Title: Revealing the Potential Brewer's Spent Yeast: Sustainable Innovations for Alternative Protein Development and Waste Reduction in the Agri-Food Sector

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**Abstract**

Background: Brewer's spent yeast (BSY), the second most significant by-product of the brewing industry, represents an abundant biomass resource with considerable environmental implications due to its annual accumulation. This study aims to valorize BSY by-products producing differentiated functional extracts that can be used to formulate protein-rich snacks. By enhancing the value of this by-product, the research aims to promote sustainable practices within the agri-food sector and introduce novel natural ingredients for developing alternative protein food products. Methods: The experiments were conducted at a pilot scale, starting with an initial yeast mass of 200 L. A pre-treatment procedure involving washing and centrifugation was implemented to eliminate residual microorganisms, suspended material, and certain bitter compounds. Subsequently, BSY underwent an integrated process to produce peptide extracts. This process involved inducing autolysis through heat treatment to facilitate the hydrolysis of yeast extracts. Following centrifugation, the resulting liquid fraction was subjected to membrane filtration with different cut-off points (40 and 10 kDa) to generate distinct fractions. The extracts were then freeze-dried and underwent physicochemical characterization. The most promising extract was used to develop prototypes for savory snacks, with evaluations focusing on parameters such as color (using the CIELAB color system), texture, and water activity. Results: The derived fractions demonstrated high protein content along with significant amounts of minerals and fiber. Furthermore, the successful formulation of protein-rich savory snacks demonstrated the feasibility of repurposing these extracted fractions as functional ingredients in the production of high-protein products for human consumption. Conclusion: This research highlights the potential of using BSY by-products to create value-added ingredients and products, thereby advancing sustainability goals and aligning with the principles of the circular economy in the food industry.

**Keywords**: BSY by-product, membrane filtration, peptide extracts, functional ingredients, circular economy.

**Topic**: APP (Alternative Protein  Production for human consumption)

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