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**Sintesis Analog Kurkumin 2,5-Bis-(2â€™-kloro-6â€™-florobenziliden)-siklopentanon Menggunakan Metode
Iradiasi Microwave dan Uji Aktivitas Antibakterinya**
RIZKY ADITYA RESTANTO, Prof. Dr. Ritmaleni, S.Si.; Dr. Apt. Purwanto, M.Sc.
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INTISARI

Fenomena infeksi dan penyakit menular karena mikroba sering dijumpai di daerah beriklim tropis. Namun, ketersediaan antibiotik yang masih impor dan fenomena resistensi antibiotik marak terjadi, sehingga diperlukan upaya penemuan antibakteri yang baru. Salah satu senyawa yang sering digunakan adalah analog kurkumin. Penelitian ini bertujuan untuk mensintesis senyawa analog kurkumin 2,5-Bis-(2'-kloro-6'-florobenziliden)-siklopentanon yang berpotensi sebagai antibakteri menggunakan metode yang ramah lingkungan dan mengikuti kaidah *green chemistry.*

Analog kurkumin disintesis dengan mereaksikan *starting material* berupa 2-kloro-6-florobenzaldehid sebanyak 2 mol ekuivalen dan siklopentanon sebanyak 1 mol ekuivalen melalui reaksi kondensasi aldol menggunakan metode iradiasi *microwave*. Produk yang dihasilkan berupa analog kurkumin seri B yang diuji kemurnian senyawanya melalui uji jarak lebur dan KLT, diikuti elusidasi struktur menggunakan spektrometer massa, IR, serta spektroskopi ^{1}H-NMR dan ^{13}C-NMR. Produk senyawa hasil sintesis juga dianalisis efek antibakterinya secara kualitatif dan kuantitatif melalui metode difusi Kirby Bauer dan mikrodilusi terhadap bakteri Gram positif *(Staphylococcus aureus* ATCC 25923*)* dan Gram negatif *(Escherichia coli* ATCC 25922*)*.

Senyawa analog kurkumin yang dihasilkan berupa kristal kuning senyawa 2,5-Bis-(2'-kloro-6'-florobenziliden)-siklopentanon dengan rendemen 41,79%, tergolong murni dengan jarak lebur 154,5-155,4˚C dan penampakan bercak tunggal pada KLT menggunakan eluen etil asetat:heksan (1:5 v/v). Hal ini diperjelas melalui data spektrum GC-MS, IR, massa, ^{1}H-NMR dan ^{13}C-NMR. Hasil data kualitatif efek antibakteri didapatkan dengan adanya zona hambat pada konsentrasi 200 dan 100 ppm, sekitar 2 dan 1 cm. Sementara data kuantitatif antibakteri didapatkan dari nilai persen penghambatan dan MIC_{50} melalui metode analisis probit. MIC_{50} senyawa berada pada konsentrasi 75,68 ppm (207,28 µM) terhadap bakteri *E. coli*, serta 153,46 ppm (420,31 µM) terhadap bakteri *S. aureus.*

Kata kunci: 2,5-Bis-(2'-kloro-6'-florobenziliden)-siklopentanon, antibakteri, *microwave*, mikrodilusi, MIC_{50}

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ABSTRACT

Microbial infections and infectious diseases are common in tropical climates. However, the availability of antibiotics that are still imported and the phenomenon of antibiotic resistance is rampant, so efforts are needed to discover new antibacterials. One compound that is often used is curcumin analogs. This research aims to synthesize curcumin analog compound 2,5-Bis-(2'-chloro-6'-fluorobenziliden)-cyclopentanone which has antibacterial potential using environmentally friendly methods and following the rules of green chemistry.

Curcumin analog were synthesized by reacting starting materials in the form of 2 mol equivalent of 2-chloro-6-fluorobenzaldehyde and 1 mol equivalent of cyclopentanone through an aldol condensation reaction using the microwave irradiation method. The resulting product is a series B curcumin analog which was tested for purity through melting distance and TLC test, followed by structural elucidation using mass spectrometer, IR, and ^{1}H-NMR and ^{13}C-NMR. The synthesized compound products were analyzed for their antibacterial effect qualitatively and quantitatively through Kirby Bauer diffusion and microdilution methods against Gram positive (*Staphylococcus aureus* ATCC 25923) and Gram negative (*Escherichia coli* ATCC 25922) bacteria.

The resulting curcumin analog compound is a yellow crystal compound 2,5-Bis-(2'-chloro-6'-fluorobenziliden)-cyclopentanone with a yield of 41,79%, classified as pure with a melting range of 154,5-155,4˚C and a single spot appearance on TLC using ethyl acetate:hexane (1:5 v/v) eluent. This was clarified through GC-MS, IR, mass, ^{1}H-NMR and ^{13}C-NMR spectrum data. Qualitative data results of antibacterial effect obtained by the presence of inhibition zone at concentrations of 200 and 100 ppm, about 2 and 1 cm. Meanwhile, quantitative antibacterial data were obtained from the percent inhibition value and MIC_{50} through probit analysis methods. The MIC_{50} of the compounds were at concentrations of 75,68 ppm (207,28 µM) against *E. coli* bacteria, and 153,46 ppm (420,31 µM) against *S. aureus* bacteria.

Keywords: 2,5-Bis(2'-chloro-6'-fluorobenziliden)-cyclopentanone, antibacterial, microwave, microdilution, MIC_{50}