

Mini-Review: Phytochemical Content and Methods of Extraction from *Eucheuma Spinosum*

Hermawati

Department of Pharmacy, Faculty of Pharmacy, Universitas 17 Agustus 1945,
Jl. Sunter Permai Raya No.1, Jakarta 14350, North Jakarta, Indonesia

Keywords: *Eucheuma Spinosum*, Maceration, Microwave Assisted Extraction.

Abstract: *Eucheuma spinosum* Species of red macroalgae Red macroalgae are macroalgae that belong to the division Thallophyta, i.e. plants that have a skeletal body structure consisting of stems/thalus and do not have leaves and roots. Mosses (Bryophyta) do not yet have the characteristics of true roots, instead they have hair-like cells that replace the function of the roots they do not yet have. The aim of this research is to compare extraction methods with specific times to produce percentage yields. *Eucheuma spinosum* Found on the surface in Indonesia. From the research results it was found that the best % yield at extraction time contained phytochemicals such as alkaloids, flavonoids, steroids, terpenoids, tannins and phenols. To obtain extracts from *Eucheuma spinosum*. Based on the results of the review, it is known that there are two types of extraction methods, namely conventional extraction methods and modern extraction methods.

1 INTRODUCTION

Seaweed is a type of algae that can live in seawater and is a low-grade plant that does not have different skeletal structures such as roots, stems and leaves. Seaweeds or algae, also known as seaweeds, make up the majority of marine algae in the division Thallophyta. There are four known classes of Thallophyta, namely Chlorophyceae (green algae), Phaeophyceae (brown algae), Rhodophyceae (red algae) and Cynophyceae (blue-green algae). Many blue-green and green algae live and develop in fresh water, while red and brown algae are found exclusively in marine habitats (Ghufran, 2013).

The seaweed *Eucheuma denticulatum* belongs to the carrageenophytes, which are seaweeds that produce water in the form of polysaccharide compounds. The carrageenan in seaweed contains very high levels of dietary fibre. The fibre in carrageenan is part of the gum fibre, a type of fibre that dissolves in water. Carrageenan can be extracted using hot water, which has the ability to form cells. The gel-forming properties of the seaweed are needed to make a good paste because it belongs to the Rhodophyta group, which produces fluorine starch. In the world of national and international trade, *Eucheuma denticulatum* is more commonly known as Cottonii.

This species produces kappa-type bouquets. Therefore, the taxonomic name has been changed from *Eucheuma alvarezii* to *Eucheuma denticulatum*, which is generally found in certain areas with special requirements, mostly growing in tidal areas or always submerged in water. Attached to substrates in aquatic areas in the form of dead rock coral, live rock coral, limestone and mollusc shells (Doty 1986 cited in Atmadja et al. 1996).

2 METHOD

In writing this review, data was searched using Google Scholar with the keyword "*Eucheuma denticulatum* extraction method". Primary data was obtained from national and international journals.

3 RESULTS AND DISCUSSION

3.1 Morphology of *Eucheuma Denticulatum*

In terms of morphology, seaweeds show no differences between roots, stems and leaves. Overall, these plants have a similar morphology even though

they are actually different. These forms are actually just thalli. The morphology of *Eucheuma denticulatum* is smooth surface, cartilagenous, thalli (skeleton of the plant body) round cylindrical or flat, the colour is red, grey, green, yellow and green, branching at irregular intervals, dichotomous or trichoyomous, has blunt nodules) and spines or spines, and the substance of the thalli "gelatinous" and "cartilagenous" (soft like cartilage). The colour is not always constant, sometimes green, yellow-green, grey or red. Colour changes often occur simply due to environmental factors. This is a process of chromatic adaptation, the adjustment between pigment

proportions and different qualities of light (Aslan, 1998).

The appearance of the thallus varies from simple to complex. The spines on the thallus are elongated, rather sparse and not arranged in a circle around the thallus. The thallus branches in different directions with the main stems emerging close together at the basal area (base). The growth is attached to the substrate by an adhesive device in the form of a disc. The first and second branches grow into dense clumps with special features that point in the direction of sunlight.

