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Molecularly Imprinted Polymers (MIPs) as carriers for Mannose-targeting delivery of 5-FU

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Introduction

D-Mannose (D-Man) is overexpressed in a few types of cancers, as metastatic breast cancer or esophageal adenocarcinoma and, for this reason, it is considered an excellent candidate for targeting of anticancer drugs. In order to overcome these drawbacks, different approaches have been investigated and, among them, Molecularly Imprinting Technology is attracting interest. Molecularly Imprinted Polymers (MIPs) as novel and versatile drug delivery vehicles have been widely studied in recent years due to the advantages of selective recognition, enhanced drug loading, sustained release, and high precision targeting. For this purpose, we present Mannose-imprinted nanoparticles for targeting and delivery of 5-Fluorouracil (5-FU) in cancer cells.

Methods

MIPs have been synthesized by inverse microemulsion polymerization and then loaded with 5-FU. The obtained polymeric particles were characterized in terms of particles size and distribution, ξ-potential and fluorescent, and hydrophilic properties. Moreover, adsorption isotherms and kinetics and in vitro release properties were also investigated.

Results

Results showed that sizes of MIPs were 274.9 ± 4.6 nm with good Polidispersity Index (0.094 ± 0.089). Binding Studies exhibited high specificity toward the target monosaccharide, while a lower binding of D-Glucose was displayed. Additionally, The kinetic study revealed that the adsorption process followed the pseudo-first order kinetic model for MIPs and NIPs and the adsorption abilities of non-imprinted particles were lower at every time point than that of the corresponding imprinted particles.
Finally, *in vitro* drug-release studies indicated the fast release of 5-FU from nanoparticles within 2 h, reaching the maximum release after 72 h.

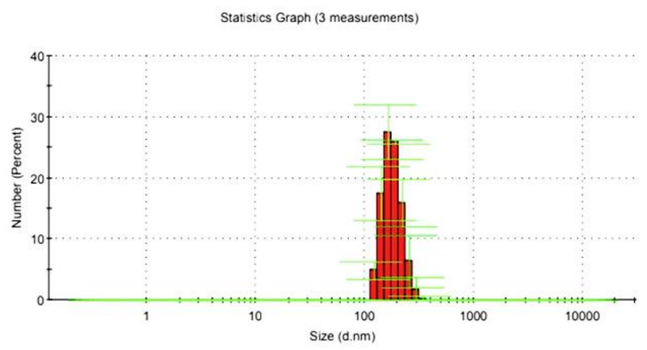

Figure 1. DLS image of D-Man imprinted particles loaded with 5-FU.

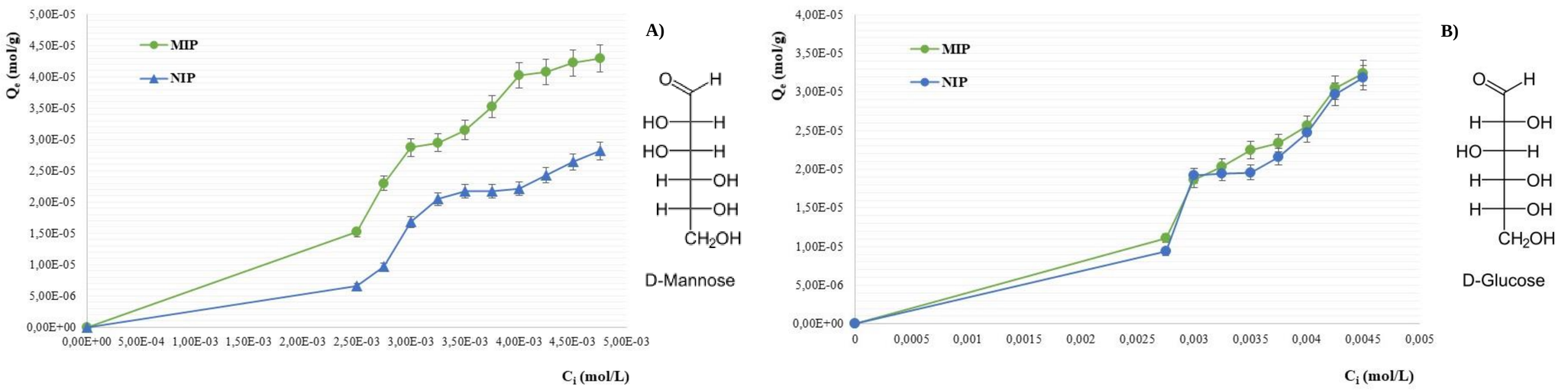

Figure 2. Adsorption isotherms of **A)** D-Man and **B)** D-Glu on imprinted and non-imprinted particles and chemical structures of D-Mannose (**D-Man**) and D-Glucose (**D-Glu**).

