Gels Horizons: From Science to Smart Materials

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Polymer Gels

Perspectives and Applications

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Chapter 14
Gelled Microparticles/Beads of Sterculia Gum and Tamarind Gum for Sustained Drug Release

Amit Kumar Nayak, M. Saquib Hasnain and Dilipkumar Pal

Abstract In recent years, a variety of biocompatible natural polysaccharides are extensively investigated as pharmaceutical excipients in designing various pharmaceutical formulations. Among these, sterculia gum and tamarind gum have emerged as two popular biopolymer candidates, which have found their applications in designing of various sustained drug releasing dosage forms. Presently, both sterculia gum and tamarind gum have been employed to design oral multiple unit sustained release systems such as microparticles, beads. The present chapter deals with a helpful and comprehensive discussion on already reported different microparticles/beads made of sterculia gum and tamarind gum, which have shown a promise in sustained drug releasing capacity over a longer period after oral administration. This chapter should be helpful in applying appropriate strategies or achieving desired controlled sustained drug release profiles from microparticles/beads made of sterculia gum and tamarind gum.

Keywords Sterculia gum · Tamarind gum · Sustained drug release
Microparticles · Beads

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1 Introduction

Recently, the majority of the population is in the favor of the consumption of naturally derived materials and their utilizations as excipient in food and biomedical applications (Pal and Mitra 2010; Pal et al. 2012; Nayak and Pal 2012). Thus, the importance of the naturally derived excipients is also increasing day by day because these are mostly nontoxic, biologically biodegradable, and readily available in nature in comparison with various synthetic excipients (Pal et al. 2010; Avachat et al. 2011; Nayak et al. 2010, 2012, 2015). Moreover, the extraction methodologies of these naturally derived excipients are very simple and economic (Nayak and Pal 2015, 2016a, b). Currently, natural polysaccharides are considered as one of the popular naturally derived polymeric groups for the use in various biomedical applications including drug delivery (Hasnain et al. 2010). The biodegradation capability of the natural polysaccharides into various physiological metabolites makes these useful biopolymeric candidates for the formulations of different kinds of drug delivery (Nayak 2016). In general, natural polysaccharides are of complex and branched structures with different monosaccharide residues connected to each other via the O-glycosidic linkages (Kaur et al. 2012a, b). Natural polysaccharides possess several important physicochemical characteristics such as aqueous solubility, high swelling ability in aqueous environment, good stability to pH alterations (Nayak 2016). These are extracted mainly from plants, animals, algals, microbials, and biotechnology (Prajapati et al. 2013). In general, plant polysacchariades are extracted from leaves, pods, fruits, seeds, rhizomes, roots, exudates (Nayak and Pal 2015). In recent years, different plant polysaccharides have been extracted as well as investigated for their potential and diverse applications as drug delivery excipients such as gelling agents, suspending agents, emulsifying agents, granulating agents, binders, mucoadhesive agents, disintegrants, enteric resistants, matrix-forming agents, release retardants, coating agents, film-forming agents (Prajapati et al. 2013). Thus, in recent years, various plant polysaccharides extracted from different plant sources are being employed as useful drug delivery excipients in various drug delivery dosage forms such as emulsions, suspensions, gels, tablets, capsules, transdermal patches, buccal films (Avachat et al. 2010; Prajapati et al. 2013). These plant polysaccharides are also being used to formulate various oral sustained drug releasing systems to achieve target site specificity, minimize fluctuations of drug concentrations within the therapeutic ranges, minimize risk of side effects and dose dumping, reduce dosing frequency, and enhance bioavailability and patient compliances (Nayak and Pal 2015).

Numerous oral sustained drug releasing dosage forms have been already designed and investigated by various drug delivery researchers and formulators (Nayak 2016). In the designing of these oral sustained releasing dosage forms, both single unit systems (such as tablets, capsules) and multiple unit systems (such as pellets, spheroids, beads, microparticles) have been developed and generally employed for the medications of patients (Kulkarni et al. 2005; Malakar et al. 2012). The multiple unit sustained drug releasing systems for oral administration