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ANTIFUNGAL AND TECHNOLOGICAL ATTRIBUTES OF LACTIC ACID BACTERIA ISOLATED FROM DAIRY MATRICES IN SICILY - ITALY

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The dairy industry faces challenges from filamentous fungi, which can cause visible mycelium growth, bitter flavors, and mycotoxin production on several products. To control fungal growth, chemical preservatives are commonly used alongside good manufacturing practices. However, the trend towards clean label foods has increased demand for natural alternatives, leading to heightened interest in bioprotective microbial cultures, particularly lactic acid bacteria (LAB). LAB´s play crucial roles as starter, adjunct, and bioprotective cultures. This demand has expanded the market for microbial cultures in food, driving research into new cultures with diverse antimicrobial and antifungal capabilities. Therefore, this work aimed to evaluate the technological properties of 35 LAB, previously obtained from dairy matrices (donkey milk and cheese) in Sicily, Italy and identified based on 16S rRNA or PCR multiplex: Lactobacillus rhamnosus (n = 5), Lactiplantibacillus plantarum (n = 21), Limosilactobacillus fermentum (n = 5), Lactobacillus delbrueckii (n = 1) and other LAB (n = 3). Initially, the genetic variability among the isolates was verified through PCR amplification of repetitive extragenic palindromic sequences (rep-PCR). The technological potential was evaluated through phenotypic tests that include diacetyl production, proteolytic capacity and aminopeptidase production. Then, the isolates were subjected to the in vitro test to identify their antifungal activity against following fungi: Aspergillus niger IOC 207 and Penicillium chrysogenum IOC 132. The rep-PCR fingerprint analysis resulted in 4 different clusters with similarity indices of at least 70% and 1 solitary fingerprints. However, there was no clustering in relation to the isolation source. Despite this, high similarity was observed regarding the identification of the isolate. Regarding technological characteristics, most strains (n=16) of Lactiplantibacillus plantarum showed the ability to produce diacetyl. Thirty LAB strains demonstrated the ability to proteolyze milk, suggesting that these bacteria possess intriguing characteristics for technological applications. Aminopeptidase activity was observed to vary greatly between strains, with better PepX performance in five strains of L.rhamnosus (1), L.plantarum (2) , Lactobacillus sp.(1) and L .fermentum (1) and better PepN performance in the last two strains mentioned above. The strains' ability for proteolysis and aminopeptidase activity suggests they can release amino acids and play a key role in hydrolyzing bitter peptides, which can also contribute to the production of acetoin/diacetyl, thereby enhancing aroma and flavor, particularly during the ripening of specific cheeses. Regarding antifungal activity, strains of L.plantarum (10) and of Lactiplantibacillus sp. (1) showed good antifungal activity against Aspergillus niger IOC 207 and Penicillium chrysogenum IOC 132 in

two concentrations of spore suspensions. The antifungal activity of many LAB can be mediated by several pathways, and being facultative heterofermentative, they can produce many antifungal compounds such as organic acids, short-chain fatty acids, protein compounds, volatile compounds and others. Thus, the technological characterization and antifungal profile suggest that LAB isolates, mainly of L.plantarum strains, have potential as bioprotective cultures in future food applications.

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