SINTESIS SENYAWA KALKON DARI ASETOFENON DENGAN METODE SONOKIMIA DAN UJI AKTIVITASNYA SEBAGAI KANDIDAT ANTIVIRUS COVID-19 SECARA *IN SILICO*

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INTISARI

Penelitian ini bertujuan untuk mengetahui aktivitas senyawa kalkon sebagai kandidat antivirus COVID-19, yang dilakukan melalui metode *in silico* berupa penambatan molekul senyawa kalkon terhadap protein reseptor COVID-19. Penelitian ini terdiri dari sintesis, karakterisasi, penambatan molekul dan analisis ADMET senyawa kalkon.

Senyawa kalkon disintesis melalui reaksi kondensasi Claisen-Schmidt. Senyawa 1,3-difenil-2-propen-1-on (kalkon TS) disintesis dari reaksi antara benzaldehida dan asetofenon dengan katalis KOH 40% serta pelarut etanol. Senyawa 3-(3,4-dimetoksifenil)-1-fenilprop-2-en-1-on (kalkon 3,4-DM) disintesis dari reaksi antara senyawa 3,4-dimetoksibenzaldehida dan asetofenon dengan katalis NaOH 40% serta pelarut metanol. Sintesis senyawa kalkon TS dan 3,4-DM dilakukan dengan metode konvensional dan sonokimia. Senyawa kalkon dikarakterisasi dengan FT-IR, GC-MS, ^{1}H-NMR dan ^{13}C-NMR. Studi *in silico* dilakukan dengan penambatan molekul kalkon terhadap empat protein reseptor SARS CoV-2, yaitu M^{pro} (PDB ID: 6W63), PL^{pro} (PDB ID: 3E9S), 2'-o-*methyltransferase* (nsp16) (PDB ID: 6WKQ) dan ACE2 (PDB ID:1R4L). Prediksi ADMET untuk senyawa kalkon dilakukan melalui *website* ADMETLab2.0 dan MolSoft.

Hasil penelitian menunjunkan bahwa senyawa kalkon TS berhasil disintesis melalui metode konvensional dan sonokimia dengan rendemen masing-masing 99,4% dan 80,3%. Produk senyawa kalkon 3,4-DM juga telah berhasil disintesis dengan metode konvensional dan sonokimia dengan rendemen masing-masing 66,7% dan 29,6%. Perbandingan waktu reaksi senyawa kalkon TS melalui metode konvensional dan sonokimia adalah 48:1, sedangkan untuk senyawa kalkon 3,4-DM adalah 72:1. Hasil studi *in silico* dengan penambatan molekul kalkon pada beberapa protein reseptor COVID-19, menunjukkan senyawa kalkon TS dan 3,4-DM dapat berinteraksi dengan sisi aktif dari keempat protein reseptor. Kalkon 3,4-DM memberikan interaksi yang lebih baik dibandingkan kalkon TS dan berinteraksi paling baik dengan protein reseptor M^{pro}. Kalkon 3,4-DM juga menunjukkan bioavailabilitas lebih baik dibandingkan kalkon TS.

Kata kunci: kalkon, penambatan molekul, sonokimia dan SARS-CoV-2

SYNTHESIS OF CHALCONE COMPOUNDS FROM ACETOPHENONE WITH SONOCHEMISTRY METHOD AND THEIR ACTIVITY AS ANTIVIRAL COVID-19 CANDIDATES BY *IN SILICO*

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ABSTRACT

This study aims to determine the activity of chalcone compounds as antiviral COVID-19 candidates have performed by *in silico* method. There was done by docking molecules of chalcone compounds to the COVID-19 receptor protein. This research consisted of synthesis, characterization, molecular docking, and ADMET prediction of chalcone compounds.

Chalcone compounds are synthesized through the Claisen-Schmidt condensation reaction. Compound 1,3-diphenyl-2-propen-1-one **(**chalcone TS) was synthesized by reacting the compound of benzaldehyde and acetophenone using a 40% KOH catalyst with ethanol as a solvent. While the chalcone 3-(3,4-dimethoxyphenyl)-1-phenylprop-2-en-1-one (chalcone 3,4-DM) was synthesized by reacting the compound 3,4-dimethoxybenzaldehyde and acetophenone using a 40% NaOH catalyst with methanol as a solvent. The synthesis of chalcone compounds TS and 3,4-DM were carried out by conventional and sonochemical methods. Chalcone compounds were characterized by FT-IR, GC-MS, ^{1}H-NMR and ^{13}C-NMR. *In silico* study were carried out by docking chalcone molecules with several SARS CoV-2 receptor proteins. The receptor proteins were used for *in silico* study are M^{pro} (PDB ID: 6W63), PL^{pro} (PDB ID: 3E9S), 2'-o-methyltransferase (nsp16) (PDB ID: 6WKQ) and ACE2 (PDB ID:1R4L). ADMET prediction for chalcone compounds were carried out through the ADMETlab2.0 and MolSoft websites.

Based on the results of the research, chalcone TS was successfully carried out through conventional and sonochemical method with yields of 99.4%, and 80.3% respectively. Chalcone 3,4-DM was also successfully carried out through conventional and sonochemical method with yields of 66.7% and 29.6% respectively. The comparison of reaction time for chalcone TS compounds through conventional and sonochemical methods is 48:1, while for chalcone 3,4-DM compounds is 72:1. The results of an *in silico* study by molecular docking of chalcone compounds to several COVID-19 receptor proteins showed that chalcone compounds could interact with the active site of the four protein receptors. Chalcone 3,4-DM given a better interaction than chalcone TS and have the best interaction with receptor protein M^{pro}. Chalcone 3,4-DM also showed better bioavailability than chalcone TS.

Keywords: chalcone, molecular docking, sonochemistry and SARS-CoV-2