

ABSTRACT

FORMULATION AND OPTIMIZATION OF PIROXICAM NANOSTRUCTURED LIPID CARRIER (NLC) USING FULL FACTORIAL DESIGN MODEL

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Piroxicam is an NSAID with a relatively high risk of gastrointestinal complications. PX drugs are widely used in the treatment of musculoskeletal, acute and chronic joint disorders such as rheumatoid arthritis (RA), osteoarthritis (OA), and ankylosing spondylitis. Included in the BCS class II group which has low water solubility and high permeability. In order to increase the bioavailability of the preparations, a drug design was developed in the form of Nanostructured Lipid Carrier (NLC). The purpose of this study was to determine the effect of differences in lipid concentrations of Glyceryl Monostearate (GMS) and Oleic Acid in the formulation of the Piroxicam NLC system that produced physicochemical characteristics in organoleptic tests, pH, viscosity, particle size, entrapment efficiency, zeta potential and flux/release. Manufacturing is done using the High Pressure Homogenization method. The organoleptic test showed good results for the Nanostructured Lipid Carrier (NLC) system, the pH value in Formula 1 (6.69 ± 0.01), Formula 2 (6.71 ± 0.01), Formula 3 (6.75 ± 0.01), and Formula 4 (7.19 ± 0.03). Viscosity values of Formula 1 (19.68 ± 0.50 cPs), Formula 2 (11.24 ± 1.42 cPs), Formula 3 (9.17 ± 0.95 cPs), and Formula 4 (21.49 ± 0.48 cPs). The particle sizes of Formula 1 (1314 ± 97.4 nm), Formula 2 (1995 ± 3453.6 nm), Formula 3 (1809 ± 3127.7 nm), and Formula 4 (603 ± 36.4 nm). The trapping efficiency of Formula 1 (88.3%), Formula 2 (86.9%), Formula 3 (86.7%), and Formula 4 (59.4%). Zeta potential of Formula 1 (-29.8 ± 4.5 mV), Formula 2 (-38.0 ± 3.9 mV), Formula 3 (-49.3 ± 10.9 mV), and Formula 4 (-37.6 ± 12.4 mV). Flux/release Formula 1 (3.3738 g/cm²), Formula 2 (4.0833 g/cm²), Formula 3 (6.7766 g/cm²), and Formula 4 (4.3755 g/cm²).

Keywords : Nanostructured Lipid Carrier (NLC), Lipids, Piroxicam, Characterization

ABSTRAK

FORMULASI DAN OPTIMASI *NANOSTRUCTURED LIPID CARRIER* (NLC) PIROXICAM MENGGUNAKAN MODEL *FULL FACTORIAL DESIGN*

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Piroxicam adalah AINS dengan risiko komplikasi saluran pencernaan yang relatif tinggi. Obat PX banyak digunakan dalam pengobatan untuk gangguan muskuloskeletal, sendi akut dan kronis seperti *rheumatoid arthritis* (RA), *osteoarthritis* (OA), dan *ankylosing spondylitis*. Termasuk dalam golongan BCS kelas II yang memiliki kelarutan dalam air yang rendah dan permeabilitas yang tinggi. Untuk meningkatkan bioavailabilitas sediaan dilakukan pengembangan desain obat dalam bentuk *Nanostructured Lipid Carrier* (NLC). Tujuan penelitian ini adalah mengetahui pengaruh perbedaan konsentrasi lipid *Gliseril Monostearate* (GMS) dan Asam Oleat dalam formulasi sistem NLC Piroxicam yang menghasilkan karakteristik fisikokimia dalam uji organoleptis, pH, viskositas, ukuran partikel, efisiensi penjebakan, zeta potensial dan flux/pelepasan. Pembuatan dilakukan menggunakan metode *High Pressure Homogenization*. Uji organoleptis menunjukkan hasil yang baik untuk sistem *Nanostructured Lipid Carrier* (NLC), nilai pH pada Formula 1 ($6,69 \pm 0,01$), Formula 2 ($6,71 \pm 0,01$), Formula 3 ($6,75 \pm 0,01$), dan Formula 4 ($7,19 \pm 0,03$). Nilai viskositas Formula 1 ($19,68 \pm 0,50$ cPs), Formula 2 ($11,24 \pm 1,42$ cPs), Formula 3 ($9,17 \pm 0,95$ cPs), dan Formula 4 ($21,49 \pm 0,48$ cPs). Ukuran partikel Formula 1 ($1314 \pm 97,4$ nm), Formula 2 ($1995 \pm 3453,6$ nm), Formula 3 ($1809 \pm 3127,7$ nm), dan Formula 4 ($603 \pm 36,4$ nm). Efisiensi penjebakan Formula 1 (88,3%), Formula 2 (86,9%), Formula 3 (86,7%), dan Formula 4 (59,4%). Zeta potensial Formula 1 ($-29,8 \pm 4,5$ mV), Formula 2 ($-38,0 \pm 3,9$ mV), Formula 3 ($-49,3 \pm 10,9$ mV), dan Formula 4 ($-37,6 \pm 12,4$ mV). Flux/pelepasan Formula 1 ($3,3738 \mu\text{g}/\text{cm}^2$), Formula 2 ($4,0833 \mu\text{g}/\text{cm}^2$), Formula 3 ($6,7766 \mu\text{g}/\text{cm}^2$), dan Formula 4 ($4,3755 \mu\text{g}/\text{cm}^2$).

Kata Kunci : *Nanostructured Lipid Carrier* (NLC), Lipid, Piroxicam, Karakterisasi