Profil Disolusi Bromelain Hasil Pemurnian dari Bonggol Nanas (Ananas comosus [L.] Merr) Dalam Nanosfer Alginat-CMC sebagai Agen Antiplatelet = Dissolution Profile of Purified Bromelain from Pineapple Cores (Ananas comosus [L.] Merr) Encapsulated in Alginate-CMC Nanospheres as an Antiplatelet Agent

Lilis Wijayanti, author

Abstrak

Bromelain yang diisolasi dari nanas (Ananas comosus [L.] Merr) dapat menjadi agen fitoterapi yang sangat baik untuk pengobatan penyakit kardiovaskular karena dapat menghambat agregasi platelet. Namun jika digunakan secara oral, bromelain dapat dengan mudah terdegradasi dalam lingkungan pH asam. Ketidakstabilan dalam kondisi tertentu akan menurunkan aktivitas farmakologisnya dan menurunkan manfaatnya bagi kesehatan. Oleh karena itu, bromelain perlu dienkapsulasi dalam matriks seperti nanosfer alginat-karboksimetil selulosa (CMC) melalui metode gelasi ionik menggunakan ion kalsium sebagai agen pengikat silang. Formula nanosfer dievaluasi rasio swelling, ukuran partikel, dan efisiensi enkapsulasinya. Karakterisasi juga dilakukan dengan menggunakan spektrofotometer infra merah (FTIR) dan mikroskop elektron (SEM). Hasil penelitian menunjukkan bahwa formula nanosfer terbaik (611,05 ± 0,35 nm) memiliki rasio swelling sebesar 177,27% dan 2119,17% pada pH 1,2 dan pH 7,4. Uji efisiensi enkapsulasi menunjukkan bahwa nanosfer Alginate-CMC dapat mengenkapsulasi bromelain sebesar 32,2%. Pelepasan bromelain dari nanosfer alginat-CMC diamati masing-masing 14,09% dan 31,14% di lingkungan lambung dan usus buatan setelah 8 jam. Bromelain dalam nanosfer alginat-CMC mempertahankan identitasnya seperti yang diamati dalam studi FTIR. Bromelain yang dienkapsulasi memiliki aktivitas proteolitik hingga 0,60 U/mL dan aktivitas antiplatelet sebesar 73,95%. Dari penelitian tersebut, dapat disimpulkan bahwa nanosfer alginat-CMC berhasil melindungi bromelain dari lingkungan asam di lambung dan memiliki karakteristik lepas lambat di lingkungan usus buatan. Hasil ini juga menunjukkan bahwa nanosfer alginat-CMC bisa menjadi sistem pengiriman yang menjanjikan untuk pengiriman enzim
.....Bromelain isolated from pineapple (Ananas comosus [L.] Merr) can be an excellent phytotherapeutic agent for cardiovascular treatment as it can inhibit platelet aggregation. However, if it is used orally, it can be easily degraded in the acidic pH environment due to enzymes secreted during the digestion process. Its instability under a certain condition will reduce its pharmacological activity and as a result, will reduce its health benefit. Therefore, bromelain needs to be encapsulated in a matrix such as alginate-carboxymethyl cellulose (CMC) nanospheres by ionic gelation method using calcium ion as a crosslinking agent. The alginate-CMC nanospheres were evaluated for their swelling ratio, particle size, and drug encapsulation efficiency. Characterization was also carried out using fourier transform infrared spectrophotometer (FTIR) and scanning electron microscope. The results showed that the best nanosphere (611.05±0,35 nm) has swelling ratios of 177.27% and 2119.17% at pH 1.2 and pH 7.4, respectively. The encapsulation test revealed that the Alginate-CMC nanospheres can encapsulate the bromelain with encapsulation efficiency of 32.2%. The release of bromelain from the nanospheres was observed 14.09% and 31.14% respectively in the artificial gastric and intestinal environment after 8 hours. Bromelain in the nanospheres retains its identity after nanospheres formation as observed in FTIR studies. The encapsulated bromelain has a proteolitic

activity up to 0.60 U/mL and antiplatelet activity of 73.95%. From these studies, it can be concluded that the alginate-CMC nanospheres can successfully protect bromelain from the acidic environment in the stomach and have slow-release characteristics. These results also suggest that alginate-CMC nanospheres could be a promising delivery system for enzyme delivery