winemaking of important Italian wines.