Mini Review: Extraction Method and Phytochemical Content of *Padina* sp.

Riong Seulina Panjaitan and Elisabeth Simarmata
Fakultas Farmasi, Universitas 17 Agustus 1945 Jakarta, Jakarta Utara, 14350, Indonesia

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Abstract: Padina sp. is a species of brown macroalgae which is yellow-brown, fan-shaped in the form of a thin sheet of living segments attached to the substrate and there is calcification on the upper surface. This article discusses the types of Padina sp. extraction methods that have been carried out and the percentage yield produced as well as the phytochemical content of Padina sp. from 2008 to 2023. In Indonesia, Padina sp. is found in the waters of Banten, Gorontalo and Lombok. Padina sp. is also found in the eastern Mediterranean Sea and in Sri Rusa Beach, Malaysia. Based on the results of the review, it is known that the conventional extraction method that is commonly used is the maceration method, while the MAE (Microwave Assisted Extraction) method is a modern extraction method that is widely used to obtain Padina sp. extract. Furthermore, the 96% ethanol extract of Padina sp. contains more phytochemicals (alkaloids, flavonoids, steroids, terpenoids and saponins) compared to the other extracts of Padina sp.

1 INTRODUCTION

Padina sp. is a species of macroalgae belonging to the division Phaeophyta (brown macroalgae), generally distributed in the ocean from shallow to deep waters. This species grows in coastal waters with sandy, slightly muddy substrates and in coastal areas with dead coral fragments as placeholders (Kemenangan et al., 2017).

Padina sp. is a rich source of various secondary metabolites. The results of phytochemical tests with acetone extract showed that Padina australis contains steroids, terpenoids, polyphenols and saponins, which have potential as antibacterial agents. (Salosso, 2012).

In order to determine the chemical content of a plant, it is necessary to separate the compounds. This process is commonly known as extraction. There are different types of extraction methods, namely conventional extraction and modern extraction methods. Conventional extraction methods include maceration, soxhletation, percolation and reflux. While modern extraction methods include microwave-assisted extraction (MAE) and ultrasound-assisted extraction (UAE) (Chemat. et al., 2017).

The purpose of this review is to provide scientific information on the appropriate extraction method used to extract the chemical content of Padina sp. and also to describe its phytochemical content from different solvents.

2 METHODS

In the preparation of this review article, data were searched by means of Google Scholar using the key words "Extraction method and phytochemical content of Padina sp.

3 RESULT AND DISCUSSION

3.1 Morphology *Padina* sp.

Padina sp. is only found attached to hard substrates because the attachment tool is only a thin disc-shaped plate called a holdfast (Benita et al., 2018). The Holdfast found is fan-shaped, in the form of thin plates with segments of lines that tend to be circular. The edges of the talus tend to curve inwards. The talus is light brown-green in colour. The hallux is small and stringy, disc-shaped (Aulia et al., 2021). Talus *Padin*a sp. has double concentric stripes on the underside,

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equally spaced, 2-3 mm wide. (Kepel et al., 2018).

Classification of *Padina* sp. :

Kingdom : *Plantae*
Divisi : *Phaeophyta*
Class : *Phaeophyceae*
Ordo : *Dictyotales*
Family: *Dictyotaceae*
Genus : : *Padina*
Species : *Padina sp*.

3.2 Distribution Location of *Padina* sp.

Figure 1: *Padina* sp.

Table 1: Habitat and Morphology of *Padina* sp.

No	Species	Location	Morphology	Referensi
1	*Padina australis*	Cibeureum Palem Beach, Anyer, Banten	Shaped like a fan, it is a thin sheet with segments with lines that tend to be circular. The edges of the talus tend to curve inward. The talus is light brown-green in color.	(Aulia et al., 2021)
2	*Padina minor*	Pohuwato Waters, Gorontalo	The talus has a greenish-brown color, is fan-shaped, and is slightly calcified on the upper surface.	(Manteu et al., 2018)
3	*Padina australis*	Bayah Beach, Banten	Fan-shaped with a height of 3-6 cm, thin sheet and consists of two layers	(B. L. Sari et al., 2020)
4	*Padina* sp.	Lombok Island	Sheet-shaped talus, 15–127 mm high, is yellow-brown in color. Holdfasts resemble disks measuring 1–12 mm.	(Ghazali et al., 2021)
5	*Padina ditristromatica*	Syria Beach, Eastern Mediterranean	The talus consists of fan-shaped lobes with rolled edges. These lobes are attached to each other at the base with short stems. The talus is yellowish or greenish-brown in color and between 5 and 10 cm tall.	(Arraj et al., 2016)
6	*Padina Minor*	Sri Rusa Beach, Port Dickson, Negeri Sembilan, Malaysia	Third talus that is divided into lobes. The color of the talus is yellowish-brown, the upper surface is covered with lime, and the height reaches 7 cm.	(Daud et al., 2015)

