COMMENTARY

Use of yeast as a method of biological control

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Based on the article "Evaluation of antimicrobial activity from native yeast against food industry pathogenic microorganisms" published by our working group, we briefly commented on the use of yeasts as bio-controllers in the food industry.

Key Words: *Yeasts; Biological control; Antimicrobial activity*

At present, food requires constant monitoring and surveillance of its quality and safety due to the existence of various pathogenic microorganisms that can contaminate them, such as bacteria, yeasts or molds, which alter their nutritional and sensorial quality, also producing significant economic losses in the food industry. Similarly, food contaminated with pathogens can produce foodborne illness (FBD) and according to the World Health Organization (WHO), around 600 million people worldwide (about 1 in 10) Contaminated and 420,000 dies for the same cause. Among the major bacterial pathogens involved in FBDs are *Escherichia coli* 0157: H7, *Listeria monocytogenes and Salmonella* spp. (1).

Chemical preservatives are used to carry out microbiological control in the food industry. However, at present, there is a worldwide trend towards the consumption of minimally processed foods and without the use of these compounds. In this way, biological control emerges as a natural option in replacement, partial or total, of the chemical preservatives used, and is based on the use of microorganisms capable of altering the environment by the production of metabolites.

Among these microorganisms are some yeast that produces compounds with antimicrobial activity against pathogenic microorganisms and deterioration.

Several studies have shown that yeast strains are capable of inhibiting the growth of unrelated microorganisms such as bacteria. The mechanism associated with this inhibition is quite controversial, as Polonelli and Morace (2), Leverentz et al. (3) and Bajaj et al. (4) reported that the killer phenomenon, which had previously been limited to yeast-yeast interaction, could be given among yeast-bacteria, noting that killer strains are able to inhibit bacterial growth (*E. coli, S. aureus, L .monocytogenes* and *Klebsiella oxytoca*). In contrast, Narayaran and Ramananda (5), Narayaran and Rao (6) and Dieuleveux et al. (7) characterized compounds produced by *Candida* spp. *and Geotrichum candidum* capable of inhibiting the growth of *L. monocytogenes*. These were characterized and identified as 3-D-phenylactic (PLA) and 3-D-indolactic acid (ILA). Also, Dieuleveux et al. (8) reported that PLA causes changes in the structure of *L. monocytogenes*, observed by scanning electron microscopy that they secreted polysaccharides and formed aggregates, also lost stiffness in their cell walls and finally disintegrated.

To respect, we identified and selected native yeasts with antimicrobial activity against *bacteria E. coli, S. typhimurium and L. monocytogenes,* using the agar method, which was easy and fast allowing the evaluation of several strains of yeast (9).

From a total of 103 yeast strains, 8.7% of the evaluated strains showed some degree of inhibition of the growth of Gram positive and Gram-negative bacteria when they were found in direct cellular contact, a condition that simulates the possible contamination rate that could be present in a prepared food. The antimicrobial activity was not restricted to a single yeast species, however, only a few strains within a species have the property of inhibiting growth. These corresponded to the genera Pichia, Candida, Saccharomyces and Metschnikowia.

In the quantification of the antimicrobial activity, it was obtained that *L. monocytogenes* was inhibited mainly by *S. cerevisiae and P. carsoni* in approximately 1 logarithmic unit of the growth. In the case of S. *typhimurium*, a reduction of 1 log unit of the growth was observed by a strain of C. *intermedia* and *S. cerevisiae*. Bacterial inhibition for *E. coli* was not significant.

Selected yeasts show significant antibacterial potentials and are promising candidates for additional characterization of the inhibitory mechanism and potential use as bio-controller cultures.

Yeasts are microorganisms that are widely distributed in nature and their versatility is due they have developed the ability to adapt to different environmental conditions, such as low temperatures and high osmotic pressures.

In this sense, it has also been reported that these microorganisms can act as biological control agents for the treatment of plant diseases (10-12). Thus, the potential observed in these microorganisms, opens prospects for the development of strategies and non-invasive methodologies that are able to control the development of other pathogenic and spoilage microorganisms.

We believe that new trends in healthy food offer opportunities for the development of new methods of biological control, as well as promoting the search and selection of new microorganisms that have antagonistic effects on pathogens of food interest.

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