

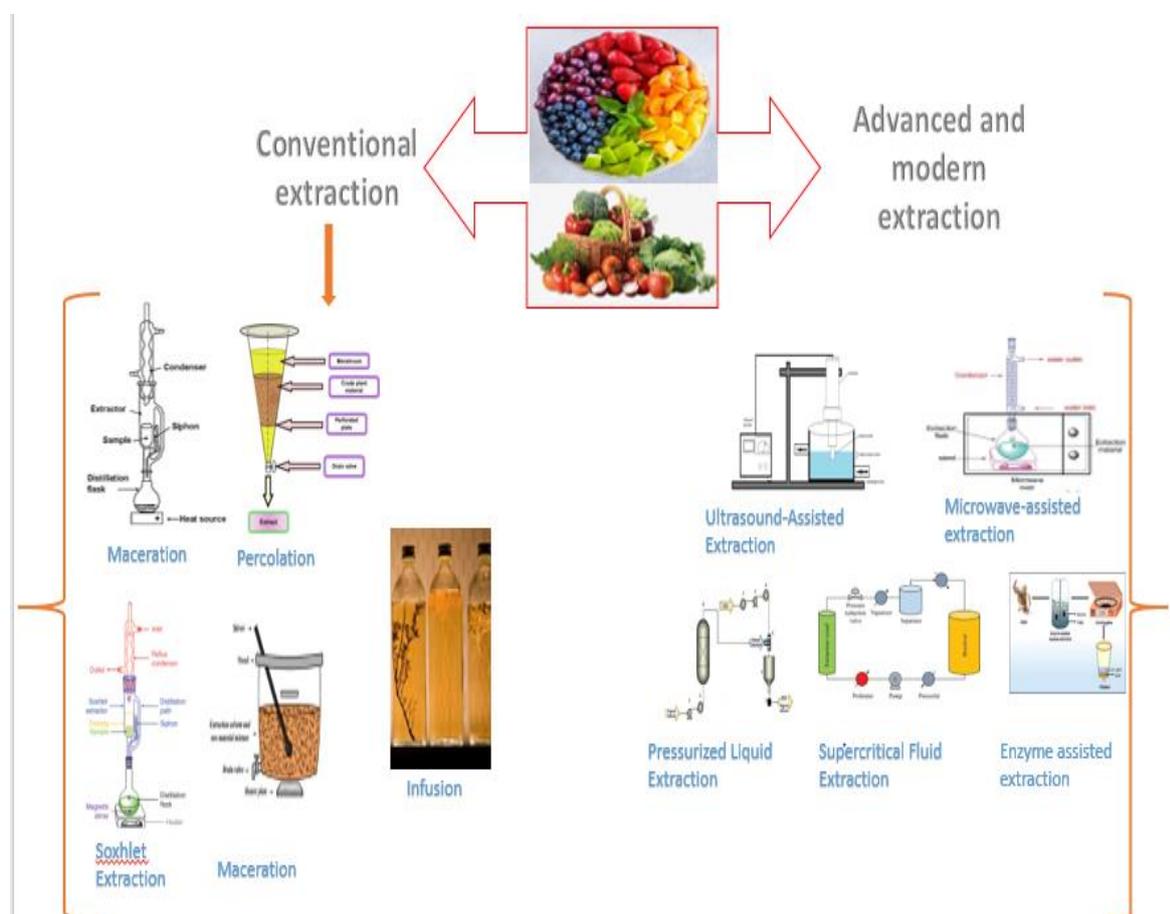
Technological advances in the study of bioactive compound

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Graphical Abstract



Abstract

Bio-active compounds are secondary metabolites derived from a variety of sources, including plants, fungi, microbes, and animals. These substances are used in the food and pharmaceutical industries in addition to having pharmacological and toxicological impacts on living things. Their application has been extended into fields like cosmetics, functional biomaterials, bioremediation, and alternative fuels due to recent discoveries of their unique features. Greener alternatives including ionic liquids,

supercritical fluids, and deep eutectic solvents are gradually replacing conventional extraction methods, which are frequently laborious and excessively dependent on solvents. Furthermore, novel extraction techniques aided by pressure, ultrasound, enzymes, pulsed electric fields, microwaves, or pulses are becoming more popular. In order to foster an environmentally friendly circular economy, these developments, along with improvements in characterisation and optimization approaches, have increased the commercial viability of extracting bio-active chemicals, particularly from organic residues and agricultural waste. Recent developments in metabolic engineering, nanoencapsulation, optimization modeling, and microfluidics are expected to solve current issues in the field, improving the stability and functionality of bio-active compounds and increasing the extraction procedures' efficiency and cost-effectiveness while protecting biodiversity. The numerous extraction and characterization methods for bioactive substances are summarized in this study, along with their important uses in food, medicine, chemicals, energy, and bioremediation, as well as their main drawbacks and possible areas for development.

Keywords: Bio-active compounds, extraction, industrial applications, pharmaceuticals, characterization.

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