FORMULASI DAN EVALUASI GEL PENYEMBUHAN LUKA DENGAN BAHAN AKTIF EKSTRAK *Spirulina platensis* YANG DIPERKAYA *CINNAMON ESSENTIAL OIL*

TESIS

diajukan untuk memenuhi sebagian dari syarat memperoleh gelar magister sains
di bidang kimia

Oleh:

Deaniar Hafilah

2313438

PROGRAM STUDI MAGISTER KIMIA

FAKULTAS PENDIDIKAN MATEMATIKA DAN ILMU PENGETAHUAN ALAM

UNIVERSITAS PENDIDIKAN INDONESIA

2025

FORMULASI DAN EVALUASI GEL PENYEMBUHAN LUKA DENGAN BAHAN AKTIF EKSTRAK *Spirulina platensis* YANG DIPERKAYA *CINNAMON ESSENTIAL OIL*

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Deaniar Hafilah

S.Si Universitas Pendidikan Indonesia, 2023

Sebuah Tesis yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Magister Sains (M.Si) pada Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

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DEANIAR HAFILAH

FORMULASI DAN EVALUASI GEL PENYEMBUHAN LUKA DENGAN BAHAN AKTIF EKSTRAK *Spirulina platensis* YANG DIPERKAYA *CINNAMON ESSENTIAL OIL*

disetujui dan disahkan oleh pembimbing:

Pembimbing I

Prof. Heli Siti Halimatul M, Ph.D.

NIP. 197907302001122002

Pembimbing II

Dr. Siti Aisyah, M.Si.

NIP. 197509302001122001

Mengetahui

Ketua Program Studi Kimia

Prof. Fitri Khoerunnisa, Ph.D

NIP. 197806282001122002

PERNYATAAN BEBAS PLAGIARISME

Saya yang bertanda tangan di bawah ini:

Nama : Deaniar Hafilah

NIM : 2313438

Program Studi : Kimia

Judul Karya : Formulasi dan evaluasi gel penyembuhan luka dengan bahan aktif ekstrak *spirulina platensis* yang diperkaya *cinnamon essential oil*

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Bandung, Januari 2025

Yang membuat pernyataan

Deaniar Hafilah

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ABSTRAK

Resistensi antibiotik dan produksi berlebihan *Reactive Oxygen Species* (ROS) merupakan faktor utama yang menghambat proses penyembuhan luka. Penelitian ini mengembangkan formulasi gel penyembuhan luka berbasis ekstrak *Spirulina platensis* yang diperkaya dengan minyak esensial kayu manis (*Cinnamon Essential Oil*, CEO) sebagai alternatif obat dalam mempercepat penyembuhan luka. Bioaktivitas ekstrak *Spirulina platensis* dan CEO diuji melalui pengujian antibakteri (metode difusi agar dan mikrodilusi), antibiofilm, serta antioksidan (metode DPPH). Konsentrasi optimal dari pengujian tersebut digunakan untuk formulasi gel penyembuhan luka. Stabilitas formulasi diuji melalui parameter pH, homogenitas, dan daya sebar, serta aktivitas antibakteri dan antioksidan. Hasil penelitian menunjukkan bahwa ekstrak *Spirulina platensis* pada konsentrasi 4% menghasilkan zona hambat terbesar (11,16-13,97 mm), MIC 2% dan MBC 4%. CEO pada konsentrasi 2% menghasilkan zona hambat 14,03-16,83 mm dengan MIC dan MBC sebesar 1,56%. Aktivitas antioksidan ditunjukkan dengan nilai IC50 sebesar 133 ppm untuk ekstrak *Spirulina platensis* dan 87 ppm untuk CEO. Formulasi gel kombinasi *Spirulina platensis*-CEO (GCS) menunjukkan stabilitas terbaik dengan homogenitas yang terjaga selama penyimpanan suhu ruang dan *cycling test*. Daya sebar formulasi memenuhi standar SNI (4-7 cm), dengan pH stabil pada kisaran 6. GCS memiliki aktivitas antibakteri unggul (zona hambar 13,90-16,46 mm) dan aktivitas antioksidan tertinggi (inhibisi 72,78%). Hasil ini mengindikasikan bahwa gel kombinasi *Spirulina platensis*-CEO berpotensi menjadi formula efektif untuk penyembuhan luka dengan aktivitas antibakteri dan antioksidan yang optimal.

Kata kunci: bioaktivitas, *Cinnamon Essential Oil*, gel penyembuhan luka, *Spirulina platensis*, stabilitas

ABSTRACT

Antibiotic resistance and excessive production of Reactive Oxygen Species (ROS) are major factors that hinder wound healing processes. This study developed a wound-healing gel formulation based on Spirulina platensis extract enriched with Cinnamon Essential Oil (CEO) as a topical alternative for accelerating wound recovery. The bioactivities of Spirulina platensis extract and CEO were evaluated through antibacterial assays (agar diffusion and microdilution methods), antibiofilm, and antioxidant assays (DPPH method). The optimal concentrations from these assays were used for the wound-healing gel formulation. The stability of the formulation was assessed in terms of pH, homogeneity, and spreadability, along with antibacterial and antioxidant activities. The results showed that Spirulina platensis extract at a concentration of 4% produced the largest inhibition zone (11.16–13.97 mm), with a MIC of 2% and an MBC of 4%. CEO at a concentration of 2% produced an inhibition zone of 14.03–16.83 mm, with MIC and MBC values of 1.56%. Antioxidant activity showed IC50 values of 133 ppm for Spirulina platensis and 87 ppm for CEO. The combined gel formulation of Spirulina platensis-CEO (GCS) demonstrated the best stability, with consistent homogeneity during room temperature storage and cycling tests. Its spreadability met SNI standards (4–7 cm), and pH remained stable at approximately 6. The GCS formulation exhibited superior antibacterial activity (inhibition zone of 13.90–16.46 mm) and the highest antioxidant activity (72.78% inhibition). These findings indicate that the combined Spirulina platensis-CEO gel formulation holds great potential as an effective wound-healing agent with optimal antibacterial and antioxidant activities.

Keywords: *bioactivity, Cinnamon Essential Oil, wound-healing gel, Spirulina platensis, stability.*

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DAFTAR GAMBAR

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DAFTAR LAMPIRAN

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