

PENGARUH NIKOTINAMID SEBAGAI KOFORMER PADA STABILITAS TERMAL KOKRISTAL ANDROGRAFOLID

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ABSTRAK

Latar Belakang: Andrografolid merupakan senyawa diterpen lakton yang memiliki potensi farmakologis tinggi, namun strukturnya cenderung tidak stabil dan rentan terdegradasi akibat pengaruh panas. Ketidakstabilan termal ini dapat menurunkan efikasi terapeutik dan memicu pembentukan produk degradasi toksik, sehingga dibutuhkan pendekatan inovatif untuk memodifikasi struktur kristal guna meningkatkan stabilitas termal bahan aktif farmasi melalui pembentukan kokristal.

Tujuan: Penelitian ini bertujuan mengetahui kemampuan nikotinamid membentuk kokristal dengan andrografolid, menentukan rasio molar optimum, serta menganalisis pengaruh pembentukan kokristal terhadap sifat fisik dan stabilitas termal andrografolid.

Metode Penelitian: Penelitian eksperimental ini menggunakan metode solvent evaporation dengan variasi rasio molar andrografolid:nikotinamid 1:5, 1:2, 1:1, 2:1, dan 5:1 hasil SLD. Karakterisasi meliputi uji organoleptis, mikroskopis, titik leleh, KLT, FTIR, analisis stabilitas FTIR setelah pemanasan, serta DSC pada rasio optimal.

Hasil: Seluruh variasi rasio menghasilkan kokristal dengan karakteristik berbeda dari bahan penyusunnya. Rasio molar 1:1 diidentifikasi sebagai rasio optimum berdasarkan perubahan morfologi berbentuk batang/prismatik memanjang, rentang titik leleh sempit (202-203°C), bercak noda tunggal KLT ($R_f=0,65$), pergeseran gugus fungsi FTIR yang menandakan interaksi ikatan hidrogen, serta ketahanan spektrum FTIR yang stabil setelah pemanasan. Analisis DSC mengonfirmasi pembentukan fase kristal baru dengan puncak endotermik utama 223,35°C.

Kesimpulan: Pembentukan kokristal andrografolid-nikotinamid melalui metode solvent evaporation terbukti meningkatkan sifat fisik dan stabilitas termal andrografolid, dengan rasio molar optimum 1:1.

Kata kunci: *Andrografolid, Kokristal, Nikotinamid, Solvent Evaporation, Stabilitas Termal*

THE EFFECT OF NICOTINAMIDE AS A COFORMER ON THE THERMAL STABILITY OF ANDROGRAFOLIDE COCRYSTALS

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ABSTRACT

Background: Andrographolide is a diterpene lactone compound with high pharmacological potential; however, its structure tends to be unstable and prone to degradation due to heat. This thermal instability can reduce therapeutic efficacy and trigger the formation of toxic degradation products; therefore, an innovative approach is needed to modify the crystal structure in order to improve the thermal stability of the pharmaceutical active ingredient through the formation of cocrystals.

Aim: This study aims to determine the ability of nicotinamide to form cocrystals with andrographolide, identify the optimal molar ratio, and analyze the effect of cocrystal formation on the physical properties and thermal stability of andrographolide.

Research Methods: This experimental study used the solvent evaporation method with varying andrographolide:nicotinamide molar ratios of 1:5, 1:2, 1:1, 2:1, and 5:1, as determined by SLD. Characterization included organoleptic and microscopic tests, melting point determination, TLC, FTIR, FTIR stability analysis after heating, and DSC at the optimal ratio.

Results: All ratio variations produced cocrystals with characteristics different from those of their constituent materials. A 1:1 molar ratio was identified as the optimal ratio based on the elongated rod-like/prismatic morphology, a narrow melting point range (202–203°C), a single TLC spot ($R_f = 0.65$), shifts in FTIR functional groups indicating hydrogen bonding interactions, and a stable FTIR spectrum after heating. DSC analysis confirmed the formation of a new crystalline phase with a main endothermic peak at 223.35°C.

Conclusion: The formation of andrographolide-nicotinamide cocrystals via the solvent evaporation method was shown to improve the physical properties and thermal stability of andrographolide, with an optimal molar ratio of 1:1.

Keyword: *Andrographolide, Cocrystal, Nicotinamide, Solvent Evaporation, Thermal Stability*