

**STUDI PROFIL METABOLIT DAN UJI AKTIVITAS INHIBISI
ENZIM α -GLUKOSIDASE FRAKSI HEMWAT BATANG BROTOWALI
(*Tinospora crisper* L.)**

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ABSTRAK

Latar Belakang: Brotowali (*Tinospora crisper* L.) memiliki aktivitas antidiabetes melalui inhibisi enzim α -glukosidase. Namun, informasi profil metabolit dan aktivitas fraksi polar dan nonpolar batang brotowali sebagai inhibitor enzim α -glukosidase masih terbatas.

Tujuan: Mengetahui profil metabolit fraksi polar dan nonpolar batang brotowali serta mengevaluasi aktivitas inhibisi enzim α -glukosidase secara *in silico* dan *in vitro*.

Metode: Batang brotowali diekstraksi dengan maserasi menggunakan metanol, kemudian difraksinasi menggunakan sistem pelarut HEMWat. Profil kandungan metabolit fraksi polar dan nonpolar dikaji dengan metode LC-HRMS. Senyawa hasil identifikasi dilakukan *virtual screening* berdasarkan profil farmakokinetik, dilanjutkan pengujian *in silico* terhadap enzim α -glukosidase dan kajian profil farmakokinetik tiga senyawa terbaik. Aktivitas inhibisi fraksi polar dan nonpolar diuji secara *in vitro* menggunakan *microplate reader*.

Hasil: Analisis LC-HRMS mengidentifikasi 324 senyawa metabolit, dengan 114 senyawa terpilih untuk uji *in silico*. Hasil penambatan molekul menunjukkan tiga senyawa dengan afinitas terbaik terhadap enzim α -glukosidase yaitu 2-monolinolenin, phytosphingosine dan 2-Amino-1,3,4-octadecanetriol. Fraksi polar memiliki aktivitas inhibisi sangat kuat dengan IC₅₀ sebesar 1,693 ppm, sedangkan fraksi nonpolar memiliki aktivitas sangat lemah dengan IC₅₀ sebesar 13222 ppm.

Kesimpulan: Analisis profil metabolit menunjukkan keberagaman metabolit pada fraksi polar dan nonpolar batang brotowali. Hasil *in silico* mengidentifikasi senyawa dengan afinitas terbaik terhadap enzim α -glukosidase, sedangkan hasil *in vitro* menunjukkan fraksi polar memiliki aktivitas inhibisi lebih kuat dibandingkan fraksi nonpolar.

Kata kunci: enzim α -glukosidase, *in silico*, *in vitro*, profil metabolit, *Tinospora crisper* L.

METABOLITE PROFILING AND α -GLUCOSIDASE INHIBITORY ACTIVITY OF HEMWAT FRACTIONS FROM BROTOWALI STEM (*Tinospora crispa* L).

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ABSTRACT

Background: Brotowali (*Tinospora crispa* L.) has antidiabetic activity through the inhibition of α -glucosidase. However, information regarding the metabolite profile and inhibitory activity of the polar and nonpolar fractions of brotowali stems as α -glucosidase inhibitors remains limited.

Objectives: To determine the metabolite profile of polar and nonpolar fractions of brotowali stem and evaluate their α -glucosidase inhibitory activity *in silico* and *in vitro*.

Methods: Brotowali stems were extracted by maceration using methanol solvent, followed by fractionation using the HEMWat solvent system. The metabolite profiles of the polar and nonpolar fractions were analyzed using LC-HRMS. The identified compounds underwent virtual screening based on their pharmacokinetic profiles, followed by *in silico* evaluation against α -glucosidase and pharmacokinetic profile analysis of the three best-performing compounds. The inhibitory activities of the polar and nonpolar fractions were evaluated *in vitro* using a microplate reader.

Results: LC-HRMS analysis identified 324 metabolites, of which 114 were selected for *in silico* analysis. Molecular docking identified three compounds with the highest affinity for the α -glucosidase: 2-monolinolenin, phytosphingosine and 2-Amino-1,3,4-octadecanetriol. The polar fraction exhibited very strong α -glucosidase inhibitory activity, with an IC₅₀ value of 1,693 ppm, whereas the nonpolar fraction exhibited very weak activity, with an IC₅₀ value of 13,222 ppm.

Conclusion: Metabolite profiling showed that the polar and nonpolar fractions of the brotowali stem contain a variety of metabolites. *In silico* results identified compounds with the highest affinity for the α -glucosidase enzyme, while *in vitro* results showed that the polar fraction exhibits stronger α -glucosidase inhibitory activity than the nonpolar fraction.

Keywords: α -glucosidase enzyme, *in silico*, *in vitro*, metabolite profiling, *Tinospora crispa* L.