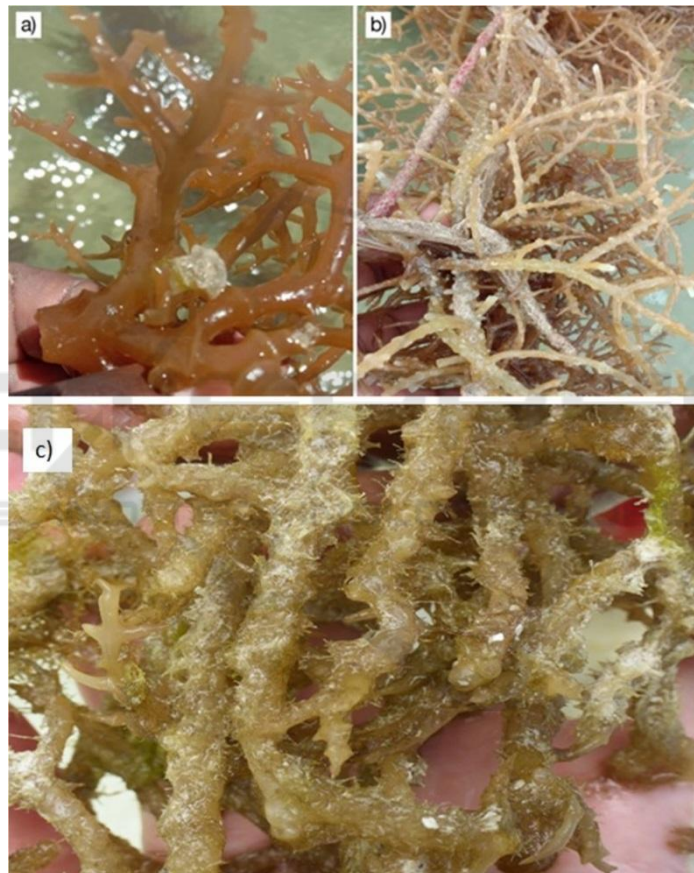


Figure 1: (Ndawala et al. 2022).

Klasifikasi makroalga adalah sebagai berikut:

- a) Kingdom : *Plantae*
- b) Divisio : *Rhodophyta*
- c) Kelas : *Florideophyceae*
- d) Ordo : *Gigartinales*
- e) Famili : *Areschougiaceae*
- f) Genus : *Eucheuma*
- g) Spesies : *Eucheuma spinosum* J. Agardh

3.2 Location of Distribution of *Eucheuma Denticulatum*

Table 1.

No.	Species	Location Habitat	Morphology	Reference
1.	<i>Eucheuma denticulate</i>	Coastal waters that have reef exposures (reefflats), such as the Riau Islands, Bangka-Belitung, Seribu, Karimun Jawa, Sunda Strait, southern Java coast, Bali, Nusa West Southeast, East Nusa Tenggara, islands islands in Sulawesi and Maluku	The thallus is round, upright, 5-30 cm long, transparent, yellowish brown to yellowish red.	(Tamat et al., 2007).
2.	<i>Eucheuma cattonii</i>	Desa Lelingluan North Tanimbar District, Kab.	has the characteristics of a cylindrical thallus, the thallus branches have sharp or blunt ends, is covered with nodules (protrusions), is reddish brown in color, is cartilageous (resembling cartilage or young), the branching is alternate (alternating), irregular and can be are dichotomous (two-two branching) or trichotomous (branching system three-three). <i>Eucheuma cattonii</i> seaweed requires sunlight to photosynthesis process	(Mayore et al., 2018)
3.	<i>Eucheuma cattonii</i>	seaweed (<i>Euheuma cottoni</i>) in Banyuputih District, Situbondo Regency	thallus silindris, thallus branches have sharp or blunt ends, are covered with nodules (bulges), are reddish brown in color, are cartilagerous (resembling cartilage or young), the branches are alternate (alternating), irregular and can be are dichotomous (two-two branching) or trichotomous (branching system three-three).	(Fasya et al., 2019)
4.	<i>Eucheuma cattonii</i>	Wonosorejo Beach Banyuwangi	The shape of the thallus is like a leaf (blade) and some are cylindrical.	(Anggraini, n.d.)
5.	<i>Eucheuma spinosum</i>	beach in Patas Village Singaraja, Gerokgak District, Regency Buleleng, Bali Province	The morphology is quite varied, including round and non-round shapes irregular, has a rough and dull surface and is slimy, opaque, cloudy and colorful and has a flat elevation, rising, hilly and cratered	(The Great Lord Ayu Sucitra Ekaryani, n.d.)
6.	<i>Eucheuma cattonii</i>	Jumiang Beach. This beach is located in Jumiang Hamlet, Tanjung Village, Pademawu District, Pamekasan Regency.	Red algae are a group There are various types of algae shape and color variations	(Noer Mardlatillah Sharo, n.d.)

