

INTISARI

Esterifikasi *Locust Bean Gum* dengan Asam Sitrat sebagai Upaya Pembuatan Koproproses Bahan Baku untuk Tablet Lepas Terkendali

Esterifikasi *locust bean gum* dengan asam sitrat digunakan HCl sebagai katalisator dan radiasi UV_(254nm) sumber energi esterifikasi. HPMC sebagai matrik dan koproproses digunakan sebagai pengikat granul untuk tablet lepas terkendali. Penelitian bertujuan membuktikan reaksi antara *locust bean gum* dengan asam sitrat dapat menghasilkan senyawa ester (koproses); membuktikan pengaruh HCl dan radiasi UV_(254nm) pada reaksi antara *locust bean gum* dengan asam sitrat; mendapatkan jumlah HCl dan waktu radiasi UV_(254nm) untuk menghasilkan koproses dengan viskositas rendah dan asam sitrat teresterifikasi tinggi (CAGLBG); membuktikan pengaruh konsentrasi HPMC dan CAGLBG terhadap mutu fisik granul (waktu alir, sudut diam, indek tap); mutu fisik tablet (kekerasan, kerapuhan); dan persen obat terlepas; dan Mendapatkan konsentrasi HPMC dan CAGLBG untuk menghasilkan granul dan tablet lepas terkendali yang memenuhi persyaratan farmakope Indonesia.

Kondisi esterifikasi dioptimasi secara *factorial design*. Jumlah HCl dan waktu radiasi UV_(254nm) sebagai faktor sedangkan viskositas dan persen asam sitrat teresterifikasi sebagai respon. Koproses dikarakterisasi secara FTIR, NMR, DSC, XRD, SEM, studi kelarutan, studi *swelling*, studi viskositas, dan studi asam sitrat teresterifikasi. Formula granul tablet lepas terkendali dioptimasi secara *simplex lattice design*. Konsentrasi HPMC dan koproses dari kondisi optimum (CAGLBG) sebagai faktor sedangkan waktu alir, sudut diam, indek tap, kekerasan, kerapuhan, dan bahan aktif terlepas sebagai respon. Granul dibuat secara granulasi basah menggunakan laktosa monohidrat sebagai pengisi. Granul dievaluasi mutu fisik granul, mutu fisik tablet, dan disolusi.

Reaksi antara *locust bean gum* dengan asam sitrat dapat menghasilkan senyawa ester (koproses). Jumlah HCl mempercepat protonisasi atom O dan pembentukan atom C positif gugus karbonil. Jumlah HCl dan interaksi keduanya menurunkan viskositas. Waktu radiasi UV_(254nm) meningkatkan viskositas. Interaksi keduanya, volume HCl, dan waktu radiasi UV_(254nm) meningkatkan persentase asam sitrat teresterifikasi. CAGLBG dihasilkan pada kondisi 1,01 mL HCl dan waktu radiasi UV_(254nm) 100 menit dengan viskositas 9,40 cPs dan asam sitrat teresterifikasi 26,42 %. Konsentrasi HPMC, CAGLBG, dan interaksi keduanya meningkatkan waktu alir, sudut diam, indek tap, kekerasan, dan kerapuhan. Konsentrasi HPMC dan CAGLBG meningkatkan bahan aktif terlepas. Interaksi keduanya menurunkan bahan aktif terlepas. Formula optimum granul tablet lepas terkendali dari HPMC 35,25 % dan CAGLBG 14,75 %, menghasilkan waktu alir 2,44 detik; sudut diam 29,43°; indek tap 20,15; kekerasan 14,07 kgf; kerapuhan 0,27%; dan bahan aktif terlepas 80%.

Kata kunci : *locust bean gum*, asam sitrat, HCl, radiasi UV_(254nm), *factorial design*; *simplex lattice design*.

ABSTRACT

Esterification of Locust Bean Gum with Citric Acid as Effort Manufacture Coproces of Raw Material for Control Release Tablets

Esterification of locust bean gum with citric acid was used HCl as a catalyst and UV radiation ($_{254\text{nm}}$) source of energy esterification. HPMC as a matrix and copolymer was used as binder coprocess of controlled tablet. This study aims were proves the reaction between locust bean gum and citric acid can produce ester compound (coprocess); proves the effect of HCl and UV radiation ($_{254\text{nm}}$) on the reaction between locust bean gum and citric acid, obtain the amount of HCl and time of UV ($_{254\text{nm}}$) radiation to produce low viscosity and high esterified citrate (CAGLBG) coprocess, proves the effect of HPMC and CAGLBG concentration on granular physical quality (flow time, angle of repose, tap index), physical quality of the tablet (hardness, brittleness), and percent of drugs released, and obtain HPMC and CAGLBG concentrations to produce controlled loose granules and tablets that meet requirements of Indonesia pharmacopoeia.

The esterification conditions ware optimized factorial design. HCl volume and UV ($_{254\text{nm}}$) radiation time was as factor while viscosity and percent of citric acid was esterified as response. Coprocess were characterized by FTIR, NMR, DSC, XRD, SEM, solubility studies, swelling studies, viscosity studies, and studies of the esterified citric acid. The granules formula of controlled tablet was optimized ware simplex lattice design. The concentrations of HPMC and CAGLBG worked as factors while the flowing time, the angle of repose, the tap index, the hardness, the friability, and the released active ingredient worked as responses. The coprocess was prepared by wet granulation using lactose monohydrate as filler. Coprocess ware evaluated the physical quality of the granules, the physical quality of the tablet, and dissolution.

The reaction between locust bean gum and citric acid could produce an ester compound (coprocess). The amount of HCl accelerates the protonization of the O atoms and the formation of a positive C atom of carbonyl groups. HCl amount and interaction both decrease viscosity. The time of UV ($_{254\text{nm}}$) radiation increases viscosity. The interaction of both, HCl amount, and time of UV ($_{254\text{nm}}$) radiation increased the percentage of citric acid esterified. CAGLBG was produced under 1.01 mL HCl and time of UV ($_{254\text{nm}}$) radiation 100 minutes, resulting viscosity 9.40 cPs and citric acid esterified 26.42%. The concentrations of HPMC, CAGLBG, and interaction both increase flow time, angle of repose, tap index, hardness, and friability. The concentrations HPMC and CAGLBG increase the release of active ingredient. The both interactions decrease the release of active ingredient. The optimum of formula of controlled tablet from HPMC 35.25% and CAGLBG was 14.75%, resulting flow time 2.44 seconds; angle of repose $29,43^{\circ}$; tap index 20.15; hardness 14.07 kgf; friability 0.27%; and release of active ingredient 80%.

Keywords: locust bean gum, citric acid, HCl, UV ($_{254\text{nm}}$) radiation, factorial design; simplex lattice design.