AKTIVITAS INHIBISI α-GLUKOSIDASE FRAKSI ETIL ASETAT DAUN RARU (*Cotylelobium melanoxylon* Pierre) DAN ANALISIS INTERAKSI MOLEKULER SENYAWA HASIL IDENTIFIKASI GC-MS

INTISARI

Diabetes melitus merupakan gangguan fungsi pankreas memproduksi insulin sehingga menyebabkan kondisi kronis terjadinya peningkatan gula darah. Eksplorasi agen antidiabetes berbasis bahan alam terus diupayakan untuk menemukan alternatif obat baru yang lebih aman, murah, dan efektif. Penggunaan tanaman Raru (*Cotylelobium melanoxylon*) telah dipercaya oleh masyarakat khususnya Sumatra Utara untuk obat diabetes, senyawa aktif flavonoid, tanin dan saponin diketahui memiliki aktivitas menurunkan kadar gula darah (hipoglikemik). Penelitian ini bertujuan mendeteksi senyawa metabolit sekunder daun Raru dan interaksinya sebagai antidiabetes.

Metode penelitian diawali dengan ekstraksi, fraksinasi, dan fraksi etil asetat diuji aktivitas antidiabetes secara *in vitro* terhadap enzim α-glukosidase. Isolasi fraksi etil asetat menggunakan KLT preparatif, perolehan pita dominan dianalisis dengan GC-MS. Senyawa hasil kromatogram diprediksi secara *in silico* melalui *molecular docking* terhadap α-glukosidase dan enzim terkait metabolisme glukosa.

Berdasarkan uji penghambatan α-glukosidase secara *in vitro*, nilai IC_{50} fraksi etil asetat sebesar 7,49 ppm. Isolasi fraksi etil asetat diperoleh pita B dengan noda tunggal pada Rf 0,33. Berdasarkan analisis GC-MS pita B terindikasi senyawa eugenol, asam palmitat, dan asam oktadekanoat. Hasil *molecular docking* menunjukkan eugenol memiliki interaksi terbaik terhadap α-glukosidase dibandingkan asam palmitat dan asam oktadekanoat, tercermin dari jumlah dan/atau kekuatan ikatan hidrogen yang terbentuk dengan residu aktif enzim. Ketiga senyawa juga berinteraksi terhadap target tambahan enzim FBPase (fruktosa-1,6-bisfosfatase 1) dan α-amilase. Afinitas ikatan ketiga senyawa terhadap FBPase lebih kuat dibandingkan terhadap α-amilase. Temuan ini menunjukkan potensi kandungan senyawa daun Raru sebagai antidiabetes melalui mekanisme penghambatan enzim metabolisme glukosa, khususnya α-glukosidase.

Kata Kunci: Raru (*Cotylelobium melanoxylon*), Antidiabetes, Inhibisi α-Glukosidase, *Molecular docking*, PLANTS

INHIBITION ACTIVITY OF α-GLUCOSIDASE BY ETHYL ACETATE FRACTION OF RARU LEAVES (*Cotylelobium melanoxylon* Pierre) AND MOLECULAR INTERACTION ANALYSIS OF COMPOUNDS IDENTIFIED BY GC–MS

ABSTRACT

Diabetes mellitus is a disorder of the pancreas's ability to produce insulin, leading to a chronic condition of elevated blood sugar levels. Research into natural-based antidiabetic agents continues in an effort to find new alternative drugs that are safer, cheaper, and more effective. The use of the Raru plant (*Cotylelobium melanoxylon*) has been trusted by the community, especially in North Sumatra, as a remedy for diabetes. The active compounds flavonoids, tannins, and saponins are known to have blood sugar-lowering (hypoglycemic) activity. This study aims to detect the secondary metabolites of Raru leaves and their interaction as antidiabetic agents.

The research method began with extraction, fractionation, and testing the antidiabetic activity of the ethyl acetate fraction in vitro against the α-glucosidase enzyme. The ethyl acetate fraction was isolated using preparative TLC, and the dominant isolate was analyzed using GC-MS. The compounds obtained from the chromatogram were predicted in silico through molecular docking against α-glucosidase and glucose metabolism related enzymes.

Based on in vitro testing, the IC_{50} value of the ethyl acetate fraction was 7,49 ppm. The separation of the ethyl acetate fraction produced band B with a single spot at Rf 0.33. GC-MS analysis of band B indicated the compounds eugenol, palmitic acid, and octadecanoic acid. The molecular docking results show that eugenol has the best interaction with α-glucosidase compared to palmitic acid and octadecanoic acid, as reflected in the number and/or strength of hydrogen bonds formed with the active residues of the enzyme. All three compounds also interact with additional enzyme targets FBPase (fructose-1,6-bisphosphatase 1) and α-amylase. The binding affinity of the three compounds to FBPase is stronger than to α-amylase. These findings indicate the potential of Raru leaf compounds as antidiabetic agents through the mechanism of inhibiting glucose metabolism enzymes, particularly α-glucosidase.

Keywords: Raru (*Cotylelobium melanoxylon*), Antidiabetic, α-Glucosidase Inhibition, *Molecular docking*, PLANTS