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THE REUSE OF FOOD BY-PRODUCTS TO FORMULATE ENRICHED FOODS

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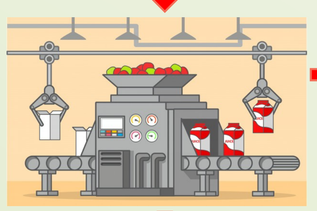
Introduction

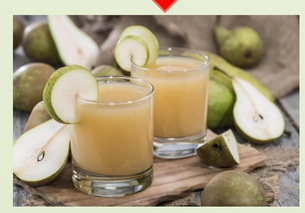
Food industry annually produces tons of by-products during processing of fruit and vegetables. Rather than throw them, it is possible to recycle them because these by-products are rich in bioactive compounds and therefore, to embrace the concepts of the circular economy, can be turned in new raw materials with antimicrobial and antioxidant properties.

The approaches utilized for by-product recycle **are mainly two**: (i) **the partial re-utilization** of peel, seed, leaves etc. or their extracts in new food formulation; (ii) **the complete adoption of all by-products** to produce new food, without generating any waste (**zero-waste approach**). An overview of by-products recycle in the last 10 years is presented.

Raw material

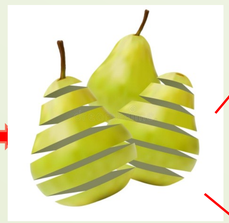


Production process



Final product

By-products



Partial recycle of by-products

Recycle

Total recycle of by-products

Overview of by-product recycle in the last 10 years

By-products

Food fortified with by-products

Approach for by-product recycle

Total re-utilization (Zero Waste)

- Muffins with overripe banana powder (pulp and peel) replacing wheat flour
- Rind, pulp and juice of watermelon used to produce jelly candies
- Whole banana flour obtained from unripe fruit to enrich fat-reduced sausages

Partial re-utilization

- Dried grape pomace used in chocolate spread; Grape pomace powder added to cakes
- Olive pomace extract to fortify pear juice; Sponge cake fortified by olive stone powder
- Fermented sheep milk-based dairy products obtained using milk and whey

Future Trends

Through the critical analysis of the numerous case-studies reported in the most recent scientific literature, it can be concluded that **the addition of by-products** to food **could improve the nutritional properties and/or enhance food shelf life.** In particular, a better content in polyphenol and high antioxidant activity were found, when by-products are added to food. Both approaches, total *(zero-waste)* and partial re-utilization *of by-products* are valid examples of sustainable efforts to reduce food waste and develop new food with functional properties; however, by-products in food are still limited. The main reasons are related to: **unavailability of food by-products at industrial level,** food **sensory quality** (by-products often compromise product acceptability), **consumer psychology** (customer is not ready to consume food with by-products) and lack of **production process updating.** Possible solutions come from a multidisciplinary approach, aimed to educate the stakeholder of supply chain and final consumers about food value and environmental impact of food. It will be also essential to provide financial support to the companies to improve the system. Finally, the legislative gap about food safety and by-products recycle must be filled.

References

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