SINTESIS SENYAWA ANALOG KURKUMIN DENGAN METODE SONIKASI SERTA EFEK SINERGISITASNYA DENGAN ASAM FERULAT DALAM MENGINHIBISI AKTIVITAS ENZIM α-AMILASE

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INTISARI

Tiga senyawa analog kurkumin (**A**, **B**, **C**) dengan bahan dasar dimetilaminobenzaldehida telah disintesis dengan metode sonikasi yang dibandingkan hasilnya dengan metode konvensional. Reaksi yang terlibat dalam tahapan sintesis adalah reaksi kondensasi aldol antara senyawa aldehida dengan keton. Keton yang digunakan adalah aseton (**A**), siklopentanon (**B**), dan sikloheksanon (**C**) yang menghasilkan senyawa analog kurkumin. Ketiga senyawa analog kurkumin dalam senyawa tunggal dan dikombinasikan dengan asam ferulat kemudian diujikan sebagai inhibitor aktivitas enzim α-amilase.

Sintesis senyawa analog kurkumin dengan metode sonikasi dilakukan dengan mengiradiasikan dimetilaminobenzaldehida, monoketon, dan metanol atau etanol sebagai pelarut dengan penambahan katalis basa KOH 5% yang menghasilkan produk analog kurkumin **A**, **B**, dan **C** dengan rendemen berturut-turut sebesar 82,5; 85,3; dan 76,1%. Elusidasi struktrur ketiga senyawa dilakukan dengan spektrofotometer UV-Vis dan FTIR, serta spektrometer GC dan MS.

Pengujian inhibisi terhadap aktivitas enzim α-amilase oleh ketiga senyawa analog kurkumin serta kombinasinya dengan asam ferulat, dan kuersetin sebagai kontrol positif dilakukan dengan metode *Starch liquefying* dengan penambahan larutan iodin secara *stop assay*. Hasil inhibisi senyawa analog kurkuminn hasil sintesis (**A**, **B**, **C**) menunjukkan persentasi inhibisi yang cukup tinggi (77,06; 76,59; 78,34%) dengan nilai IC_{50} berturut-turut 23,64; 1,36; dan 5,93 µg/mL. Hasil inhibisi kombinasi menunjukkan bahwa analog kurkumin **C** dengan asam ferulat memberikan tingkat inhibisi yang paling tinggi yaitu sebesar 95,94% dengan IC_{50} 13,38 µg/mL. Kombinasi analog kurkumin **A** dan asam ferulat memberikan efek sinergis yang kuat dengan nilai indeks kombinasi kurang dari satu (0,33). Senyawa analog kurkumin hasil sintesis sangat cukup berpotensi dalam menginhibisi aktivitas enzim α-amilase sehingga dapat dijadikan kandidat obat anti diabetes dan obesitas.

Kata kunci: Analog kurkumin, sonikasi, efek sinergisitas, asam ferulat, enzim α-amilase

ULTRASOUND-ASSISTED SYNTHESIS OF SOME CURCUMIN ANALOGS CURCUMIN AND THEIR SYNERGISTIC EFFECT WITH FERULIC ACID ON α-AMILASE ENZYME INHIBITION ACTIVITY

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ABSTRACT

Three curcumin analogs (**A**, **B**, **C**) from dimethylaminobenzaldehyde derivates were synthesized using a green method (ultrasound-assisted technique) compared with conventional method. The reaction involved in the step of synthesis is the aldol condensation reaction between the aldehyde compound and the ketone. The ketones used are acetone (**A**), cyclopentanone (**B**), and cyclohexanone (**C**) which produces curcumin analogs compounds. Three curcumin analog compounds are treated separately and combined with ferulic acid to tested as inhibitors of α-amylase enzyme activity.

The synthesis of curcumin analogs by ultrasound-assisted technique was carried out by irradiating dimethylaminobenzaldehyde, monoketone, and methanol or ethanol as solvents with addition of base catalyst (KOH 5%) with yields products **A**, **B** and **C** respectively 82.5; 85.3; and 76.1%. The structural elucidation of products was performed with FTIR and UV-Vis spectrophotometers, also GC and MS spectrometers.

Testing of inhibition of α-amylase enzyme activity by three curcumin analog compounds as well as its combination with ferulic acid, and quercetin as a positive control was performed by starch liquefying method with the addition of iodine solution by stop assay. The result of inhibition showed that curcumin analogs (**A**, **B**, **C**) have the high inhibition (77.06; 76.59; 78.34%) with IC_{50} value 23,64; 1,36; dan 5,93 µg/mL respectively. The result of the combination inhibition showed that of curcumin analog **C** with ferulic acid gave the highest inhibition level of 95.94% with IC_{50} 13.38 µg/mL. The combination of curcumin analog **A** and ferulic acid has a strong synergistic effect with a combination index value of less than 1 (0.33). Curcumin analogs are quite potent in inhibiting the activity of α-amylase and that it can be a candidate for anti diabetic drugs and obesity.

Keywords: Curcumin analogs, ultrasound, synergistic effect, ferulic acid, α-amylase