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Green approaches for enhancing bioavailability of antioxidants in food systems and heath products

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Abstract

The growing demand for nutraceuticals and functional foods has necessitated the development of sustainable and efficient processing strategies that enhance the bioavailabilities of bioactive compounds while ensuring safety and environmental compatibility. Conventional extraction methods such as Soxhlet extraction, steam distillation, and solvent extraction suffer from limitations including solvent toxicity and thermal degradation of valuable phytochemical compounds. Green approaches such as gamma irradiation, ultrasonication-assisted solvent extraction, and supercritical CO_2 extraction are inadvertently safer and more efficient alternatives that preserve antioxidant activity and improve product quality [1]. Unique applications of the said technologies have been researched upon including extension of shelf lives and enhancement of antioxidant contents in agro commodities (such as corn grits, button mushrooms, tomatoes, marigold, and tuberose flowers); and their successive utilization in design and development of antioxidant-rich 'green' food products while maintaining their natural antioxidant synergy [2,3,4,5,6,]. *In vivo* bioavailability studies in animal models have also been performed to confirm that the designer antioxidant-rich 'green' food products are truly so [7, 8]. In the pursuit of development of innovative nutraceutical and therapeutic products, advanced delivery systems such as nanoencapsulation have also been investigated for improving stability, targeted delivery, and sustained release of the bioactive compounds [9, 10, 11].

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