SINTESIS SENYAWA ANALOG KURKUMIN (1E,4E)-1,5-BIS[4-(DIMETILAMINO)FENIL]PENTA-1,4-DIEN-3-ON), AKTIVITASNYA SEBAGAI SENYAWA KANDIDAT ANTIKANKER PAYUDARA PADA T47D LINI SEL DAN MELALUI STUDI PENAMBATAN MOLEKUL

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INTISARI

Penelitian sintesis dan penambatan molekuler senyawa analog kurkumin dari p-dimetilaminobenzaldehid dengan aseton serta aktivitas sitotoksiknya terhadap lini sel T47D telah dilakukan. Tujuan dari penelitian ini adalah untuk melakukan sintesis analog kurkumin, mengetahui interaksi spesifik dan afinitas ikatan terhadap protein target melalui penambatan molekuler, serta mengetahui aktivitas sitotoksisitas terhadap lini sel T47D dan sel normal Vero.

Sintesis senyawa (1E,4E)-1,5-bis[4-(dimetilamino)fenil]penta-1,4-dien-3-on) dilakukan dengan mereaksikan p-dimetilamino benzaldehid dan aseton menggunakan metode sonikasi dengan katalis basa NaOH 40%. Produk sintesis dikarakterisasi menggunakan ATR-IR, ^{1}H-NMR, dan ^{13}C-NMR. Penambatan molekuler terhadap protein EGFR, Bcl-2, p53 *mutant* dan ER dilakukan dengan menggunakan AutoDock Vina terhadap analog kurkumin dan kurkumin. Uji sitotoksisitas dilakukan secara *in vitro* terhadap lini sel T47D dan sel normal Vero dengan metode *Microculture Tetrazolium Technique* (MTT).

Berdasarkan hasil sintesis diperoleh senyawa analog kurkumin berwarna oranye kekuningan dengan persen hasil sebesar 74,31%. Penambatan molekuler terhadap protein EGFR, dan p53 *mutant* memberikan hasil afinitas analog kurkumin lebih rendah dibandingkan ligan asli dan kurkumin, pada Bcl-2 hasil afinitas lebih rendah dari kurkumin tetapi lebih tinggi dari ligan asli sedangkan untuk protein ER afinitas analog kurkumin lebih tinggi dibandingkan ligan asli dan kurkumin. Hasil uji *in vitro* sitotoksisitas menunjukkan senyawa analog kurkumin memiliki aktivitas sitotoksik sangat kuat dengan nilai IC_{50} 10,09 µg/mL dan kurkumin memiliki aktivitas sitotoksik sangat kuat dengan nilai IC_{50} 4,010 µg/mL terhadap sel kanker payudara T47D, kedua senyawa tersebut memiliki selektivitas tinggi terhadap sel normal Vero.

Kata kunci: analog kurkumin, penambatan molekul, uji sitotoksisitas.

SYNTHESIS OF CURCUMIN ANALOGUE COMPOUND (1E,4E)-1,5-BIS[4-(DIMETHYLAMINO)PHENYL]PENTA-1,4-DIEN-3-ONE, ITS ACTIVITY AS A CANDIDATE ANTICANCER COMPOUND FOR BREAST CANCER ON THE T47D CELL LINE AND THROUGH MOLECULAR DOCKING STUDIES

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ABSTRACT

Research on the synthesis and molecular docking of curcumin analogue compounds from p-dimethylaminebenzaldehyde with acetone and its cytotoxic activity against T47D breast cancer cells has been conducted. The purpose of this study is to synthesis curcumin analogues, determine specific interactions and binding affinity to target proteins through molecular docking and determine cytotoxicity activity against T47D breast cancer cells and normal Vero cells.

The synthesis of (1E,4E)-1,5-bis[4-(dimethylamino)phenyl]penta-1,4-dien-3-one was carried out by reacting p-dimethylaminebenzaldehyde and acetone using sonication method with base catalyst NaOH 40%. The synthesis products were characterized using ATR-IR, ^{1}H-NMR, and ^{13}C-NMR. Molecular docking of EGFR, Bcl-2, p53 mutant and ER proteins was performed using AutoDock Vina against curcumin and curcumin analogues. A cytotoxicity test was conducted in vitro against T47D breast cancer cells and Vero normal cells using the Microculture Tetrazolium Technique (MTT) method.

Based on the synthesis, a yellow-orange curcumin analogue compound was obtained with a yield of 74.31%. Molecular docking to EGFR and p53 mutant proteins resulted in a higher affinity of curcumin analogue compared to native ligand and curcumin, Bcl-2 proteins resulted in a higher affinity of curcumin but lower than native ligand while for ER protein the affinity of curcumin analogue was lower than native ligand and curcumin. The results of in vitro cytotoxicity tests showed that curcumin analogue compounds had a very strong cytotoxic activity with an IC_{50} value of 10.09 µg/mL, and curcumin had a very strong cytotoxic activity with an IC_{50} value of 4.010 µg/mL against T47D breast cancer cells, both compounds had high selectivity against normal Vero cells.

Keywords: curcumin analogue, cytotoxicity test, molecular docking.