

Sintesis Senyawa Oxindol dan Derivatnya melalui Reaksi Kondensasi Knoevenagel serta Uji Aktivitas Antimikroba dan Antioksidan = Synthesis of Oxindole Compounds and Their Derivatives Through the Knoevenagel Condensation Reaction with Antimicrobial and Antioxidant Activity Tests

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Abstrak

Isatin atau 1H-indol-2,3-dion, merupakan senyawa bahan alam yang dapat ditemukan dalam tanaman dari genus *Isatis*. Studi terhadap bioaktivitas isatin menunjukkan potensi sebagai antivirus, anti-HIV, antimikroba, antitumor, antiinflamasi, antikejang, antibakteri, dan antijamur. Pada penelitian ini, sintesis senyawa turunan oxindol dilakukan melalui dua tahap. Pertama, prekursor isatin direaksikan dengan TCCA untuk memperoleh intermediat 1, 5-kloroisatin, dan juga dengan NaNO₃ untuk memperoleh intermediat 2, 5-nitroisatin. Diperoleh yield intermediat 1 sebesar 45% dan intermediat 2 sebesar 58,2%. Kemudian, senyawa prekursor, intermediat 1, dan intermediat 2 direaksikan dengan malononitril melalui reaksi Kondensasi Knoevenagel terkatalisis I₂ untuk memperoleh senyawa turunan oxindol. Reaksi dioptimasi dan diperoleh kondisi optimum untuk memperoleh senyawa turunan oxindol yaitu pada 10% mol katalis, suhu reaksi 75oC, dan dalam pelarut protik, etanol. Keberhasilan sintesis senyawa intermediat dan senyawa turunan oxindol dianalisa menggunakan kromatografi lapis tipis (KLT), UV-Vis, FTIR, GC-MS, LC-MS, dan Melting Point-Apparatus. Diperoleh yield senyawa turunan oxindol 1 dengan prekursor isatin sebesar 71,13%, senyawa turunan 2 dengan prekursor 5-kloroisatin 61,39%, dan senyawa turunan 3 dengan prekursor 5-nitroisatin sebesar 67,39%. Hasil uji aktivitas antimikroba pada senyawa turunan oxindol 1, 2, dan 3 menunjukkan aktivitas yang lemah terhadap bakteri uji *S. aureus* dan *E. coli*. Uji aktivitas antioksidan dengan DPPH memberikan nilai IC₅₀ masing-masing 266,47 ppm, 220,43 ppm, dan 654,85 ppm untuk senyawa turunan oxindol 1, 2, dan 3.

.....Isatin or 1H-indole-2,3-dione, is a natural compound that can be found in plants of the genus *Isatis*. Studies on the bioactivity of isatin show potential as antiviral, anti-HIV, antimicrobial, antitumor, anti-inflammatory, anticonvulsant, antibacterial, and antifungal properties. In this study, the synthesis of oxindol derivatives was carried out in two stages. First, isatin was reacted with TCCA to obtain intermediate 1, 5-chloroisatin, and also with NaNO₃ to obtain intermediate 2, 5-nitroisatin. The yield obtained of intermediate 1 is 45% and intermediate 2 is 58.2%. Then, the precursor compounds, intermediate 1, and intermediate 2 were reacted with malononitrile through the I₂-catalyzed Knoevenagel condensation reaction to obtain oxindole derivatives. The reaction was optimized and optimum conditions were obtained to obtain oxindole derivatives, namely at 10% mole of catalyst, reaction temperature of 75oC, and in protic solvent, ethanol. The success of the synthesis of intermediates and oxindol derivatives was analyzed using thin layer chromatography (TLC), UV-Vis, FTIR, GC-MS, LC-MS, and Melting Point-Apparatus. The yield of oxindol derivative compound 1 with isatin as the precursor was 71.13%, derivative compound 2 with 5-chloroisatin as the precursor was 61.39%, and derivative compound 3 with 5-nitroisatin as the precursor was 67.39%. The results of the antimicrobial activity test on oxindol derivatives 1, 2, and 3 showed weak activity against both test bacteria, *S. aureus* and *E. coli*. The antioxidant activity test with DPPH gave IC₅₀ values of

266.47 ppm, 220.43 ppm, and 654.85 ppm for oxindol derivatives 1, 2, and 3, respectively.