SINTESIS KALKON DARI 3-ASETILKUMARIN DAN TURUNAN BENZALDEHIDA SERTA UJI AKTIVITASNYA SEBAGAI SENYAWA ANTIKANKER

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INTISARI

Sintesis senyawa turunan kalkon berbahan dasar 3-asetilkumarin dengan berbagai turunan benzaldehida serta uji bioaktivitasnya sebagai senyawa antikanker telah dilakukan. Turunan benzaldehida yang digunakan dalam penelitian ini yaitu benzaldehida, 4-metoksibenzaldehida, dan 4-klorobenzaldehida. Sintesis dilakukan melalui reaksi kondensasi *Claisen-Schmidt* dengan pelarut etanol serta katalis basa piperidin. Elusidasi struktur senyawa produk dilakukan dengan instrumen FT-IR, KLT densitometer, serta ^{1}H- dan ^{13}C-NMR. Uji aktivitas senyawa dilakukan secara *in vitro* dengan metode MTT terhadap sel kanker HeLa, WiDr, 4T1 dan Vero.

Sintesis kalkon **A** menghasilkan padatan kuning dengan titik leleh sebesar 186-187 ℃ dan persen hasil 89%. Pada sintesis kalkon **B** diperoleh padatan berwarna putih kekuningan dengan titik leleh sebesar 170-171 ℃ dan persen hasil 63%, sedangkan kalkon **C** diperoleh padatan berwarna kuning dengan titik leleh sebesar 201-203 ℃ dan persen hasil 49%. Hasil uji antikanker pada kalkon **A;B;C** terhadap sel kanker HeLa, WiDr, 4T1, dan Vero menunjukkan bahwa ketiga senyawa aktif dan selektif terhadap sel kanker yang diujikan. Kalkon **C** memiliki nilai IC_{50} terbaik pada sel kanker HeLa yaitu sebesar 0,24 µg/mL, sedangkan kalkon **A** memiliki nilai IC_{50} terbaik pada sel kanker WiDr dan 4T1 masing – masing sebesar 2,80 dan 4,86 µg/mL. Kalkon **B** memiliki nilai IC_{50} <20 µg/mL sehingga tergolong toksik terhadap ketiga sel kanker yang diujikan. Kalkon **C** memiliki indeks selektivitas paling tinggi yaitu 291,38 terhadap Hela dan 23,87 terhadap WiDr, namun tidak selektif pada sel kanker 4T1.

Kata kunci : benzaldehida, kalkon, kumarin, piperidin, senyawa kanker

SYNTHESIS OF CHALCONES FROM 3-ACETYLCOUMARIN WITH BENZALDEHYDE DERIVATIVES AND THEIR ASSAY AS ANTICANCER AGENTS

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ABSTRACT

The synthesis of chalcone derivatives based on 3-acetylcoumarin with various benzaldehyde derivatives and the evaluation of their bioactivity as anticancer compounds have been conducted. The benzaldehyde derivatives used in this study were benzaldehyde, 4-methoxybenzaldehyde, and 4-chlorobenzaldehyde. The synthesis was performed through the *Claisen-Schmidt* condensation reaction using ethanol as a solvent and piperidine as a base catalyst. The structural elucidation of the products was carried out using FT-IR, TLC densitometer, and ^{1}H- and ^{13}C-NMR instruments. The bioactivity tests were performed *in vitro* using the MTT method against HeLa, WiDr, 4T1, and Vero cancer cell lines.

The synthesis of chalcone **A** produced a yellow solid with a melting point of 186–187 °C and a yield of 89%. Chalcone **B** was obtained as a pale yellow solid with a melting point of 170–171 °C and a yield of 63%. Meanwhile, chalcone **C** produced a yellow solid with a melting point of 201–203 °C and a yield of 49%. The results of anticancer assays of chalcones **A;B;C** against HeLa, WiDr, 4T1, and Vero cell lines demonstrated that all three compounds were active and selective toward the tested cancer cells. Chalcone **C** exhibited the best IC_{50} value on HeLa cancer cells, which was 0.24 µg/mL, while chalcone **A** had the best IC_{50} values on WiDr and 4T1 cancer cells of 2.80 and 4.86 µg/mL, respectively. Chalcone **B** had an IC_{50} value of less than 20 µg/mL, thus it was classified as toxic against the three tested cancer cell lines. Chalcone **C** has the highest selectivity index, namely 291.38 against HeLa and 23.87 against WiDr, but is not selective for 4T1 cancer cells.

Keywords**:** benzaldehyde, cancer compounds, chalcone, coumarin, piperidine