

Developing a High-Protein Fruit Puree using Co-products from Agro-food Processing

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In the last years, we have been witnessing an increase in the challenges of the global food system due to population growth, resource shortage and environmental problems. The linear economic model is contributing to waste generation and it is not considered sustainable. Circular economy, on the other hand, is based on closed-loop systems that simultaneously minimize environmental impact and still have economic value. Agro-food byproducts and co-products often have valuable nutrients and bioactive compounds that can be incorporated into novel food products, thus contributing to the circular economy. In addition, consumer demand for protein-rich foods continues to increase and this fact has to be taken into consideration when developing new food products.

In this study, a high-protein fruit puree was developed using primarily agro-food co-products. Apple pomace, a fiber-rich residue from juice production, was selected as the main matrix component due to its content of dietary fiber, micronutrients, and phenolic compounds. To enhance the protein content, rice okara (a co-product of rice milk production) was incorporated. Additional ingredients included lemon juice (as a natural preservative and flavor enhancer), xanthan gum (as a stabilizer), and water. Several formulations were prepared varying the proportions of the main components, and the samples were subjected to physicochemical (pH, °Brix, water activity), nutritional (proximate composition including protein content), and sensory analyses (flavor, texture, appearance). The formulation was optimized to achieve a balanced nutritional profile while preserving favorable sensory attributes. Subsequently, a second formulation phase was carried out to explore the potential for further protein enhancement. In this stage, the proportion of rice okara was increased, and banana was introduced as a natural sweetener and flavoring agent to compensate for potential sensory alterations. The results confirmed that it is possible to significantly improve the protein content without negatively affecting the sensory acceptability of the final product. This work demonstrates that, by valorizing co-products, we have created a food product with low environmental impact while meeting the consumer demand for protein-rich foods.