Non-saccharomyces yeasts and metabolically engineered yeasts: An innovation trends in industrial biotechnology.

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Abstract

Yeast species such as Saccharomyces cerevisiae and others are among the most important biotechnological organisms. *S. cerevisiae* and closely related ascomycetous yeasts are the world's leading producers of biotechnology goods, outperforming other industrial microorganisms in terms of productivity and revenue. The fundamental responsibilities of the *S. cerevisiae* group in food fermentations such as beers, cider, wines, sake, distilled spirits; bread products, cheese, sausages, and other fermented foods are traditional industrial features of the *S. cerevisiae* group. Production of fuel ethanol, single-cell protein (SCP), feeds and fodder, industrial enzymes, and small molecular weight metabolites are all long-standing industrial operations employing *S. cerevisae* yeasts. Non-Saccharomyces yeasts (non-conventional yeasts) have recently been used as industrial organisms for a wide range of biotechnological applications. Non-Saccharomyces yeasts are increasingly being employed to express proteins, biocatalysts, and multi-enzyme pathways for the manufacture of fine chemicals and small molecular weight molecules with medicinal and nutritional value. Non-Saccharomyces yeasts have key roles in agriculture as biocontrol agents, bioremediation agents, and environmental quality indicators. Several of these goods and methods are now commercially available, while others are still in the early stages of development.

Keywords: Non-Saccharomyces yeasts, Biotechnological organisms, Biocontrol agents, Enzymes.

Introduction

In the early phases of wine fermentation, non-Saccharomyces yeasts play an important role. As the alcohol content rises, indigenous or commercial *Saccharomyces cerevisiae* strains take over and finish the conversion of grape must sugars to ethanol, CO_2, and other secondary metabolites. Because the presence of non-Saccharomyces during fermentation affects the wine composition, their role throughout the fermentation process cannot be overlooked [1]. The new challenges to improve the appeal and value of wine made with traditional technologies are being met by selecting and employing autochthonous non-Saccharomyces and Saccharomyces strains that can help wines retain their regional identity. With a better understanding of yeast biochemistry and physiology, it's now possible to choose and generate yeast strains with defined effects on specific processes. Non-Saccharomyces wine yeasts once thought to be undesirable or spoilage yeasts have been shown to improve the analytical composition and fragrance profile of the wine [2,3].

The ability of non-Saccharomyces yeasts to secrete enzymes and create secondary metabolites, such as glycerol and ethanol, as well as the release of mannoproteins and contributions to colour stability, is species- and strain-specific, emphasising the significance of careful strain selection. The use of mixed starters of selected non-Saccharomyces yeasts with Saccharomyces cerevisiae strains represents an alternative to both spontaneous and inoculated wine fermentations, taking advantage of non-Saccharomyces wine yeast species' potential positive role in the organoleptic characteristics of wine. Mixed starters can address the growing demand for new and improved wine yeast strains suited to various types and styles of wine in this context. We primarily examine studies focused on non-Saccharomyces strain selection and design of mixed starters designed to increase primary and secondary fragrance of wines, with the goal of presenting old and new data on the potential of non-Saccharomyces yeasts to meet this market trend. Non-Saccharomyces wine yeasts' potential to create oenologically relevant enzymes and metabolites is also discussed [4,5].

Mixed fermentations with non-Saccharomyces strains and *S. cerevisiae* can enhance primary and secondary wine aroma, but also reduce the ethanol content of wine. They can exert a positive effect in base wines for sparkling wine production improving foaming properties. Remarkably, a new red winemaking technology has been developed as an alternative to traditional malolactic fermentation. The main

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reason for re-evaluating non-Saccharomyces yeasts and for introducing mixed cultures in the winemaking process was to get differentiated wines reflecting the characteristic of a given wine region. The design of mixed cultures should take into account not just results from smart screenings but also potential interactions among microorganisms.

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