7.	<i>Eucheuma spinosum</i>	Sumenep waters, Madura, East Java.	The thallus being at the end will provide speed higher growth in comparison with thallus seeds from the pangka	(Art, 2021)
8.	<i>Eucheuma cottonii</i>	East Java which has not yet developed is Pacitan, Banyuwangi and Sumenep.	The morphology is quite varied, including round and non-round shapes. irregular, with a rough and dull surface and is slimy, opaque, cloudy and colourful and has a flat elevation rising, hilly and cratered	(The Great Lord Ayu Sucitra Ekaryani, n.d.)
9.	<i>Eucheuma cottonii</i>	Jepara waters	The shape of the thallus is like a leaf (blade) and some are cylindrical.	(Mega Ariyani, n.d.)
10.	<i>Eucheuma cottonii</i>	waters of the Pride Regency of Sulawesi Middle	The shape of the thallus is like a leaf (blade) and some are cylindrical.	(Wahyu Priyo Legowo, n.d.)
11.	<i>E. spinosum</i>	Batumulapan Village, Nusa Penida District, Klungkung Regency, Bali Province	the shape of the thallus is round, upright, 5-30 cm long, transparent, yellowish brown to yellowish red.	(Putu Tara Hradaya Komala, n.d.)

3.3 Conventional Extraction *Eucheuma Denticulate*

Table 2.

No.	Species	Extract	Conventional Extraction Methods	% yield	Reference
1.	<i>Eucheuma spinosum</i>	Methanol and Ethanol	Maceration	Methanol 50% :1.6%	(Tamat et al., 2007).
2.	<i>Eucheuma cattonii</i>	Methanol	Maceration	Methanol 99.9%	(Fasya et al., 2019)
3.	<i>Eucheuma cattonii</i>	Methanol	Maceration	Methanol 50%	(Afif et al., 2016)
4.	<i>Eucheuma cattonii</i>	Methanol	Maceration	Methanol 6,316%	(Anggraini, n.d.)
5.	<i>Eucheuma cattonii</i>	Ethanol	Maceration	Ethanol 96%	(Noer Mardlatillah Sharo, n.d.)
6.	<i>Eucheuma cattonii</i>	Methanol	Maceration	Ethanol 95%	(Syafitri et al., 2022)
7.	<i>Eucheuma cattonii</i>	Methanol	Maceration	Ethanol 96%	(Wahyu Priyo Legowo, n.d.)
8.	<i>Eucheuma spinosum</i>	Methanol	Maceration	methanol 96%.	(Damongilala et al., 2021)
9.	<i>Eucheuma cattonii</i>	Methanol	Maceration	ethanol 96%	(Muhammad Ryan Nurshodiq, n.d.)
10.	<i>Eucheuma denticulate</i>	Methanol	Maceration	Methanol 50%	(Yanuarti et al., 2017)

3.4 Phytochemical Content of *Eucheuma denticulatum*

Table 3.

