

PREPARATION AND EVALUATION OF SURFACE SOLID DISPERSION OF *MORINGA OLEIFERA* LEAF EXTRACT USING FREEZE DRYING METHOD

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ABSTRACT

Moringa leaf extract contains flavonoids which are useful as a source of antioxidants. The development of Moringa leaf extract into pharmaceutical dosage forms has several problems, including thick consistency, low solubility in water, and stability alteration during heating. Formation of surface solid dispersion (SSD) of moringa extract is one approach to increase the solubility of flavonoid compounds and improve the physical-mechanical characteristics of moringa leaf extract. This research aims to develop SSD of moringa extract with microcrystalline cellulose as the carrier, as well as to carry out physical and chemical characterization. The method used in the preparation of SSD of Moringa leaf extract-microcrystalline cellulose is freeze drying. There are two ratios developed in this study, namely 1:2 and 1:4. The results of the analysis showed that the SSD moisture content of Moringa leaf extract-microcrystalline cellulose 1:2 was 6.09%, while the ratio 1:4 was 5.06%. The SSD 1:2 exhibited sufficient powder flowability, while the 1:4 ratio showed poor flowability. The results of the analysis of crystallinity and thermal characteristics indicated a decrease in the regularity of the crystal lattice marked by a decrease in the specific peak intensity on the X-ray diffractogram, as well as a shift in the melting point and a decrease in the enthalpy of the SSD system 1:2 and 1:4 on the DSC thermogram. The total flavonoid content of SSD 1:2 was $7,1 \pm 0,0527$ mg QE/g, while the total flavonoid content of SSD 1:4 was $4,0 \pm 0,0797$ mg QE/g. The solubility of flavonoid compounds from the SSD 1:2 system was 67.33 µg/ml, showing an enhancement of solubility compared to Moringa leaf extract (64.11 µg/ml), physical mixture (54.60-58.81 µg/ml), and SSD 1:4 (48.09 µg/ml) ($p < 0.05$). Based on these results, it can be concluded that SSD of Moringa leaf extract-microcrystalline cellulose (1:2) has the potential to be further developed into pharmaceutical dosage forms.

Keywords: *Moringa oleifera*; Surface Solid Dispersion; Extract; Freeze Drying

ABSTRAK

Ekstrak daun kelor memiliki kandungan flavonoid yang bermanfaat sebagai sumber antioksidan. Pengembangan ekstrak daun kelor menjadi sediaan farmasi memiliki beberapa permasalahan antara lain konsistensinya kental, kelarutan rendah dalam air, serta tidak stabil dalam pemanasan. Pembentukan *surface solid dispersion* (SSD) ekstrak kelor merupakan salah satu pendekatan untuk meningkatkan kelarutan senyawa flavonoid dan memperbaiki karakteristik fisik-mekanik ekstrak daun kelor. Penelitian ini bertujuan untuk mengembangkan SSD ekstrak kelor dengan pembawa mikrokristalin selulosa, sekaligus melakukan karakterisasi fisik dan kimia. Metode yang digunakan dalam pembentukan SSD ekstrak daun kelor-mikrokristalin selulosa adalah *freeze drying*. Terdapat dua rasio yang dikembangkan dalam penelitian ini yaitu 1:2 dan 1:4. Hasil analisis menunjukkan bahwa kandungan lembab SSD ekstrak daun kelor-mikrokristalin selulosa 1:2 adalah 6,09%, sedangkan rasio 1:4 adalah 5,06%. Kemampuan alir serbuk SSD 1:2 termasuk dalam kategori cukup dapat mengalir, sementara rasio 1:4 menunjukkan kemampuan alir yang buruk. Hasil analisis kristalinitas dan karakteristik termal mengindikasikan terjadinya penerunan keteraturan kisi kristal ditandai dengan penurunan intensitas puncak spesifik pada difraktogram sinar-X, serta pergeseran titik lebur dan penurunan entalpi sistem SSD 1:2 maupun 1:4 pada termogram DSC. Kadar total flavonoid SSD 1:2 adalah $7,1 \pm 0,0527$ mg QE/g, sedangkan kadar total flavonoid SSD 1:4 adalah $4,0 \pm 0,0797$ mg QE/g. Kelarutan senyawa flavonoid dari sistem SSD 1:2 adalah 67,33 µg/ml mengalami peningkatan dibandingkan ekstrak daun kelor (64,11 µg/ml), campuran fisik (54,60-58,81 µg/ml), dan SSD 1:4 (48,09 µg/ml) ($p < 0,05$). Berdasarkan hasil tersebut, dapat disimpulkan bahwa SSD ekstrak daun kelor-mikrokristalin selulosa (1:2) berpotensi untuk dikembangkan lebih lanjut menjadi sediaan farmasi.

Kata Kunci: *Moringa oleifera*; *Surface Solid Dispersion*; Extract; *Freeze Drying*



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