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Editorial: High value utilization of waste in food processing

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Editorial on the Research Topic
High value utilization of waste in food processing

1 Introduction

High value utilization of waste in food processing is an important aspect of sustainable development and environmental protection (Ravindran and Jaiswal, 2016). It involves converting various waste materials generated during food processing into valuable products or resources, thereby reducing the environmental impact of waste disposal and promoting economic growth (Saba et al., 2023). One significant area of high value utilization is the recycling of food waste into compost or biofertilizers (Hamilton et al., 2015). Organic waste from food processing, such as vegetable scraps and fruit peels, can be composted to create a rich soil amendment that can be used in agriculture. This not only reduces the need for chemical fertilizers but also improves soil health and crop yields. Another example is the extraction of valuable components from waste streams (Chan et al., 2018). For instance, oils and fats from cooking waste can be recovered and used as biofuels or in the production of soaps and detergents. Similarly, proteins and carbohydrates from food waste can be extracted and used in the production of animal feed or bioplastics. Furthermore, waste from food processing can also be used to produce energy (Pagliano et al., 2017). Through processes such as anaerobic digestion or incineration, organic waste can be converted into biogas or energy-rich fuels that can be used to power factories or provide heat for buildings. In addition to these direct utilizations, food waste can also be used in innovative ways to create new products. For example, some companies are developing technologies to convert food waste into bioplastics, which can be used as an alternative to traditional petroleum-based plastics (Acquavia et al., 2021).

Overall, high value utilization of waste in food processing offers numerous benefits, including reducing environmental pollution, conserving resources, and promoting economic growth. Advanced technologies including multiple fermentation, countercurrent extraction, electrodialysis, capsule embedding, and artificial intelligence production lines, can effectively optimize the processing technology as a result of advancements in food processing technology (Shen et al., 2019). Future efforts should continue to intensify research and development, promote the widespread application of these technologies, and contribute to the construction of a green, low-carbon, and circular economic model.

2 An overview of published articles

The study by Feng et al. focused on analyzing dietary fibers (DF) extracted from papaya peel (PP) and seed (PS) using three extraction methods: acidic, enzymatic, and alkaline. Characterization of these DF samples was conducted using various techniques including SEM, FT-IR, XRD, thermal and rheological analyses, and monosaccharide composition determination. Results indicated that DF extracted via the acidic method exhibited looser and more intricate structures, while enzymatically extracted DF demonstrated superior thermal stability. Additionally, the extraction method influenced the monosaccharide composition of the DF. Notably, DF extracted through the acidic method demonstrated elevated functional and antioxidant properties. This study provides a comprehensive analysis of DF derived from papaya peel and seed using multiple extraction methods. The application of advanced analytical methods provides a detailed insight into the structural and functional attributes of these fibers. The discovery that acidic extraction produces DF with remarkable functional and antioxidant properties holds importance, indicating potential health advantages upon integration into food formulations. Overall, the research is well-designed and executed, paving the way for further exploration of papaya-derived DF in functional food applications.

The study by García-Ramón et al. centered on enhancing the extraction of phenolic compounds from avocado Hass peels in Peru, a region producing a substantial quantity of avocado by-products. The primary objective of the study was to assess the impact of various process variables on the extraction yield, total phenolic content, total flavonoid content, and antioxidant capacity of the extracts. Additionally, the investigation involved the analysis of phenolic compounds and the evaluation of antioxidant capacity. The findings of the study indicated that the extraction conditions exerted a significant influence on the desired outcomes, particularly in the case of unripe avocado peels extracted using 40% ethanol at 49.3°C and a specific solvent-to-feed ratio, which resulted in the highest levels of phenolic and flavonoid content, as well as potent antioxidant properties. The main phenolic compounds identified in the extracts were vanillic acid and 4-hydroxyphenylacetic acid. The findings highlight the potential of avocado peels as a valuable source of natural antioxidants, offering a sustainable and healthier option to synthetic antioxidants in the food industry. This study not only contributes to reducing waste but also presents opportunities for enhancing the value of agricultural by-products, thereby benefiting both the environment and the economy.