3.3 Extraction Method of *Padina* sp.

Extraction methods are steps that involve the separation of the natural product target from the raw material (Zhang et al., 2018). Extraction methods can be divided into two categories, namely traditional extraction methods and new technology extraction methods based on energy or mechanism (Getachew et al., 2020). Advantages of modern extraction methods Microwave-assisted extraction can be used on an industrial and laboratory scale with a short extraction time. However, it also has disadvantages such as not being suitable for thermolabile compounds, high cost and requiring special skills to operate (Zhang et al., 2018). While the advantages of the conventional maceration extraction method are its low cost, ease of processing, and the equipment used, the disadvantages are that it requires quite a long time, uses quite a lot of solvent, and is likely to lose compounds. In addition, some compounds may be difficult to extract at room temperature (Chairunnisa et al., 2019).

From the review results obtained, the conventional and modern extraction methods have a % yield as shown in Table 2 below. For the maceration method, the yield results were obtained using different solvents, namely methanol (4.5%), ethyl acetate (0.8%) and n-hexane (0.45%), while in the research carried out (Monica, 2020) using the modern method with microwave assisted extraction, a yield of 3.60% was obtained.

3.4 Phytochemical Content of *Padina* sp.

Phytochemical analysis of some Padina sp. contains on average alkaloids, saponins, tannins, flavonoids, steroids and tannins, while phenols are not present in all Padina sp. In Table 3, the solvents used also vary from ethanol, methanol, ethyl acetate, n-hexane and chloroform. When the ethanol solvent is used, Padina sp. contains mainly saponins, while the methanol solvent contains mainly flavonoids and tannins.

Table 2: Results of % Extraction Yield of *Padina* sp.

No	Specied	Solvent	Extraction method	% Yield	Reference
1	*Padina australis*	Metanol, Etil asetat, N-heksana	maceration	Metanol = 4,55%, Etil asetat = 0,8%, N-heksana = 0,45%	(Maharany et al., 2017)
2	*Padina australis*	Etanol 96%	Maceration	Etanol = 1,23%	(Wijayanti et al., 2020)
3	*Padina australis*	Etanol	Maceration	Etanol = 2,14%	(Astika et al., 2022)
4	*Padina australis*	Metanol	Maceration	-	(Hidayati et al., 2017)
4	*Padina australis*	Etanol 99%	Microwave Assisted Extraction	Etanol= 3,60%	(Monica, 2020)
5	*Padina minor*	Etanol	Microwave Assisted Extraction	-	(B. L. Sari et al., 2020)
6	*Padina australis*	Etanol 96%	Ultrasound Assisted Extraction	-	(D. K. Sari et al., 2022)

Table 3: Phytochemical Testing Results of *Padina* sp.

No	Species	Solvent	Phytochemical Content	Reference
1	*Padina australis*	Etanol 96%	Alkaloid, Saponin, Tanin	(Astika et al., 2022)
2	*Padina minor*	Etanol	Flavanoid, Saponin, Steroids, Tripenoid, Alkaloid	(Manteu et al., 2018)
3	*Padina Australis*	Etanol 96%	Alkaloids, flavanoids, steroid, terpenoid, tannin, dan saponins	(Wijayanti et al., 2020)
4	*Padina australis*	Etanol	Flavanoids	(Nuzul et al., 2018)
5	*Padina australis*	Metanol	Flavanoids, Tripenoid, Tanin	(Hidayati et al., 2022)
6	*Padina boergesenii*	Metanol	Flavanoid, saponin, tannin	(Ragunath et al., 2020)
7	*Padina australis*	Aseton	Steroid, terpenoid, polifenol dan saponin	(Salosso, 2012)
8	*Padina pavonica*	Etanol dan Etil Asetat	Alkaloid, steroid, flavanoid, fenol, dan saponin	(Sofiana et al., 2021)
9	*Padina australis*	N-heksana, etil asetat, etanol, aseton,	Alkaloid, steroid, fenol, terpenoid	(Latifah et al., 2019)
10	*Padina gymnospora*	Metanol, kloroform	Alkaloid, fenol, flavanoid, steroid, tanin, terpenoid	(Pradeep & Thatheyus, 2019)

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