

Sintesis dan Aktivitas Antioksidan Senyawa Turunan Spiro [Indol-Azetidinon] Berbasis Isatin dan 5-Kloroisatin Menggunakan Katalis Nanopartikel K₂CO₃ = Synthesis and Antioxidant Activity of Spiro[Indole-Azetidinone] Derivatives Based on Isatin and 5-Chloroisatin Using K₂CO₃ Nanoparticles Catalyst

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Abstrak

Isatin (1H-indole-2,3-dione) merupakan senyawa heterosiklik yang memiliki bioaktivitas beragam. Senyawa spiro merupakan senyawa bisiklik yang terikat dengan satu atom yang sama dan memiliki bioaktivitas sebagai antioksidan. Pada penelitian ini, dilakukan sintesis senyawa turunan spiro[indol-azetidinon] berbasis isatin dan 5-kloroisatin yang diharapkan memiliki aktivitas antioksidan. Senyawa turunan spiro[indol-azetidinon] disintesis dari isatin dan 5-kloroisatin dengan variasi amina aromatik primer membentuk senyawa intermediet basa Schiff yang direaksikan dengan asam kloroasetat dan trietilamina dengan kehadiran katalis nanopartikel K₂CO₃. Nanopartikel K₂CO₃ disintesis dari K₂CO₃ anhidrat dengan etanol dan asam laurat yang dikarakterisasi menggunakan XRD, BET, dan SEM. Didapatkan nanopartikel K₂CO₃ memiliki ukuran kristal rata-rata sebesar 31,49 nm. Senyawa turunan spiro[indol-azetidinon] diidentifikasi menggunakan KLT serta dikarakterisasi menggunakan FTIR, UV-Vis, dan LC-MS. Didapatkan senyawa basa Schiff 1, 2, 3, dan 4 dengan persen yield masing-masing sebesar 18,21%, 10,06%, 21,13%, dan 7,39%. Didapatkan persen yield dari senyawa turunan spiro[indol-azetidinon] 1, 2, 3, dan 4 masing-masing sebesar 20,46%, 16,77%, 62,87%, dan 45,56%. Hasil uji aktivitas antioksidan dengan metode DPPH menunjukkan nilai IC₅₀ untuk senyawa turunan spiro[indol-azetidinon] 1, 2, 3, dan 4 masing-masing sebesar 503,34 ppm, 586,52 ppm, 763,15 ppm, dan 933,22 ppm.

.....Isatin (1H-indole-2,3-dione) is heterocyclic compound which has various bioactivities. Spiro compounds are bicyclic compounds that bound to the same atom and have bioactivity as antioxidants. In this research, synthesis of spiro[indole-azetidinone] derivatives based on isatin and 5-chloroisatin was carried out that expected to have antioxidant activity. Spiro[indole-azetidinone] derivatives were synthesized from isatin and 5-chloroisatin with a variety of primary aromatic amines formed Schiff base intermediate compounds that reacted with chloroacetic acid and triethylamine in the presence of K₂CO₃ nanoparticles catalyst. K₂CO₃ nanoparticles were synthesized from anhydrous K₂CO₃ with ethanol and lauric acid that characterized using XRD, BET, and SEM. It was found that K₂CO₃ nanoparticles had an average crystal size of 31.49 nm. Spiro[indole-azetidinone] derivatives were identified using TLC and characterized using FTIR, UV-Vis, and LC-MS. The Schiff base compounds 1, 2, 3, and 4 were obtained with yield percents of 18.21%, 10.06%, 21.13%, and 7.39%, respectively. The percent yield of spiro[indole-azetidinone] 1, 2, 3, and 4 derivatives were 20.46%, 16.77%, 62.87%, and 45.56%, respectively. The results of antioxidant activity tests using DPPH method showed the IC₅₀ values for spiro[indole-azetidinone] 1, 2, 3, and 4 derivatives were 503.34 ppm, 586.52 ppm, 763.15 ppm, and 933.22 ppm, respectively.