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ORIGINAL RESEARCH ARTICLE

Fabrication and characterization of CNF/PLGA nanocomposite system for encapsulation of bacoside A_3

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ABSTRACT

The inception of nanocellulose-based biodegradable polymeric composites has accomplished astounding application in constructing superior biomaterials. The featuring characteristics of nanocellulose like bio-compatibility, low-cost production, abundance, and toxic-free nature, have paved the way for application in drug delivery. The stability and sustainability of medicinally important constituents of the herbs are also a major concern for the phytopharmaceuticals and nutraceutical industries. Hence, the goal of the present study was to fabricate a composite system of cellulose nanofiber/poly-lactic-co-glycolide (CNF/PLGA) to encapsulate Bacoside A_3 (BA_3) of Bacopa monnieri plant extract. The stability and sustained release of BA_3 at three different pH conditions from the fabricated system were evaluated for its application in the nutraceutical industry. The CNF/PLGA composite system had more storage stability (64%) of BA_3 than pure Bacopa extract (47%) for 45 days. The fabricated composite system maintained the antioxidant properties of Bacopa extract. The release of BA_3 was sustained in the CNF/PLGA matrix for up to 24 hours (pH = 9) compared to the control. The release kinetics implies that the BA_3 was effectively restrained in the CNF/PLGA nanocomposite matrix and follows the Korsmeyer-Peppas model and anomalous diffusion mechanism. The hydrolysis of PLGA and mechanical strength of CNF would be responsible for the sustained release of BA_3 from the composite system. In summary, the Bacopa extract CNF/PLGA composite system could be an option for the nutraceutical/pharmaceutical product with improved stability and sustained release of its active constituents.