1. Abstract:

The present study aimed to formulate and evaluate chitosan–jute leaf polysaccharide (JLP) based nanoparticles for the encapsulation and delivery of Diclofenac Sodium, a widely used non-steroidal anti-inflammatory drug (NSAID). The combination of chitosan and JLP, both natural biopolymers, was chosen for their excellent biocompatibility, biodegradability, and mucoadhesive properties, enhancing drug delivery potential. The nanoparticles were synthesized through ionic gelation and characterized using techniques such as Fourier Transform Infrared Spectroscopy (FTIR), Field Emission Scanning Electron Microscopy (FE-SEM), Particle Size Analysis, and Zeta Potential Measurement. FTIR analysis confirmed the successful incorporation of Diclofenac Sodium into the polymer matrix without significant chemical interactions. FE-SEM revealed submicron-sized particles with irregular morphology, while dynamic light scattering showed a bimodal distribution with an average hydrodynamic diameter of 821.3 nm. The zeta potential of −2.4 mV indicated low colloidal stability. Drug content analysis demonstrated acceptable drug loading across batches. Differential Scanning Calorimetry (DSC) confirmed the physical compatibility and stability of the drug within the nanoparticle system. Dissolution studies indicated a sustained release profile of Diclofenac Sodium from the nanoparticle formulation. The results collectively demonstrate that chitosan–JLP nanoparticles provide a promising platform for the controlled delivery of poorly water-soluble drugs, offering improved bioavailability and therapeutic efficacy.