No.	Species	Solvent extract	Phytochemical content	Reference
1.	<i>Eucheuma denticulate</i>	Ethanol	Flavonoid, Saponin, Alkaloid, Steroid, Terpenoid, Tanin, Fenol	Sangi, et al., (2008)
2.	<i>Eucheuma spinosum</i>	Methanol and Ethanol	Flavonoid, Saponin, Alkaloid, fenolik, steroid dan triterpenoid	(Suzery and Kusri, 2004)
4.	<i>Eucheuma cattoni</i>	Methanol	flavonoid, saponin, steroid, triterpenoids and fluorotannins	(Fasya et al., 2019)
5.	<i>Eucheuma cattonii</i>	Methanol	flavonoid, steroid dan alkaloid.	(Afif et al., 2016)
6.	<i>Echeuma of cotton</i>	Methanol	steroid	(Anggraini, n.d.)
7.	<i>Echeuma of cotton</i>	Ethanol	alkaloid, flavonoid dan triterpenoid/steroid	(Noer Mardlatillah Sharo, n.d.)
8.	<i>Echeuma of cotton</i>	Methanol	flavonoid, alkaloid, triterpenoid	(Syafitri et al., 2022)
9.	<i>Eucheuma spinosum</i>	Methanol	alkaloid, flavonoid dan triterpenoid/steroid	(Ode Mursalim, n.d.)
10.	<i>Eucheuma denticulate</i>	Ethanol	Flavonoid, Saponin, Alkaloid, Steroid, Terpenoid, Tanin, Fenol	(Edward Julys Dompeipen, n.d.)
11.	<i>E. spinosum</i>	Ethanol	phytochemical test, total phenolic, total flavonoids, and antioxidant power test.	(Putu Tara Hradaya Komala, n.d.)
12.	<i>Eucheuma cottonii</i>	Ethanol	flavonoids, phenols, and triterpenoids	(Yuyun Ramdani, n.d.)

4 CONCLUSION

Based on the data obtained from this research, the conclusions are: a. The % yield of the methanol extract of *Hormophysa cuneiformis* with a shorter time variation of 30 minutes produced a relatively high % yield of 5.53% compared to the maceration method with a time variation of 3 days which had a value of 6.76%. And it contains active compounds of flavonoids and steroids in the macerated extract and steroid in the UAE extract. b. The IC₅₀ value of the methanol extract of the macerated macroalga *Hormophysa cuneiformis* was 59.47 µg/mL in the strong category, while the UAE method had a value of 108.57 µg/mL in the medium category. The LC₅₀ value of the macerated methanol extract of the macroalgae *Hormophysa cuneiformis* was 217.859 µg/mL in the very toxic category, while the UAE method gave a value of 844.294 µg/mL in the medium toxic category.

REFERENCES

- Afif, S., Fasya, A. G., & Ningsih, R. (2016). Extraction, Toxicity Assay and Identification of Active Compounds of Red Algae (*Eucheuma cottonii*) from Sumenep Madura. *ALCHEMY*, 4(2), 101. <https://doi.org/10.18860/al.v4i2.3199>
- Anggraini, V. (2018). T. S. U. I. N. M. M. I. (n.d.). *Uji toksisitas isolat steroid hasil kromatografi kolom dengan variasi gradien eluen fraksi etil asetat Makroalga Eucheuma cottonii*.
- Arto, Y. A. (2021). Uji Mutu Refined Karaginan Dari *Eucheuma spinosum* Berdasarkan Perbedaan Konsentrasi Kalium Hidroksida Dengan Metode Microwave Assited Extraction (Mae). *Journal of Herbal, Clinical and Pharmaceutical Science (HERCLIPS)*, 2(02), 38. <https://doi.org/10.30587/herclips.v2i02.2418>
- Damongilala, L. J., Losung, F., & Dotulong, V. (2021). Aktivitas Antibakteri Ekstrak Rumput Laut *Eucheuma spinosum* Segar dari Perairan Pulau Nain Sulawesi

