frontiers | Frontiers in Sustainable Food Systems

TYPE Editorial
PUBLISHED 19 July 2024
DOI 10.3389/fsufs.2024.1457532

OPEN ACCESS

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RECEIVED 30 June 2024
ACCEPTED 10 July 2024
PUBLISHED 19 July 2024

CITATION
Madera-Santana TJ, Barreras-Urbina CG, Rodríguez-Félix F and Ancín M (2024) Editorial: Green technologies for the extraction of bioactive compounds, its use for the production of nanomaterials, and their application in the food industry.
Front. Sustain. Food Syst. 8:1457532.
doi: 10.3389/fsufs.2024.1457532

Editorial: Green technologies for the extraction of bioactive compounds, its use for the production of nanomaterials, and their application in the food industry

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KEYWORDS

bioactive compounds, nanotechnology, food industry, nanomaterials, green extraction

Editorial on the Research Topic
Green technologies for the extraction of bioactive compounds, its use for the production of nanomaterials, and their application in the food industry

New technologies aimed at obtaining several compounds applicable in food and other industries have garnered significant interest in recent decades due to the wide benefits these compounds provide (Huguet-Casquero et al., 2021). The extraction processes of different bioactive compounds have been extensively studied, aiming to minimize the loss of these compounds during processing and increase yield (Usman et al., 2022). Some of the compounds and methods studied include the extraction of phenolic compounds and tannins through solvent extraction, aqueous extraction, Microwave-Assisted Extraction (MAE), Soxhlet, and Ultrasound-Assisted Extraction (UAE), among others (Kumar et al., 2021; Rodriguez Garcia and Raghavan, 2022). However, several authors have focused on experimental research with new extraction methods.

Green extraction techniques are classified as new methods for the sustainable extraction of various bioactive compounds (Soquetta et al., 2018; Rodriguez Garcia and Raghavan, 2022). They have the advantage of using less extraction time and solvent, thus reducing energy consumption. Due to these characteristics, several authors have classified them as clean extractions, meaning that they do not cause considerable damage to the environment compared to conventional extractions (Soquetta et al., 2018; Rodriguez Garcia and Raghavan, 2022). Current research is taking advantage of nanoscience and nanotechnology to produce nanomaterials capable of encapsulating or protecting bioactive compounds for potential applications, especially in the food industry, but also in other areas (Majumdar et al., 2020).

Recently, several techniques for the encapsulation or entrapment of bioactive compounds have been studied. The aim is to protect the bioactivity of these compounds for potential applications in the food industry, such as antioxidants and antimicrobials, among others. Also, it is important to maintain their stability, and ensure their protection and functionality (Majumdar et al., 2020; Huguet-Casquero et al., 2021).

The nature of the raw material is considered in both the matrix and the core of the nanoparticle (Tavares et al., 2021). The particle size and the physical and chemical characteristics of the material are evaluated for potential applications. These characteristics guide researchers in choosing the appropriate technique, considering all aspects of the material and, above all, its potential application (Tavares et al., 2021). Techniques recently used for the fabrication of nanomaterials can be classified as mechanical, chemical, and physicochemical (Tavares et al., 2021). Examples of mechanical techniques are spray drying, spray cooling, and supercritical fluid. Furthermore, examples of chemical techniques are *in situ* polymerization and molecular inclusion; meanwhile, examples of physicochemical techniques are coacervation, ionic gelation, and emulsification (Tavares et al., 2021).

On the other hand, researchers have been focused on the study of the encapsulation of bioactive compounds in nanostructures due to their potential applications in nanofood preservation, packaging, functionality, and safety (Ansari, 2023).

Both green extraction technologies for bioactive compounds and their encapsulation through nanotechnology for potential application in the food industry are important for food security and safety. The global population demands more food, generating waste that must be reduced. Available food must be maximized, and food processing must be improved and enriched (Ansari, 2023).

The aim of Research Topic was to present and highlight new alternatives for the extraction of bioactive compounds, their processing, and potential application in nanomaterials and food-related industries, as well as the relationship between bioactive compounds and their potential application in various areas of the food industry.

Cannas et al. focused their study on the green extraction of phenolic compounds from "*Spinoso sardo*" globe artichoke using two green extraction methods. The authors mention that their results can have an impact from environmental, economic, and social points of view, centered on reducing the problems involved in the extraction of bioactive compounds by conventional methods.

Morsy et al.'s development of nanoparticles with curcumin as an encapsulated bioactive compound was published, highlighting the effectiveness of these nanoparticles at different concentrations. They also select the ideal concentration where the effects with various biological activities are observed, particularly for consideration in the food industry, specifically in the meat industry.

Isidro-Requejo et al. published an article about the extract of the tomato plant (*Lycopersicon esculentum*), where they studied its antifungal activity. After several lab tests, they found that this extract has interesting biological activities for potential application in the food industry, specifically against various genera of fungi involved in food and minimally processed foods, as well as in the pharmaceutical industry.

Zhang and Ye studied the combination of two methodologies for obtaining and improving jujube kernel properties. The approaches in these articles align with the objective of employing innovative methodologies with a tendency toward green extractions, and their implementation in food and various materials with potential applications in food, as well as the modification of the jujube kernel fiber to improve its physicochemical properties.

Green processes for the extraction of bioactive compounds and their application as encapsulants for the industry, especially the food industry, are innovative methodologies that are in constant progress. The results of research related to these processes tend to mark important findings that motivate other researchers to improve the materials used and provide advantages besides to those that already exist. Therefore, this Research Topic includes articles related to bioactive compounds, nanomaterials, and their potential use in the food industry.

Author contributions

TM-S: Conceptualization, Writing – review & editing. CB-U: Writing – original draft, Writing – review & editing. FR-F: Writing – review & editing. MA: Writing – review & editing.

Funding

The author(s) declare that no financial support was received for the research, authorship, and/or publication of this article.

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.

Publisher's note

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