The study by Piayura et al. focused on the development of an expanded snack utilizing Riceberry rice flour and dried coconut meal, a byproduct of coconut milk processing, via a twin-screw extruder. A factorial design was utilized to examine the effects of varying feed moisture levels and quantities of dried coconut meal on the physicochemical, functional, and sensory characteristics of the snack. Key findings included the impact of moisture and dried coconut meal on viscosity, expansion, color, texture, and antioxidant properties of the extruded snacks. The findings are valuable for the food processing industry, specifically in the realm of enhancing the utilization of agricultural byproducts such as dried coconut meal. In addition to analyzing physicochemical properties, the research also delves into sensory attributes, a key factor in consumer approval. Overall, the research is well-designed, comprehensive, and has practical implications for the development of healthy and sustainable snack options.

The study by Chen et al. presented a novel approach for the production of extracellular polymeric substances (EPS) and iron or copper complex from glutinous rice processing wastewater, which is both environmentally friendly and economically viable. This study initially isolated an EPS-producing bacterium from marine sources utilizing glutinous rice processing wastewater, subsequently investigating the application of EPS as a carrier for the synthesis of EPS-iron (EPS-Fe) and EPS-copper (EPS-Cu) complexes. Furthermore, this study determined the optimal conditions for synthesizing EPS-Fe and EPS-Cu, followed by a comprehensive characterization of both compounds. The results demonstrated the potential of EPS-Fe and EPS-Cu as a new type of comprehensive essential trace mineral supplement, offering a safer alternative to inorganic trace minerals. The study also highlighted the antioxidant and antiproliferative properties of these complexes, suggesting their possible use in health supplements or functional foods. Overall, this work offers a promising approach to mitigating environmental contamination from glutinous rice processing wastewater by producing valuable organic metal complexes. This, in turn, could enable the widespread production and utilization of organic metal complexes as dietary supplements, feed additives, or fertilizer enhancers.

The study by Miloradovic et al. conducted an analysis of goat whey sourced from two distinct origins: the market (produced in small and large dairy facilities) and a laboratory (derived from goat milk heated at different temperatures). The samples were subjected to comprehensive analysis including gross composition, pH, protein content, mineral composition, and microbial examination. Findings revealed that the protein composition of whey was influenced by the applied heat treatment, while the mineral content was determined by the type of coagulation. Particularly noteworthy was the observation that acid whey exhibited significantly higher concentrations of calcium and zinc compared to sweet whey. This study provides a comprehensive analysis of goat whey from different sources and heating conditions. The use of statistical methods such as analysis of variance (ANOVA) and principal component analysis (PCA) adds rigor to the data interpretation. The finding that heat treatment does not affect Ca and Mg content in goat whey, unlike cow milk, is particularly interesting and may have implications for the dairy industry. The study also highlights the consistency in quality between small and large scale market goat whey, despite differing legal requirements, which is reassuring for consumers. Overall, the research is well-designed and presents valuable insights into the properties of goat whey.

The review by Alqahtani et al. focused on date press cake (DPC), a significant by-product of the date honey or syrup industry in the Middle East, North Africa, and Southwest Asia. This article explored the potential uses of DPC in various food and non-food applications, discussing its chemical composition, nutritional value, functionality, current usages, as well as limitations and future trends. Given the large amount of waste generated in date processing, finding value-added uses for DPC is environmentally

and economically beneficial (Al-Khalili et al., 2023). The article successfully outlines the current state of DPC utilization and the need for further research to fully harness its potential. By discussing limitations and future trends, it paves the way for further exploration and innovation in this field. Overall, this is a valuable resource for researchers and industry professionals interested in sustainable waste management and value-addition in the date palm industry.

3 Conclusions

In summary, the six contributions published in this Research Topic provide insights into the high value utilization of waste in food processing. These articles explored the potential application value of various food processing by-products, including papaya peel and seed, avocado Hass peels, dried coconut meal, glutinous rice processing wastewater, goat whey, and date press cake. As technologies continue to advance, we can expect to see even more innovative and sustainable solutions for managing and utilizing food processing waste in the future.

Author contributions

ZC: Writing – original draft, Conceptualization. MW: Writing – original draft. YW: Writing – original draft. JT: Writing – review & editing. ZL: Writing – review & editing, Conceptualization.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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