- Utara. *JURNAL ILMIAH SAINS*, 21(1), 91.
<https://doi.org/10.35799/jis.21.1.2021.33881>
- Edward Julys Dompeipen. (n.d.). *Pengaruh Konsentrasi Inokulum Dan Waktu Fermentasi Dalam Produksi Bioetanol Dari Rumput Laut Eucheuma Cottonii Dengan Menggunakan Mikroba Asosiasi*.
- Fasya, A. G., Baderos, A., Madjid, A. D. R., Amalia, S., & Megawati, D. S. (2019). *Isolation, identification and bioactivity of steroids compounds from red algae Eucheuma cottonii petroleum ether fraction*. 030025.
<https://doi.org/10.1063/1.5115629>
- I Gusti Agung Ayu Sucitra Ekaryani. (n.d.). *Isolasi Bakteri Dari Rumput Laut Eucheuma spinosum dan Skrining Aktivitas Antibakteri Terhadap Beberapa Bakteri Gram Positif dan Negatif*.
- Mayore, S., Damongilala, L. J., Mewengkang, H. W., Salindeho, N., Makapedua, D. M., & Sanger, G. (2018). Analisis Fitokimia Dan Uji Total Kapang Pada Rumput Laut Kering *Eucheuma denticulatum* DAN *Kappaphycus alvarezii*. In *Jurnal Media Teknologi Hasil Perikanan* (Vol. 6, Issue 3).
- Mega Ariyani. (n.d.). *Pengaruh Penambahan Tepung Duri Ikan Lele Dumbo (Clarias Gariepinus) Dan Bubur Rumput Laut (Eucheuma Cottonii) Terhadap Kadar Kalsium, Kadar Serat Kasar Dan Kesukaan Kerupuk*.
- Muhammad Ryan Nurshodiq. (n.d.). *Plikasi Kitosan Sebagai Antimikroba Pada Cangkang Kapsul Berbasis Karagenan Dari Rumput Laut Eucheuma Cottonii*.
- Noer Mardlatillah Sharo. (n.d.). *Uji Toksisitas Dan Identifikasi Senyawa Ekstrak Alga Merah (Eucheuma Cottonii) Terhadap Larva Udang Artemia salina Leach*.
- Ode Mursalim. (n.d.). *Pertumbuhan Eucheuma denticulatum Berdasarkan Kedalaman Yang Dipelihara Dengan Metode Vertinet*.
- Putu Tara Hradaya Komala. (n.d.). *Pengaruh Suhu Ekstraksi Terhadap Aktivitas Antioksidan Ekstrak Metanolik Eucheuma spinosum*.
- Syafitri, T., Hafiludin, H., & Chandra, A. B. (2022). Pemanfaatan Ekstrak Rumput Laut (*Eucheuma cottonii*) Dari Perairan Sumenep Sebagai Antioksidan. *Jurnal Kelautan: Indonesian Journal of Marine Science and Technology*, 15(2), 160–168.
<https://doi.org/10.21107/jk.v15i2.14905>
- Wahyu Priyo Legowo. (n.d.). *Nalisis Karakteristik Fisika Padatan Karagenan Dari Eucheuma Cottonii Hasil Ekstraksi Koh Ph 9 Asal Kabupaten Banggai Sulawesi Tengah*.
- Yanuarti, R., Nurjanah, N., Anwar, E., & Pratama, G. (2017). Kandungan Senyawa Penangkal Sinar Ultra Violet dari Ekstrak Rumput Laut *Eucheuma cottonii* dan *Turbinaria conoides*. *Biosfera*, 34(2), 51.
<https://doi.org/10.20884/1.mib.2017.34.2.467>
- Yuyun Ramdani. (n.d.). *Variasi Metode Ekstraksi Dan Penetapan Nilai SPF Sediaan Lotion Ekstrak Rumput Laut Merah (Eucheuma cottonii)*.