SYNTHESIS AND CYTOTOXICITY ASSAY OF CHALCONE AND PYRAZOLINE DERIVATIVES BASED ON *p*-ANISALDEHYDE AS ANTICANCER

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ABSTRACT

Synthesis of chalcone derivatives has been carried out using p-anisaldehyde and acetophenone derivatives, i.e., 4-methoxyacetophenone, and 3,4-dimethoxyacetophenone, as the starting materials. Then, the cyclocondensation of the chalcone derivatives produced the pyrazoline derivatives. The synthesized compounds were tested for cytotoxicity against 4T1 cancer cells.

The synthesis was started by reacting the acetophenone derivatives and p-anisaldehyde in the presence of KOH to give **chalcone A and B** via Claisen-Schmidt condensation. To synthesize pyrazoline derivatives, phenylhydrazine was added into chalcone solution with glacial acetic acid. The mixture was refluxed or sonicated to give **Pyrazoline A** and **B**. All the products were analyzed by FTIR, GC-MS, ^{1}H- and ^{13}C-NMR spectrometers. Anticancer assay on 4T1 and Vero cell lines were done by MTT methods.

The **chalcone A** was obtained as a bright yellow solid in 90.94% yield, and **chalcone B** was yielded as a dark yellow solid in 92.51%. For the reflux method, **pyrazoline A** was produced as bright yellow solid in 24.27% yield, while for sonochemical method obtained as a broken white solid in 16.68%. **Pyrazoline B** with reflux method produced dark yellow solid with 41.19% yield and orange solid in 24.95% yield for sonochemical method. **Chalcone A** was active towards 4T1 and inactive to normal Vero cell with IC_{50} values 48.532 and 1014.952 μg/mL, respectively. **Chalcone B** from MTT assay against 4T1 and normal Vero cell were toxic with IC_{50} values 19.057 and 28.041 μg/mL, respectively. **Pyrazoline A and B** were tested against 4T1 and shows that they were not toxic toward the cancer cells with IC_{50} values of 193.650 and 869.830 μg/mL, respectively.

Keywords: chalcone, pyrazoline, anticancer, cytotoxicity, MTT method.

SINTESIS DAN UJI SITOTOKSISITAS SENYAWA TURUNAN KALKON DAN PIRAZOLINA BERBAHAN DASAR *p*-ANISALDEHYDE SEBAGAI ANTIKANKER

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INTISARI

Sintesis turunan kalkon telah dilakukan dengan menggunakan turunan asetofenon yang berupa 4-metoksiasetofenon dan 3,4-methoksiasetofenon berbahan dasar *p*-anisaldehida. Kemudian, derivatisasi lebih lanjut dilakukan dengan modifikasi turunan kalkon yang menghasilkan beberapa turunan pirazolina. Senyawa hasil sintesis diuji sitotoksisitasnya terhadap sel kanker 4T1.

Sintesis diawali dengan mereaksikan turunan asetofenon dan *p*-anisaldehida dalam suasana basa KOH untuk menghasilkan senyawa turunan kalkon **A** dan **B** melalui reaksi kondensasi Claisen-Schmidt. Untuk sintesis turunan pirazolina, fenilhidrazina ditambahkan ke dalam larutan kalkon dengan asam asetat glasial. Campuran kemudian di refluks atau sonikasi untuk menghasilkan turunan pirazolina **A** dan **B**. Semua produk dianalisis dengan FTIR, GC-MS, ^{1}H dan ^{13}C-NMR spektrometer. Uji sitotoksisitas dilakukan terhadap sel kanker 4T1 dan sel normal Vero dengan metode MTT.

Senyawa **kalkon A** diperoleh dengan padatan berwarna kuning muda dengan rendemen 90,94% dan **kalkon B** diperoleh padatan kuninng tua dengan rendemen 92,51%. Untuk metode refluks, **pirazolina A** menghasilkan padatan kuning muda dengan rendemen 24,27%, sedangkan untuk metode sonokimia diperoleh padatan putih tulang pada rendemen 16,68%. **Pirazolina B** dengan metode refluk menghasilkan padatan kuning tua dengan rendemen 41,19% dan padatan oranye dengan rendemen 24,95% dengan metode sonokimia. Senyawa-senyawa tersebut diuji aktivitas biologisnya sebagai antikanker. **Kalkon A** menunjukan keaktifan terhadap sel 4T1 dan tidak aktif terhadap sel normal Vero dengan nilai IC_{50} sebesar 48,532 dan 1014,952 μg/mL. **Kalkon B** dari uji MTT terhadap sel 4T1 dan sel normal Vero adalah toksik dengan nilai IC_{50} ialah 19,057 dan 28,041 μg/mL. **Pyrazolina A** dan **Pyrazolina B** telah diuji terhadap sel 4T1 dan menunjukan bahwa mereka tidak toksik terhadap sel kanker dengan nilai IC_{50} 193,650 dan 869,830 μg/mL.

Kata Kunci : kalkon, pirazolina, antikanker, sitotoksisitas, Metode MTT