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Quorum sensing-based alcohol production by yeast

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Quorum sensing is the ability of the microorganism to send signals and detect the population density of microbes using autoinducers. Quorum sensing forms the basis of biofilm formation. Wine, a commonly consumed alcoholic beverage often prepared from fruits like grapes, is fermented by yeast. The combination of quorum sensing and yeast for wine production is a booming topic in the fermentation industry. Further, the yeast interacts with other microbial populations during wine production, resulting in the flavour of the wine.   The underlying principle and mechanism behind quorum sensing is the regulation of gene expression in response to fluctuations in cell population density. The knowledge of microbial interaction and quorum sensing is unclear. But the changes found in the microorganisms and the product formed during quorum sensing are identified. The quorum-sensing molecules, 2-phenyl ethanol and tryptophol (aromatic alcohol), were identified in Saccharomyces cerevisiae. Additionally, these molecules are known to influence signalling. The characteristics of this signalling include the involvement of autoregulated and induced genes in the synthesis of aromatic alcohol. The production of signals is affected by environmental conditions, and the formation of pseudohyphae is controlled by quorum sensing.   Quorum sensing is also influenced by physical factors and nutrient content in the medium. Factors influencing the production of aromatic alcohol include the presence of ammonium salts, oxygen availability, environmental pH, ethanol and cell density. When dense microbial populations exist, quorum sensing also helps the yeast to adjust to stressful conditions caused due to extreme pH or nutrient depletion. Therefore, the powerful combination of quorum sensing and yeast has the potential to produce aromatic alcohol.

Keywords: Quorum sensing, Alcohol, Yeast, Wine fermentation, Environmental stress

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