Development of gliadin based electrospun nanofiber carriers for colloidal delivery of curcumin: Characterization of morphological, fluorescence, molecular, thermal, crystallographic and bioactive properties

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In this work, the feasibility and potential of food-grade gliadin nanofiber as a delivery vehicle for curcumin were investigated. By optimizing the electrospinning parameters, homogeneous and fine gliadin nanofibers containing different amounts of curcumin were fabricated. It was observed that gliadin micro-nanoparticles were gradually transformed to gliadin nanofibers depending on an increase in gliadin concentration, thus which gave rise to fabrication of thicker nanofibers. The electrospun nanofibers were characterized in terms of morphological, molecular, thermal and crystallographic properties. As a result, the nanofibers were nearly uniform with smooth surface and had an average diameter ranging from 258 to 375 nm. Encapsulation efficiency of gliadin nanofibers increased with increase in curcumin loading, which was also confirmed by X-ray diffraction patterns revealing that the most part of curcumin could be encapsulated in gliadin nanofibers. *In vitro* assessments indicated that the curcumin loaded gliadin nanofibers showed controlled release of curcumin and protected its free radical scavenging ability. Also, these nanofibers provided well antibacterial activity against *Staphylococcus aureus* and *Escherichia coli*.

Furthermore, the encapsulation of curcumin within nanofibers conspicuously enhanced bioactive properties of curcumin; namely, antioxidant activity of the nanofibers. The results suggested that the gliadin nanofiber could be an available carrier for delivery of curcumin and has the potential for applications in food industry and other bioactive delivery systems.

Keywords: Electrospinning, curcumin, gliadin, nanocarrier, nanofiber, encapsulation

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