INTRODUCTION: The genetic improvement of industrial wine strains is now based on genetic engineering, the technology where just one characteristic of a gene can be modified with precision without affecting other desirable properties.

Impressive progress has been made, specially, in *Saccharomyces cerevisiae*. The principal targets of improvement fall into four categories: Fermentation performance, processing, organoleptic characteristics and wholesomeness of the product.

This technology is enabling the development of a new generation of specialized yeast strains, with new more suitable characteristics for winemaking.

THE PURPOSE OF THIS PAPER IS: to review selected examples of the different applications of yeast genetic engineering in the fields of winemaking.

FERMENTATION PERFORMANCE

Desiccation tolerance by accumulating trehalose

Genetic engineering: Deletion of genes *ATH1* and *NTH1*. Deletion of the *TPS1* gene.

*ATH1* and *NTH1* are involved in trehalose degradation; *TPS1* is involved in its synthesis.

Trehalose acts as a protective molecule against desiccation.

One study demonstrated that the deletion of genes *ATH1* and *NTH1*, improve yeast cells viability after dehydration.

However, in other study, with the deletion of the *TPS1* gene, the strains didn’t produce trehalose, but they were able to tolerate desiccation.

Is there a consistent relationship between trehalose and desiccation tolerance?

ORGANOLEPTIC CHARACTERISTICS

The “body” of a wine improves by increasing glycerol.

Genetic engineering: Overexpression of the *GDP1* gene and deletion of the *ALD6* gene

*GDP1* is involved in glycerol synthesis.

Glycerol contributes to smoothness and overall body of a wine. An overproduction leads to a decreased ethanol yield.

*GDP1* overexpression results in an increased production of acetate (side effect).

The deletion of *ALD6* results in a substantially lower acetate yield.

WINE WHOLESOMENESS

Decreased ethyl carbamate by decreasing urea formation

Genetic engineering: Overexpression of the *DUR1,2* gene

*DUR1,2* encodes urea amidolyase, which catalyzes the degradation of urea.

Urea is the major precursor of ethyl carbamate in wine, which is a carcinogen.

*DUR1,2* overexpression results in a decreased production of urea.

CONCLUSIONS:

- The use of modern biotechnology in wine yeasts is currently a powerful tool for improving the process of winemaking, and *Saccharomyces cerevisiae* is an outstanding model organism for applied research.
- But there are limitations in this kind of organisms (OGM) or its derived products such as byproducts formation, legislation and consumer perception.