

ABSTRAK

Nama : Faldi Pangihutan Simanullang
Program Studi : S1 Farmasi
Judul : uji *In Silico* Senyawa Daun Sirih (*Piper betle* L.)
Sebagai Inhibitor Plasminogen Activator Inhibitor
1 (PAI 1)

Daun sirih (*Piper betle* L.) diketahui mengandung berbagai senyawa bioaktif yang berpotensi sebagai inhibitor alami plasminogen activator inhibitor-1 (PAI-1), regulator utama sistem fibrinolisis yang menjadi target terapi pada kondisi perdarahan, trombosis, dan fibrosis. Penelitian ini bertujuan mengevaluasi interaksi 14 senyawa utama daun sirih, yaitu ascorbic acid, gallic acid, catechin, caffeic acid, syringic acid, rutin, *p*-coumaric acid, sinapic acid, ferulic acid, myricetin, quercetin, apigenin, kaempferol, dan eugenol terhadap PAI-1 menggunakan pendekatan *in silico*. Analisis dilakukan melalui *molecular docking*, identifikasi interaksi residu kunci, serta prediksi profil ADME dan toksisitas. Hasil *molecular docking* menggunakan PLANTS menunjukkan bahwa catechin dan myricetin memiliki afinitas ikatan yang lebih baik dibandingkan ligan asal (TB7) dan ligan pembanding (asam traneksamat). Catechin menunjukkan PLANTS docking score $-98,40$, sedangkan myricetin $-96,61$, lebih rendah dibandingkan TB7 ($-94,98$) dan asam traneksamat ($-71,02$). Analisis interaksi molekuler menunjukkan keterlibatan residu asam amino Ser530 dan Tyr358 yang berperan penting dalam aktivitas PAI-1. Selain itu, kedua senyawa memenuhi kriteria sifat mirip obat (*drug-likeness*) serta menunjukkan profil farmakokinetik yang baik berdasarkan prediksi ADME. Berdasarkan hasil tersebut, catechin dan myricetin berpotensi dikembangkan sebagai kandidat obat hemostatik berbasis bahan alam.

Kata kunci: Daun sirih, PAI-1, *In Silico*, Molecular Docking, PLANTS Score

ABSTRACT

Name : Faldi Pangihutan Simanullang
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Title : In Silico Test of Betel Leaf Compounds (*Piper betle* L.) as Plasminogen Activator Inhibitor 1 (PAI 1)

Betel leaf (*Piper betle* L.) is known to contain various bioactive compounds with potential activity as natural inhibitors of Plasminogen Activator Inhibitor-1 (PAI-1), a key regulator of the fibrinolytic system and a therapeutic target in bleeding, thrombosis, and fibrosis. This study aimed to evaluate the interactions of 14 major betel leaf compounds ascorbic acid, gallic acid, catechin, caffeic acid, syringic acid, rutin, *p*-coumaric acid, sinapic acid, ferulic acid, myricetin, quercetin, apigenin, kaempferol, and eugenol with PAI-1 using an *in silico* approach. The analysis included molecular docking, identification of key residue interactions, and prediction of ADME and toxicity profiles. Molecular docking using PLANTS demonstrated that catechin and myricetin exhibited better binding affinities compared to the native ligand (TB7) and the reference ligand (tranexamic acid). Catechin showed a PLANTS docking score of -98.40 , while myricetin showed -96.61 , both lower than TB7 (-94.98) and tranexamic acid (-71.02). Molecular interaction analysis indicated the involvement of amino acid residues Ser530 and Tyr358, which play important roles in PAI-1 activity. Additionally, both compounds satisfied drug-likeness criteria and demonstrated favorable pharmacokinetic profiles based on ADME predictions. Based on these findings, catechin and myricetin have potential to be developed as natural hemostatic drug candidates.

Keywords: Betel leaf, PAI-1, In Silico, Molecular Docking, PLANTS Score