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Pengaruh Durasi Ekstraksi Gracilaria edulis dengan Metode Ultrasonic-Assisted Extraction Terhadap Aktivitas Antioksidan
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Intisari

Pengaruh Durasi Ekstraksi *Gracilaria edulis* dengan Metode *Ultrasonic-Assisted Extraction* terhadap Aktivitas Antioksidan

Gracilaria edulis merupakan salah satu jenis rumput laut merah yang diketahui mengandung senyawa bioaktif berpotensi sebagai sumber antioksidan alami. Penelitian ini dilakukan untuk mengetahui pengaruh lama durasi ekstraksi terhadap aktivitas antioksidan ekstrak *Gracilaria edulis* yang diperoleh melalui metode *Ultrasonic Assisted Extraction* (UAE). Sampel *Gracilaria edulis* terlebih dahulu dikeringkan pada suhu 50°C selama 24 jam sebelum diekstraksi menggunakan pelarut etanol dengan variasi durasi sonikasi 10, 15, 20, 25, dan 30 menit pada amplitudo 90%, serta dibandingkan dengan hasil ekstraksi metode maserasi sebagai kontrol. Masing-masing ekstrak selanjutnya dianalisis kadar total fenolik dan diuji aktivitas antioksidannya menggunakan metode FRAP (*Ferric Reducing Antioxidant Power*) dan DPPH (*2,2-diphenyl-1-picrylhydrazyl*) dengan variasi konsentrasi uji 100, 200, 300, 400, dan 500 ppm. Ekstrak *Gracilaria edulis* dengan inhibisi tertinggi diidentifikasi kandungan senyawa menggunakan *Gas Chromatography Mass Spectrometry* (GC-MS) Hasil penelitian menunjukkan bahwa kadar total fenolik tertinggi diperoleh pada ekstrak *Ultrasonic Assisted Extraction* (UAE) dengan lama durasi ekstraksi 25 menit, yaitu sebesar (10,14 ± 0,38 mgGAE/g), sedangkan kadar terendah diperoleh melalui metode maserasi sebesar (4,36 ± 0,35 mgGAE/g). Kandungan flavonoid tertinggi pada ekstraksi *Ultrasonic Assisted Extraction* (UAE) perlakuan 25 menit (15,58 ± 0.21 mgQE/g) dan hasil terendah pada ektraksi maserasi (10.10 ± 0.67 mgQE/g). Nilai aktivitas antioksidan pada metode FRAP (*Ferric Reducing Antioxidant Power*) tertinggi pada ekstraksi *Ultrasonic Assisted Extraction* (UAE) perlakuan 25 menit (80,61± 0.87 µmol Fe^{2+}). Nilai aktivitas antioksidan terbaik pada metode DPPH (*2,2-diphenyl-1-picrylhydrazyl*), yang ditunjukkan dengan nilai IC_{50} terendah, diperoleh pada perlakuan *Ultrasonic Assisted Extraction* (UAE) selama 25 menit sebesar 0,55 ± 49,58 mg/ml, sementara nilai aktivitas antioksidan terendah ditunjukkan dengan nilai IC_{50} tertinggi ditunjukkan oleh ekstrak hasil maserasi sebesar 0,96 ± 30,58 mg/ml. Senyawa potensial antioksidan yang terdeteksi melalui GC-MS pada perlakuan terbaik (25 menit) yaitu asam lemak jenuh (n-*Hexadecanoic acid/asam palmitat* dan *Octadecanoic acid/asam stearat*), ester asam lemak (*Hexadecanoic acid methyl ester/metil palmitat, 9-Octadecenoic acid (Z)-methyl ester/metil oleat*, dan cis-*7-Hexadecenoic acid methyl ester/asam palmitoleat)*, serta diterpenoid (*Phytol*).

Kata kunci: *Gracilaria edulis*, *Ultrasonic Assisted Extraction*, aktivitas antioksidan, DPPH, FRAP, IC_{50}

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Abstract

The Effect of Extraction Durations of *Gracilaria edulis* Using The Ultrasonic-Assisted Extraction Method on Antioxidant Activity

Gracilaria edulis is one type of red seaweed known to contain bioactive compounds with potential as a natural source of antioxidants. This study was conducted to determine the effect of extraction time on the antioxidant activity of *Gracilaria edulis* extract obtained through the Ultrasonic Assisted Extraction (UAE) method. Samples of *Gracilaria edulis* were first dried at a temperature of 50°C for 24 hours before being extracted using ethanol solvent with sonication time variations of 10, 15, 20, 25, and 30 minutes at 90% amplitude, and compared with the results of maceration extraction as a control. Each extract was subsequently analyzed for total phenolic content and tested for its antioxidant activity using the FRAP (Ferric Reducing Antioxidant Power) and DPPH (*2,2-diphenyl-1-picrylhydrazyl*) methods with concentration variations tested at 100, 200, 300, 400, and 500 ppm. The *Gracilaria edulis* extract with the highest inhibition was further identified for its bioactive compound content using Gas Chromatography-Mass Spectrometry (GC-MS). The results showed that the highest total phenolic content was obtained from the Ultrasonic Assisted Extraction (UAE) extract with an extraction time of 25 minutes, namely 10.14 ± 0.38 mgGAE/g, while the lowest content was obtained through the maceration method at 4.36 ± 0.35 mgGAE/g. The highest flavonoid content was found in the Ultrasonic Assisted Extraction (UAE) extract at the 25-minute treatment (15.58 ± 0.21 mgQE/g), with the lowest result obtained from maceration extraction (10.10 ± 0.67 mgQE/g). The highest antioxidant activity value using the FRAP (Ferric Reducing Antioxidant Power) method was found in the Ultrasonic Assisted Extraction (UAE) extract at the 25-minute treatment (80.61 ± 0.87 µmol Fe^{2+}). The best antioxidant activity value using the DPPH (*2,2-diphenyl-1-picrylhydrazyl*) method, indicated by the lowest IC_{50} value, was obtained at the Ultrasonic Assisted Extraction (UAE) treatment for 25 minutes at 0.55 ± 49.58 mg/ml, while the lowest antioxidant activity was shown by the highest IC_{50} value, found in the maceration extract at 0.96 ± 30.58 mg/ml. The potential antioxidant compounds detected by GC-MS in the best treatment (25 minutes) were classified into several groups, namely saturated fatty acids (*n-hexadecanoic acid/palmitic acid* and *octadecanoic acid/stearic acid*), fatty acid methyl esters (*hexadecanoic acid methyl ester/methyl palmitate, 9-octadecenoic acid (Z)-methyl ester/methyl oleate, and* cis-*7-hexadecenoic acid methyl ester/palmitoleic acid*), and a diterpenoid (*phytol*).

Keywords: *Gracilaria edulis*, Ultrasonic Assisted Extraction, antioxidant activity, DPPH, FRAP, IC_{50}