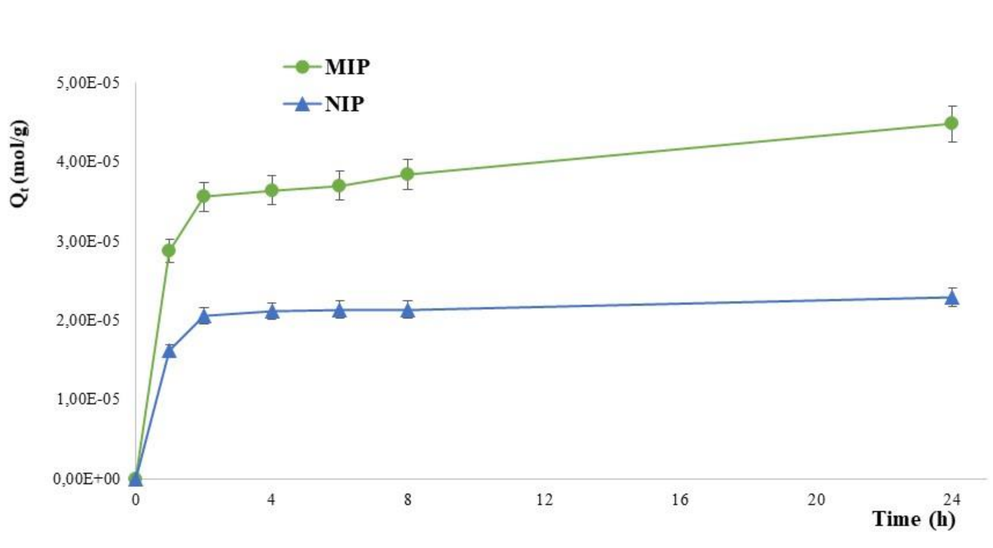

Figure 3. D-Man adsorption kinetic curves for MIPs and Non-Imprinted Polymers (NIPs).

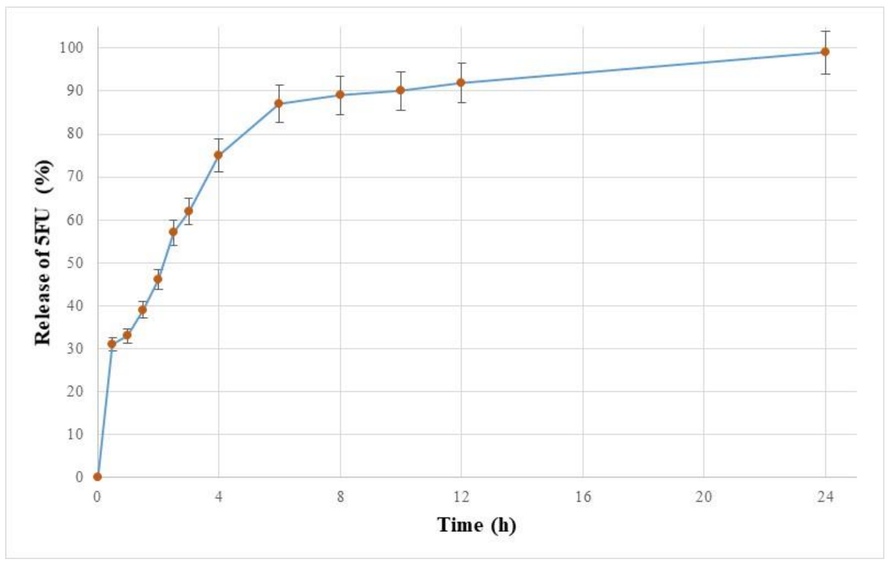

Figure 4. Release profile of 5-FU from MIP.

References

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