Abstract

The ease of access to food in our era has come with a risk of unhealthy lifestyle, giving rise to numerous health problems, including colorectal cancer (CRC). However, the development of cancer chemotherapy has been outpaced by the swift growth of CRC prevalence. The harsh side effects still become the primary reason for the low patient compliance, which may be minimized by limiting the drug action locally. Mucoadhesion is one of the strategies to limit undesired drug distribution. Dietary fibres, *e.g.* pectin and chitosan (CS), have exhibited mucoadhesive properties and selective digestibility, *i.e.* in the presence of colonic microflora. This study focused on fabricating a pectin-based drug delivery system loaded with 5-fluorouracil (5-FU), a primary CRC chemotherapy. Moreover, complexation with CS and thiolated pectin (TP) synthesis was also performed to enhance the mucoadhesion properties. The beads were fabricated using ionotropic gelation with calcium ions. A set of physicochemical characterizations were performed to evaluate the quantitative properties, while FTIR was conducted for structural analysis. Furthermore, the swelling, mucoadhesion, and release profile were determined. The 5-FU-loaded beads had a 45-60% drug entrapment efficiency, which was enhanced in TP-containing groups. TP also significantly ($p< 0.05$) reduced the swelling capacity while increasing the mucoadhesive property, in which the TPCF group was prominently superior. However, the drug release profile indicated a total Fickian diffusion with an abrupt release of up to ~70% in a neutral pH buffer. Therefore, it is suitable for rectal administration to avoid premature release and maximally exploit the superior mucoadhesive characteristics.

Keywords: Drug delivery system, thiolated, pectin, chitosan, mucoadhesive, colorectal cancer.