

AKTIVITAS ANTIDIABETES EKSTRAK KAYA POLIFENOL DAUN SEROJA (*NELUMBO NUCIFERA*): EVALUASI IN VITRO MELALUI INHIBISI ENZIM DAN STUDI IN VIVO

ABSTRAK

Diabetes melitus merupakan penyakit metabolik kronis yang ditandai oleh hiperglikemia akibat gangguan sekresi insulin, resistensi insulin, atau kombinasi keduanya. Peningkatan prevalensi diabetes melitus secara global serta keterbatasan terapi konvensional mendorong pengembangan alternatif pengobatan berbasis bahan alam yang lebih aman dan efektif. Daun seroja (*Nelumbo nucifera*) diketahui mengandung senyawa polifenol yang memiliki potensi sebagai agen antidiabetes melalui berbagai mekanisme biologis. Penelitian ini bertujuan untuk mengevaluasi aktivitas antidiabetes ekstrak kaya polifenol daun seroja melalui pendekatan *in vitro* dan *in vivo*. Ekstrak diperoleh melalui optimasi proses ekstraksi menggunakan *Response Surface Methodology* (RSM) dengan desain Box–Behnken, kemudian dikarakterisasi menggunakan metode LC-HRMS. Aktivitas antidiabetes *in vitro* ditentukan berdasarkan kemampuan ekstrak dalam menghambat enzim α -glukosidase, sedangkan aktivitas *in vivo* dievaluasi melalui pengukuran kadar glukosa darah pada tikus model hiperglikemia selama 28 hari perlakuan. Hasil penelitian menunjukkan bahwa ekstrak kaya polifenol daun seroja memiliki aktivitas penghambatan enzim α -glukosidase dengan nilai IC_{50} sebesar 112,43 μ g/mL yang termasuk kategori aktif. Aktivitas tersebut diduga berkaitan dengan kandungan senyawa fenolik dan flavonoid, seperti quercetin glikosida dan flavonoid polihidroksi yang teridentifikasi melalui analisis LC-HRMS. Selain itu, ekstrak menunjukkan aktivitas antihiperglikemik yang bersifat *dose-dependent*, di mana dosis 600 mg/kg bb memberikan efek paling optimal dengan menurunkan kadar glukosa darah dari $324,34 \pm 11,89$ mg/dL menjadi $102,45 \pm 5,11$ mg/dL pada hari ke-28, dengan efektivitas yang mendekati glibenklamid sebagai kontrol positif. Hasil penelitian ini menunjukkan bahwa ekstrak kaya polifenol daun seroja berpotensi dikembangkan sebagai agen antidiabetes berbasis bahan alam melalui mekanisme penghambatan enzim α -glukosidase dan penurunan kadar glukosa darah pada kondisi hiperglikemia.

Kata kunci: diabetes melitus, *Nelumbo nucifera*, daun seroja, polifenol, antidiabetes, α -glukosidase, hiperglikemia.

ANTIDIABETIC ACTIVITY OF POLYPHENOL-RICH EXTRACTS FROM SEROJA LEAVES (NELUMBO NUCIFERA): IN VITRO EVALUATION THROUGH ENZYME INHIBITION AND IN VIVO STUDIES

ABSTRACT

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from impaired insulin secretion, insulin resistance, or a combination of both. The increasing global prevalence of diabetes mellitus, coupled with the limitations and adverse effects associated with conventional therapies, has encouraged the exploration of natural products as alternative therapeutic agents. *Nelumbo nucifera* (lotus) leaves are known to contain abundant polyphenolic compounds with potential antidiabetic properties. This study aimed to evaluate the antidiabetic activity of a polyphenol-rich extract of *Nelumbo nucifera* leaves through both *in vitro* and *in vivo* approaches. The extract was obtained through an optimized extraction process using Response Surface Methodology (RSM) with a Box–Behnken design and subsequently characterized using Liquid Chromatography–High Resolution Mass Spectrometry (LC-HRMS). The *in vitro* antidiabetic activity was assessed based on α -glucosidase inhibitory activity, while the *in vivo* study was conducted using hyperglycemic rat models by monitoring blood glucose levels over a 28-day treatment period. The results demonstrated that the polyphenol-rich extract exhibited α -glucosidase inhibitory activity with an IC_{50} value of 112.43 μ g/mL, indicating active inhibitory potential. This activity was attributed to the presence of phenolic and flavonoid compounds, including quercetin glycosides and polyhydroxylated flavonoids identified through LC-HRMS analysis. Furthermore, the extract exhibited a dose-dependent antihyperglycemic effect, with the 600 mg/kg body weight dose producing the greatest reduction in blood glucose levels, from 324.34 ± 11.89 mg/dL to 102.45 ± 5.11 mg/dL on day 28, approaching the efficacy of glibenclamide as the positive control. These findings suggest that the polyphenol-rich extract of *Nelumbo nucifera* leaves possesses significant antidiabetic potential through α -glucosidase inhibition and blood glucose-lowering.

Keywords: diabetes mellitus, *Nelumbo nucifera*, lotus leaf, polyphenols, antidiabetic activity, α -glucosidase inhibition, hyperglycemia.