Antioxidant properties of Streptococcus thermophilus, Lactiplantibacillus plantarum Levilactobacillus brevis strains isolated from Brazilian tropical fruits

Giselle Santos Silva[1], Emma Faucher[1,2], Gabriela Zampieri Campos[1], Emília Maria França Lima[1], Katia Leani[1], Svetoslav Dimitrov Todorov[1,3]

[1.] ProBacLab, Universidade de São Paulo, São Paulo 05508-000, Brazil;
[2.] AMU, Aix-Marseille University, Marseille 13006, France;
[3.] CISAS, Instituto Politécnico de Viana do Castelo, 4900-347 Viana do Castelo, Portugal;

Lactic acid bacteria (LAB) are renowned for their antioxidant properties, which play a crucial role in mitigating oxidative stress in the body. Oxidative stress arises from an imbalance between reactive oxygen species (ROS) and the body\'s ability to detoxify these reactive intermediates or repair the resulting damage. Excessive ROS can lead to cellular damage, contributing to various diseases, including cancer, cardiovascular diseases, and neurodegenerative disorders. LAB exhibit antioxidant activity through several mechanisms. They produce antioxidant enzymes such as superoxide dismutase (SOD) and can have pseudo-catalase activity, which neutralize ROS. Additionally, LAB can scavenge free radicals directly. For instance, strains like Lactiplantibacillus plantarum and Limosilactobacillus fermentum have demonstrated significant free radical scavenging abilities (Bryukhanov et al., 2022). Moreover, LAB can enhance the body\'s antioxidant defense by modulating the gut microbiota. They promote the growth of beneficial bacteria that produce short-chain fatty acids (SCFAs), which have anti-inflammatory and antioxidant effects. LAB also produce exopolysaccharides and other metabolites that contribute to their antioxidant capacity.

Streptococcus thermophilus L32, *Lactiplantibacillus plantarum* L3 and *Levilactobacillus brevis* L5 were isolated from Brazilian lemon, differentiated by repPCR and identified by biomolecular analysis, including partial sequencing of 16S rRNA. They were characterized regarding their antioxidants properties. Studied strains can be considered safe, based on the evaluation of hemolytic activity, degradation of mucin, susceptibility/resistance to antibiotics and production of the enzyme gelatinase. In addition, they can also be considered potentially beneficial based on their stability and survival in simulated gastrointestinal tract conditions (stomach and duodenum), ?-galactosidase production, diacetyl production and specific levels of hydrophobicity.

Recorded levels of DPPH in the studied strains ranged between 93.52% for *Lpb. plantarum* L3, 77.88% for *Lvb. brevis* L5, to 53.29% for *Str. termophilus* L32, indicating that antioxidant properties are strain specific, compared to the positive control, ascorbic acid (1 mg/mL) (74.80%). The beneficial attributes of these cultures to fermented food products may enable the reduction of chemical additives in line with consumers' demand for more natural and chemical-free food commodities.

Several studies have evaluated the DPPH antioxidant activity of *Str. thermophilus* with DPPH inhibition values ranging from 18.97% to 44.44%, indicating varying levels of antioxidant activity among the isolates (Kim et al., 2022). *Lpb. plantarum* showed significant DPPH radical scavenging activity, with some strains achieving scavenging percentages as high as 58.1%, or even comparable to those of ascorbic acid (Martiz et al., 2023). Research has shown that *Lvb. brevis* strains can achieve DPPH inhibition rates of up to 94.47%, making it one of the more effective LAB in terms of antioxidant potential (Won et al., 2021), while in different study was reported DPPH inhibition rates of 60.51% for *Lvb. brevis* (Qin et al., 2024).

The antioxidant properties of the studied strains can be applied to food preservation, reducing or even eliminating the need to use

chemical additives, providing healthier options for consumers.

References

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