KARAKTERISTIK EKSTRAK DAN HIDROLISAT KOLAGEN DARI LIMBAH TULANG IKAN PATIN SERTA PREDIKSI *IN SILICO* POTENSI BIOAKTIVITAS SEBAGAI AGEN PENYEMBUH LUKA DIABETES

SKRIPSI

Diajukan untuk memenuhi syarat untuk memperoleh gelar Sarjana Sains pada
Program Studi Kimia

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ABSTRAK

Pemanfaatan sumber bahan alami yang efektif, aman, dan berkelanjutan menjadi alternatif penting untuk mendukung pengembangan terapi baru. Penelitian ini bertujuan menganalisis karakteristik kolagen dan hidrolisat kolagen dari limbah tulang ikan patin serta memprediksi potensi bioaktivitasnya sebagai agen penyembuh luka diabetes secara *in silico*. Hasil karakterisasi FTIR, UV-Vis, SDS-PAGE, dan XRD menunjukan hasil yang sesuai untuk kolagen Tipe I yang ada pada tulang ikan patin. Setelah dihidrolisis dengan enzim bromelain hidrolisat kolagen memiliki hasil uji FTIR, UV-Vis, dan SDS-PAGE yang mengindikasikan bahwa ekstrak kolagen telah terhidrolisis dengan baik. Analisis *in silico* mengidentifikasi peptida aktif dari tulang ikan patin bersifat antioksidan, non-toksik, dan non-alergenik. Studi *molecular docking* menunjukkan afinitas ikatan yang tinggi terhadap protein target inflamasi (*TNF-α*, *IL-6*), antioksidan (*NF-κB*), dan antibakteri (*Peptide deformylase* dari *Pseudomonas aeruginosa*). Temuan ini mengindikasikan potensi peptida dalam menekan inflamasi berlebihan pada luka diabetes, mengurangi stres oksidatif untuk mempercepat regenerasi jaringan, serta menghambat pertumbuhan bakteri oportunistik penyebab infeksi. Berdasarkan pengujian in silico diperlukan pengujian in vitro lanjutan terhadap hidrolisat yang diperoleh untuk validasi bioaktifitas penyembuhan luka diabetes.

Kata kunci: antibakteri, antiinflamasi, antioksidan, bioakivitas, diabetes, hidrolisat, *in silico*, kolagen, penyembuhan luka, peptida aktif, tulang ikan patin.

ABSTRACT

The utilization of effective, safe, and sustainable natural sources is an important alternative to support the development of new therapies. This study aims to analyze the characteristics of collagen and collagen hydrolysate from catfish bone waste and predict its potential bioactivity as a diabetic wound healing agent in silico. The results of FTIR, UV-Vis, SDS-PAGE, and XRD characterization showed appropriate results for Type I collagen present in catfish bone. After hydrolysis with bromelain enzyme, collagen hydrolysate had FTIR, UV-Vis, and SDS-PAGE test results indicating that the collagen extract had been well hydrolyzed. In silico analysis identified active peptides from catfish bone as antioxidants, non-toxic, and non-allergenic. Molecular docking studies showed high binding affinity to inflammatory target proteins (TNF-α, IL-6), antioxidants (NF-κB), and antibacterials (Peptide deformylase from Pseudomonas aeruginosa). These findings indicate the peptide's potential to suppress excessive inflammation in diabetic wounds, reduce oxidative stress to accelerate tissue regeneration, and inhibit the growth of opportunistic bacteria that cause infection. Based on in silico testing, further in vitro testing of the resulting hydrolysate is needed to validate its bioactivity in diabetic wound healing.

Keywords: *antibacterial, anti-inflammatory, antioxidant, bioactivity, diabetes, hydrolysate, in silico, collagen, wound healing, active peptide, catfish bon*

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DAFTAR LAMPIRAN

DAFTAR SINGKATAN

TNF-α	= Faktor Nekrosis Tumor alfa
NF-κB	= *Nuclear Factor kappa-light-chain-enhancer of activated B cells*
IL-6	= Interleukin 6
XRD	= *X-Ray Diffraction*
UV-Vis	= *Ultraviolet-Visible*
SDS PAGE	= *Sodium dodecyl sulfate polyacrylamide gel electrophoresis*
FTIR	= *Fourier Transform Infrared Spectroscopy*

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