DEPARTMENT OF PHARMACEUTICAL TECHNOLOGY
398, Ramkrishnapur Rd, Near Jagadighata Market, Barasat, Kolkata, West Bengal 700125, India

ABSTRACT

Flavonoids are naturally occurring polyphenolic compounds known for their wide range of therapeutic properties, including antioxidant, anti-inflammatory, and anticancer activities. However, their clinical application is often limited by poor aqueous solubility, low stability, and limited bioavailability. This study aims to address these challenges by formulating and evaluating protein-based nanocarriers encapsulating flavonoids for controlled release applications. Proteins such as albumin and casein, owing to their biocompatibility, biodegradability, and ability to interact with flavonoid molecules, were selected as the nanocarrier matrix. Nanoparticles were prepared using ionic gelation and desolvation techniques, and optimized formulations were characterized for particle size, zeta potential, morphology, drug entrapment efficiency, and in vitro release profile. The optimized flavonoid-loaded protein nanoparticles exhibited uniform spherical morphology with particle sizes ranging between 100–200 nm, high entrapment efficiency (>80%), and a sustained release of flavonoids over 24 to 48 hours. Additionally, stability studies demonstrated the physical integrity of nanoparticles under physiological conditions. Preliminary biological evaluations revealed enhanced antioxidant activity of the encapsulated flavonoids compared to their free counterparts. This research highlights the potential of protein-based nanocarriers in overcoming the delivery barriers associated with flavonoids, offering a promising platform for sustained and targeted drug delivery. The findings open avenues for the development of nutraceuticals and therapeutic agents using natural bioactive compounds in nano-formulations for improved clinical efficacy.

Keywords: Desolvation technique, Nanoparticles, Flavonoids, Nano formulation, Anti-inflammatory, Antioxidant.