Universitas Ngudi Waluyo
Program Studi Farmasi
Skripsi, Februari 2026
Amelia Nurjanah
051221120

FORMULASI DAN UJI AKTIVITAS ANTIOKSIDAN NANOEMULSI EKSTRAK LOBAK PUTIH (*Raphanus sativus* L.) DENGAN VARIASI KONSENTRASI TWEEN 80 DAN PEG 400

ABSTRAK

Latar Belakang: Lobak putih (*Raphanus sativus* L.) mengandung senyawa bioaktif yang memiliki aktivitas antioksidan. Nanoemulsi dapat meningkatkan bioavailabilitas dan stabilitas senyawa aktif. Penelitian ini bertujuan memformulasikan nanoemulsi ekstrak lobak putih dengan variasi konsentrasi Tween 80 dan PEG 400 serta mengevaluasi karakteristik fisikokimia, stabilitas, dan aktivitas antioksidannya.
Metode: Ekstrak diperoleh melalui maserasi menggunakan etanol 70%. Nanoemulsi dibuat dengan metode emulsifikasi spontan menggunakan VCO sebagai fase minyak, Tween 80 sebagai surfaktan, dan PEG 400 sebagai kosurfaktan dengan empat variasi konsentrasi. Evaluasi meliputi uji organoleptis, tipe emulsi, pH, viskositas, transmitan, ukuran partikel, indeks polidispersitas (PDI), uji stabilitas (sentrifugasi dan *cycling test*), dan uji aktivitas antioksidan menggunakan metode DPPH dengan spektrofotometri UV-Vis. Data dianalisis menggunakan ANOVA dan *post hoc* SPSS Versi 25.
Hasil: Semua formula memiliki karakteristik cairan coklat jernih, tipe emulsi O/W, pH 4,92-5,12, ukuran partikel 16,38-21,29 nm, PDI 0,117-0,252, transmitan 98,38-98,79%, dan viskositas 1064-1188 cPs. Semua formula stabil pada uji sentrifugasi dan *cycling test* selama 6 siklus. Aktivitas antioksidan tergolong kuat dengan IC_{50} 81,51-97,07 ppm. Formula 1 menunjukkan aktivitas tertinggi (IC_{50} 81,51±1,08 ppm), diikuti Formula 2 (86,03±0,95 ppm), Formula 3 (90,77±1,18 ppm), dan Formula 4 (97,07±2,11 ppm).
Kesimpulan: Variasi konsentrasi Tween 80 dan PEG 400 tidak memberikan pengaruh signifikan terhadap ukuran partikel, PDI, dan stabilitas fisik, namun berpengaruh signifikan ($p<0,05$) terhadap viskositas, pH dan aktivitas antioksidan. Formula 1 menghasilkan aktivitas antioksidan tertinggi.
Kata kunci: Nanoemulsi, lobak putih, Tween 80, PEG 400, antioksidan.

Universitas Ngudi Waluyo
Pharmacy Study Program
Final Project, February 2026
Amelia Nurjanah
051221120

FORMULATION AND ANTIOXIDANT ACTIVITY TEST OF WHITE RADISH (*Raphanus sativus* L.) EXTRACT NANOEMULSION WITH VARIATIONS IN TWEEN 80 AND PEG 400 CONCENTRATIONS

ABSTRACT

Background: White radish (*Raphanus sativus* L.) contains bioactive compounds with antioxidant activity. Nanoemulsion can enhance bioavailability and stability of active compounds. This study aimed to formulate white radish extract nanoemulsion with varying concentrations of Tween 80 and PEG 400 and evaluate its physicochemical characteristics, stability, and antioxidant activity.
Methods: Extract was obtained through maceration using 70% ethanol. Nanoemulsion was prepared by spontaneous emulsification using VCO as oil phase, Tween 80 as surfactant, and PEG 400 as cosurfactant with four concentration variations. Evaluations included organoleptic tests, emulsion type, pH, viscosity, % transmittance, particle size, polydispersity index (PDI), stability tests (centrifugation and *cycling test*), and antioxidant activity using DPPH method with UV-Vis spectrophotometry. Data were analyzed using ANOVA and *post hoc* tests SPSS Ver.25.
Results: All formulas exhibited clear brown liquid characteristics, O/W emulsion type, pH 4.92-5.12, particle size 16.38-21.29 nm, PDI 0.117-0.252, % transmittance 98.38-98.79%, and viscosity 1064-1188 centipoises. All formulas were stable in centrifugation and *cycling test* for 6 cycles. Antioxidant activity was categorized as strong with IC_{50} values of 81.51-97.07 ppm. Formula 1 showed the highest activity (IC_{50} 81.51±1.08 ppm), followed by Formula 2 (86.03±0.95 ppm), Formula 3 (90.77±1.18 ppm), and Formula 4 (97.07±2.11 ppm).
Conclusion: Variations in Tween 80 and PEG 400 concentrations showed no significant effects on particle size, PDI, and physical stability, but significantly affected ($p<0.05$) viscosity, pH and antioxidant activity. Formula 1 produced the highest antioxidant activity.
Keywords: Nanoemulsion, white radish, Tween 80, PEG 400, antioxidant.