Isolation and characterization of novel bacterial strains for the development of fermented plant-based products

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Abstract: In recent years, interest in fermented foods has grown significantly due to the benefits fermentation provides to nutritional, sensory, and bioactive profiles of final products. In Western countries, most fermented products are dairy-based. Meanwhile, growing demand for plant-based alternatives has driven the development of fermented plant-based beverages, which offer comparable nutritional and sensory benefits to animal-derived alternatives. However, bacterial strains used for fermentation are often derived from dairy products and may face challenges adapting to plant-based substrates. This highlights the need for novel strains specifically adapted to plant-based substrates, capable of improving fermentation efficiency. Along this line of research, this project focused on isolating and characterizing novel bacterial strains suitable for fermenting plant-based beverages, aiming to create products with optimal properties. After inoculating different plant-based drinks with the brine of homemade fermented vegetables, 35 lactic acid bacterial strains belonging to seven species (*Lactiplantibacillus paraplantarum, L. plantarum, Lactococcus lactis, Leuconostoc pseudomesenteroides, L. mesenteroides, Levilactobacillus brevis,* and *Loigolactobacillus coryniformis*) were isolated. The isolated strains underwent safety tests, including evaluations for antibiotic resistance, biogenic amine and D-lactic acid production. Following these assessments, 24 of the 35 strains were deemed safe for human consumption. These strains were used to ferment a soy-based beverage, selected for its nutritional profile and commercial availability. The technological and nutritional properties of the strains have been evaluated, including growth capacity, texture modification through soy protein coagulation, and utilization of fermentable sugars. Additionally, their phytase and protease activities were measured, along with their capability to convert glycosylated isoflavones into bioavailable aglycone forms and to alter the estrogenic activity of these compounds. Among the strains analyzed, those exhibiting the most favorable characteristics were selected. In conclusion, the selected strains not only exhibit excellent technological and nutritional properties but also highlight the potential for tailoring fermentation processes to plant-based substrates, overcoming the limitations of traditional dairy-derived cultures. These findings pave the way for the development of innovative, sustainable, and health-promoting plant-based fermented beverages that meet the growing consumer demand for alternative protein sources.