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KILLER YEASTS AND ALCOHOLIC BEVERAGES.

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Killer yeasts are able to produce a toxic protein which is lethal for sensitivity yeast strains. The killer effect of these toxins is due to they damage the integrity of cell membranes, producing an inhibition of the active transport of several nutrients and other effects. Killer yeasts are usually tolerant to the toxin that they produce.

The killer effect plays an important role in the ecology of the natural communities of yeasts, and also has great relevance in industrial yeast processes, such as the production of alcoholic beverages. In any yeasts community the killer strains can inhibit the growth of sensitive strains, and important implications have been observed in many beverages such as beer, wine, rum, pulque, cachaça, etc. Wild killer yeasts have been identified as inhibitory to strains used as starters in the production of alcoholic beverages; but, on the other hand, the isolation, characterization and application of killer or killer-resistant strains has interesting biotechnological applications.

In our research group, we performed a study to know the incidence of killer strains in sugar cane molasses[1]. We found that there was at least one killer strain in every sample that we analyzed. These strains eventually could inhibit industrial starters used in the production of rum or alcohol. We did not find previous reports of killer strains of the species *Schizosaccharomyces pombe*, but in our study we found some killer strains of this species.

In a similar study performed in agave sap (aguamiel) and pulque[2], a total of 16 strains belonging to six species were isolated from both products. One strain of *Saccharomyces cerevisiae* (*chevalieri*) isolated from pulque which did not show killer activity was, on the other hand, resistant to other killer strains and it had a remarkable ethanol tolerance, suggesting that this strain could be used for alcohol production.

This *Saccharomyces cerevisiae* var. *chevalieri* strain was used for the elaboration of wine. The strain was not killer but it displayed a wide tolerance when it was challenged to yeasts strains producers of killer toxins from K1 to K9. It resulted also highly tolerant to alcohol, SO_2, and high concentrations of glucose. It grew well in a range of pH from 3 to 6.5, and temperature from 26 to 41ºC. This yeast was used for the production of red wine (Cabernet Sauvignon), comparing the resulted product with a commercial wine elaborated under the same conditions with the usual (control) yeast. *S. cerevisiae* var. *chevalieri* displayed faster fermentation rate in wine most, and produced more alcohol than the control yeast. The resulted wines were sensory evaluated by a trained panel, and the attributes were very similar for both products. A profile of volatile metabolites was obtained by MS-GLC: no significant differences were found in aroma compounds. It was concluded that this strain of *S. cerevisiae* var. *chevalieri* isolated from pulque, demonstrated to be excellent wine yeast, resistant to killer toxins.

[1]Bonilla-Salinas M., Lappe P., Ulloa M., García-Garibay M., Gómez-Ruiz L. 1995. Isolation and Identification of Killer Yeasts from Sugar Cane Molasses. Letters in Applied Microbiology 21(2), 115-116.

[2]Estrada-Godina A.R., Cruz-Guerrero A.E., Lappe P., Ulloa M., García-Garibay M., Gómez-Ruiz L. 2001. Isolation and identification of killer yeasts from Agave sap (aguamiel) and pulque. World Journal of Microbiology & Biotechnology 17(6), 557-560.