Isolasi Bakteri Endofit dari Daun Kumis Kucing (*Orthosiphon aristatus* (Blume) Miq.) dan Uji Aktivitas Inhibitor Enzim α-Glukosidase secara In Vitro

Tesis

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ABSTRAK

Salah satu tanaman herbal di Indonesia yang sering digunakan dalam pengobatan tradisional yaitu daun kumis kucing (*Orthosiphon aristatus* (Blume) Miq). Secara tradisonal tanaman ini digunakan sebagai obat diabetes, hipertensi, rematik, asam urat dan diuretik. Untuk mendapatkan satu produk obat baru dari bahan alam membutuhkan simplisia sangat banyak serta lahan yang luas untuk menanam tanaman aslinya. Karena keterbatasan jumlah lahan maka diperlukan suatu metode yang lebih efektif. Isolasi bakteri endofit dari tanaman dapat menjadi metode yang digunakan karena siklus hidup bakteri relatif singkat serta tidak diperlukannya tanah yang luas.. Penelitian ini bertujuan untuk mengetahui potensi senyawa dari isolat bakteri endofit dari daun kumis kucing (*Orthosiphon aristatus* (Blume) Miq) sebagai antidiabetes yang memiliki aktivitas inhibitor enzim α-glukosidase. Isolasi bakteri endofit dilakukan dengan metode tanam langsung. Fermentasi bakteri endofit menggunakan media *nutrient broth*. Hasil fermentasi diekstrak dengan pelarut etil asetat. Uji KLT bioautografi dan penentuan nilai IC_{50} dilakukan sebagai skrining bioaktivitas inhibitor enzim α-glukosidase. Metode LC-MS/MS digunakan untuk pendekatan profil kandungan kimia ekstrak bakteri. Senyawa ekstrak bioaktif diisolasi dengan menggunakan kolom Sephadex LH-20. Terdapat 8 isolat dari hasil isolasi bakteri endofit daun kumis kucing. Dimana 4 isolat bakteri dari 8 isolat yang didapatkan memiliki aktivitas inhibitor enzim α-glukosidase dengan nilai IC_{50} bakteri endofit KK 1 (41,352µg/mL), KK 3 (57,041µg/mL), KK 4 (56,702 µg/mL) dan KK 5 (164,156 µg/mL). Hasil LC-MS/MS senyawa yang didapatkan yaitu Adlupone (golongan m-benzoquinone) dengan nilai IC_{50} sebesar 41,352 µg/mL. Pengujian secara molekuler spesies bakteri potensial yang didapatkan yaitu *Priestia aryabhattai*, dan *Priestia megaterium*. Berdasarkan hasil tersebut dapat disimpulkan bahwa senyawa dari bakteri endofit daun kumis kucing (*Orthosiphon aristatus* (Blume) Miq) memiliki potensi menghambat aktivitas inhibitor enzim α-glukosidase.

Kata Kunci : Bakteri endofit, enzim α-glukosidase, LC-MS/MS, *Orthosiphon aristatus* (Blume) Miq

The Isolation of Endophytic Bacteria from the Leaves of Kumis Kucing (*Orthosiphon aristatus* (Blume) Miq.) and In Vitro Assay of α-Glucosidase Enzyme Inhibitory Activity

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ABSTRACT

One of the herbal plants commonly used in traditional Indonesian medicine is Kumis Kucing leaves (Orthosiphon aristatus (Blume)Miq). Traditionally, this plant is used as a treatment for diabetes, hypertension, rheumatism, gout, and as a diuretic. Developing a new medicinal product from natural sources requires a significant amount of simplicia a more effective method is needed. Isolating endophytic bacteria from plants can be an effective alternative, as bacteria have a relatively short life cycle and do not required extensive land. This study aims to explore the potential of compounds from endophytic bacterial isolates from Kumis Kucing leaves (Orthisphon aristatus (Blume) Miq) as antidiabetic agents with α-glucosidase enzyme inhibitor activity. The isolation of endophytic bacteria was performed using the direct planting method. Fermentation of endophytic bacteria was carried out using nutrient broth media. The fermentation products were extracted with ethyl acetate solvent. Thin Layer Chromatography (TLC) bioautography and IC50 determination were conducted to screen the bioactivity of α-glucosidase enzyme inhibitors. LC-MS/MS was used to profile the chemical contents of the bacterial extracts. Bioactive compounds were isolated using Sephadex LH-20 column chromatography. Eight isolated were obtained from the endophytic bacteria isolated from Kumis Kucing leaves. Four of these isolated exhibited α-glucosidase enzyme inhibitor activity, with IC_{50} values for endophytic bacteria KK 1 (41,325 µg/mL), KK 3 (57,041 µg/mL), KK 4 (56,702 µg/mL), and KK 5 (164,156 µg/mL). The LC-MS/MS analysis identified Adlupone (a member of the m-benzoquinone class) with an IC_{50} value of 41,325 µg/mL. Moleculer testing revealed the potential bacterial species to be Priestia aryabhattai and Priestia megaterium. Based on these results, it can be concluded that compounds from endophytic bacteria isolated from kumis kucing leaves (Orthosiphon aristatus (Blume) Miq) have the potential to inhibit α-glucosidase enzyme activity.

Keyword : α-glucosidase enzyme, endophytic bacteria, LC-MS/MS, Orthosiphon aristatus (Blume) Miq