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ABSTRACT BOOK

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Electrospun Nanofiber Oral Films of Buckwheat Rutin: Overcoming Solubility Limitations and Enhancing Biological Performance

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Abstract:

Fagopyrum esculentum Moench (buckwheat) is a pseudocereal widely valued for its rich content of bioactive compounds, including flavonoids, phenolic acids, and dietary fiber. Among these, rutin is one of the most abundant and biologically active constituents, contributing to the pronounced antioxidant, anti-inflammatory, antimicrobial, and neuroprotective properties of buckwheat. Promising biological profile is offset by challenges in nutraceutical use, primarily its low solubility in water and restricted oral bioavailability. Electrospun polymeric nanofibers have emerged as a promising strategy to overcome these challenges by enhancing dissolution and bioavailability of rutin, thereby broadening its potential application as a nutraceutical ingredient with relevance for longevity and healthy aging.

In this study, a lyophilized buckwheat extract was standardized for rutin content using HPLC, with rutin identity further confirmed through FTIR derivative analysis. The lyophilizate was incorporated into electrospun oral films composed of polyvinylpyrrolidone K30 (PVP K30) and polyvinyl alcohol (PVA) at varying polymer ratios. The resulting nanofibers underwent comprehensive physicochemical characterization and in vitro evaluation of release. FTIR analysis revealed intermolecular interactions between rutin and the polymeric carriers, confirming successful encapsulation. Scanning electron microscopy (SEM) verified the nanofibrous morphology of the oral films, while X-ray powder diffraction demonstrated that rutin was present in an amorphous state. Dissolution studies in simulated saliva showed a significant enhancement in rutin release, highlighting the potential of electrospun oral films as a promising delivery system for rutin.

These findings suggest that electrospun PVP K30/PVA nanofibrous oral films represent an effective delivery platform for rutin present in buckwheat, ensuring enhanced dissolution and supporting its potential application in nutraceuticals.