Fostering the Transition to Sustainable Food Systems:
Embracing Novelty and Overcoming Challenges

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**Aim:**
The valorization of rice okara by-products for food applications remains underexplored. This study aimed to evaluate the functional potential of four rice okara flours produced by SimpleYeast: dehydrated (OAD), thermally treated (OAT), enzymatically treated 1 (OAE1), and enzymatically treated 2 (OAE2), and their application in the development of protein-enriched salty crackers.

**Method:**
Physicochemical and functional properties of the flours were determined: protein content, color parameters (L*, a*, b*), water activity (aw), moisture, water and oil holding capacity, solubility, and degree of hydrolysis (TNBS assay). Salty crackers were formulated incorporating 15% of each flour type (CD, CT, CE1, CE2). Consumer acceptance was assessed through sensory analysis by untrained panellists.

**Results:**
The thermal and enzymatic treatments influenced color and water activity. ANOVA showed significant differences in L* values ($p < 0.001$), with OAE2 (enzymatic treatment 2) being markedly darker ($43.9 \pm 1.0$) and more yellowish ($b^* = 21.1 \pm 0.8$) compared to OAD ($64.8 \pm 1.0$; $9.5 \pm 0.1$), OAT ($58.8 \pm 0.7$; $10.1 \pm 0.1$), and OAE1 ($54.7 \pm 0.5$; $11.3 \pm 0.2$). a* values were also highest for OAE2 ($8.2 \pm 0.4$). Water activity differed significantly ($p < 0.001$), with OAE2 having the highest value ($0.5 \pm 0.0$), compared to 0.3–0.4 in the other samples. Enzymatic treatments enhanced solubility and hydrolysis degree. All flours maintained high protein content (~70%). High-protein salty crackers (~20%) produced with thermally treated okara (CT) received the highest overall consumer preference, followed by CE2 (enzymatic treatment 2), CE1 (enzymatic treatment 1), and CD (dehydrated). All prototypes were positively accepted and considered appealing, with higher scores for versions with treated flour.

**Conclusion:**
The study demonstrated that rice okara flours can be effectively valorized into high-protein functional ingredients for food applications. Thermal and enzymatic treatments improved functional properties and consumer acceptability of crackers, with thermally treated okara showing the best sensory performance. These results highlight the potential of these sustainable ingredients in the development of protein-rich snack products.