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A Comparative study of Submerged and Solid-State Fermentation of Rice Bran Using Rumen Isolate Lactic Acid Bacteria

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Structured Abstract

Background: As a byproduct of milling rice, tonnes of rice bran (RB) are produced annually, somehow it left underutilized due to its high insoluble fibre and lipid content and leads to pollution of the environment. The application of lactic acid bacteria (LAB) treated with RB has shown an enormous amount of potential in overcoming this issue. This study compares the efficiency of solid-state fermentation (SSF) and submerged fermentation (SmF) implementing LAB of rumen isolates to enhance the nutritional profile and functional characteristics of RB, and proves significant possibilities for future applications across numerous sectors.

Methods: The inquiry into the fermentation processes aspires to identify the best strategy for optimizing RB's potential as a nutrient-dense and sustainable resource. Total phenolic content (TPC) and antioxidant activity have been evaluated as indicators of fermentation efficiency. By identifying differences in the bioactive components and antioxidant potential of treated RB, these measurements determine whether or not the fermentation processes enhanced the nutritional and functional characteristics of RB. Additionally, an analysis using gas chromatography-mass spectrometry (GC-MS) was done to find compounds that are beneficial for the production of skincare and cosmetics production.

Results: However, the early research indicates that both fermentation procedures significantly increase RB's TPC and antioxidant activity. Compared to SmF, SSF showed a relatively higher increase in those characteristics. This indicates the bioactive potential of RB is more effectively released by SSF synthesis. The research also uses GC-MS to evaluate the metabolite profiles of fermented and non-fermented RB in order to provide an in-depth comprehension of the impacts of fermentation.

Conclusion: In conclusion, the development of skincare products could benefit from the enhanced TPC and antioxidant activity, along with the found beneficial components identified by GC-MS, due to the increased bioactive properties that have been proven to enhance skin health. This comparison study indicates SSF has more potential than SmF in improving the nutritional and functional characteristics of RB using LAB from rumen isolates. The results provide an environmentally friendly way to use agricultural waste and improve its value for a variety of industrial uses, such as food, medications, and cosmetics products in particular.

Keywords: Solid State Fermentation, Submerged Fermentation, Rice Bran, Total Phenolic Content, Antioxidant Activity

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