SINTESIS DAN PENAMBATAN MOLEKULER SENYAWA ANALOG KURKUMIN DARI 2-HIDROKSIBENZALDEHIDA DENGAN 1-METIL-4-PIPERIDON SERTA AKTIVITAS SITOTOKSIKNYA TERHADAP SEL KANKER PAYUDARA T47D

Rahmawati Sulistya
20/459321/PA/19982

INTISARI

Penelitian sintesis dan penambatan molekuler senyawa analog kurkumin dari 2-hidroksibenzaldehida dengan 1-metil-4-piperidon serta aktivitas sitotoksiknya terhadap sel kanker payudara 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 sel kanker payudara T47D dan sel normal Vero.

Sintesis senyawa (3*E*,5*E*)-3,5-bis(2-hidroksibenzilidin)-1-metil-4-piperidon dilakukan dengan mereaksikan 2-hidroksibenzaldehida dan 1-metil-4-piperidon menggunakan metode sonokimia dengan katalis basa. Produk sintesis dikarakterisasi menggunakan ATR-IR, ^{1}H-NMR, dan ^{13}C-NMR. Penambatan molekuler terhadap protein EGFR, Bcl-2 dan p53 mutan dilakukan dengan menggunakan AutoDock Vina terhadap analog kurkumin dan kurkumin. Uji sitotoksisitas dilakukan secara *in vitro* terhadap sel kanker payudara T47D dan sel normal Vero dengan metode *Microculture Tetrazolium Technique* (MTT).

Berdasarkan hasil sintesis diperoleh senyawa analog kurkumin berwarna kuning dengan persen hasil sebesar 86%. Penambatan molekuler terhadap protein EGFR dan p53 mutan memberikan hasil afinitas analog kurkumin lebih tinggi dibandingkan ligan asli dan kurkumin sedangkan untuk protein Bcl-2 afinitas analog kurkumin lebih rendah dibandingkan ligan asli dan kurkumin. Hasil uji *in vitro* sitotoksisitas menunjukkan senyawa analog kurkumin memiliki aktivitas sitotoksik sedang dengan nilai IC_{50} 21,37 µg/mL dan kurkumin memiliki aktivitas sitotoksik tinggi dengan nilai IC_{50} 10,60 µg/mL terhadap sel kanker payudara T47D, kedua senyawa tersebut memiliki selektivitas rendah terhadap sel normal Vero.

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

SYNTHESIS AND MOLECULAR DOCKING OF CURCUMIN ANALOGUE FROM 2-HYDROXYBENZALDEHYDE WITH 1-METHYL-4-PIPERIDONE AND ITS CYTOTOXIC ACTIVITY AGAINST T47D BREAST CANCER CELL

Rahmawati Sulistya
20/459321/PA/19982

ABSTRACT

Research on the synthesis and molecular docking of curcumin analogue compounds from 2-hydroxybenzaldehyde with 1-methyl-4-piperidone and its cytotoxic activity against T47D breast cancer cell has been conducted. The purpose of this study was to synthesize 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 (3*E*,5*E*)-3,5-bis(2-hydroxybenzylidine)-1-methyl-4-piperidone was carried out by reacting 2-hydroxybenzaldehyde and 1-methyl-4-piperidone using sonochemical method with base catalyst. The synthesis products were characterized using ATR-IR, ^{1}H-NMR, and ^{13}C-NMR. Molecular docking of EGFR, Bcl-2, and mutant p53 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 curcumin analogue compound was obtained with a yield of 86%. Molecular docking to EGFR and mutant p53 proteins resulted in a higher affinity of curcumin analogue compared to native ligand and curcumin, while for Bcl-2 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 moderate cytotoxic activity with an IC_{50} value of 21.37 µg/mL, and curcumin had a high cytotoxic activity with an IC_{50} value of 10.60 µg/mL against T47D breast cancer cells, both compounds had low selectivity against normal Vero cells.

Keywords: curcumin analogue, cytotoxicity test, molecular docking.