Abstract

This study explores the development of molecularly imprinted polymers (MIPs) using alginate and pectin for potential therapeutic applications in celiac disease (CD), a chronic autoimmune disorder triggered by gluten consumption in genetically predisposed individuals. The focus is on targeting Frazer's Fraction (FF), a key gluten-derived peptide that initiates the immune response in CD. By employing molecular imprinting technology (MIT), polymers with specific recognition sites for FF were created to prevent its absorption and mitigate the immune response. The MIPs were synthesized using the ionotropic gelation method, with FF as the template, and were characterized for their size, protein adsorption, and in vitro release properties. The results demonstrated that the MIPs had a mean diameter of 13 ± 2.5 μm and showed minimal nonspecific protein adsorption, suggesting their potential for biological applications. These MIPs exhibited superior binding affinity for FF compared to non-imprinted particles, indicating successful imprinting. Furthermore, the MIPs were found to be biocompatible and demonstrated a significant selective recognition capacity under gastrointestinal conditions, effectively reducing protein release. The study concludes that alginate/pectin-based MIPs hold promise for personalized therapy in CD by offering targeted FF uptake, enhanced drug binding efficacy, and improved bioavailability, paving the way for innovative therapeutic strategies in managing this disorder.