1.1 Abstract:

The present study focuses on the formulation and evaluation of diclofenac sodium-loaded chitosan-pectin nanoparticles. Diclofenac sodium, a widely used non-steroidal anti-inflammatory drug (NSAID), is known for its effectiveness in pain and inflammation management. However, its therapeutic efficacy is often limited by poor solubility and gastrointestinal side effects. To overcome these challenges, we have developed a novel nanoparticulate delivery system using chitosan and pectin as biopolymers. Chitosan, a natural polysaccharide, provides excellent biocompatibility and mucoadhesive properties, while pectin, another polysaccharide, enhances the stability and controlled release of the drug. The nanoparticles were prepared using the ionotropic gelation method, and various parameters such as particle size, zeta potential, drug loading capacity, and encapsulation efficiency were optimized. Characterization of the nanoparticles was conducted using techniques such as light scattering method, scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR), and Powder X-ray diffraction(P-XRD). The in vitro release profile of diclofenac sodium from the nanoparticles was studied in simulated gastrointestinal fluids, demonstrating a sustained release pattern over 24 hours. The anti-inflammatory efficacy of the formulated nanoparticles was evaluated using in vivo models, showing significant improvement compared to the free drug. Cytotoxicity studies indicated that the nanoparticles were biocompatible and safe for use. In conclusion, the diclofenac sodium-loaded chitosan-pectin nanoparticles present a promising approach for enhancing the solubility, stability, and therapeutic efficacy of diclofenac sodium while minimizing its adverse effects. This novel drug delivery system has the potential to improve patient compliance and treatment outcomes in inflammatory conditions.