Journal of TROPICAL BIODIVERSITY E-ISSN : 2774-4116

Phytochemistry and Potential of *Sargassum binderi*, *Sargassum cinereum*, *Padina australis*, and *Turbinaria conoides* as Medicinal Ingredients

Dandy Priamanatha [1)], Sri Handayani [1.2)], Astri Zulfa [1)]

[1] *Faculty of Biology and Agriculture, Universitas Nasional*
[2] *Center for Marine Studies and Coastal Area Management, Universitas Nasional*

Email: handayani2001id@yahoo.com

Submission	:	February, 14th 2025
Revision	:	April 17th 2025
Publication	:	August 30th 2025

Abstract

This study investigated the phytochemicals and potential from macroalgae *Sargassum binderi*, *Sargassum cinereum*, *Padina australis* and *Turbinaria conoides* as material medicine. Samples in the study are taken from the sea around Kepulauan Seribu. Qualitative and quantitative tests conducted in the laboratory Nasional University Chemistry and Research Center Laboratory Plant Spices and Medicines. Research focuses on composition of phytochemicals consisting of groups of alkaloids, tannins, flavonoids, and saponins, then see its potential as a material drug through scientific studies. The results found in the research on every sample found contain all group phytochemicals in a way qualitative. Apart from that, levels of phytochemicals obtained are different. *Sargassum binderies* own high levels of flavonoids and saponins so that potential become drug as antioxidant, antiatherosclerotic, anti-inflammatory, antithrombogenic, antitumor, antiosteoporotic , antiviral, antibacterial, antifungal, and antiparasitic. While level tannin highest owned by *Turbinaria conoides* so that potential become material drug as antioxidant, antibacterial, antiviral, anticarcinogenic, anti-inflammatory, antiallergic, and vasodilator agents. *Padina australis* and *Sargassum cinereum* in a way sequentially own level highest from flavonoid and saponin groups, so that potential become material drug as antioxidant, antiatherosclerotic, anti-inflammatory, antithrombogenic, antitumor, antiosteoporotic, antiviral, antibacterial, antifungal, antiparasitic, and has hemolytic. All samples in a way qualitative contain alkaloids, so that has the potential to also become a material drug as anticancer, antibacterial, antiviral, antifungal, cytotoxic to herbivorous, analgesic, and relaxant muscle. Research more carry on about activity pharmacology, compounds phytochemicals specific, alkaloid levels, and dosage best can open knowledge about material drug from more macroalgae complete

Keyword: Medicinal ingredients, Macroalgae, Phytochemicals, Potential

INTRODUCTION

Utilization of macroalgae in the field of health and food has actually been done since the 17th century by several countries. China and Japan have utilized macroalgae

since 1670 as medicines, food additives, cosmetics, animal feed, and organic fertilizers. The people of Japan, China and Korea have utilized macroalgae as daily food (Suparmi and Sahri, 2009). Currently, the utilization of macroalgae is increasingly widespread and diverse, due to the increasing knowledge of macroalgae commodities. This marine biological resource is an excellent commodity to develop because of its chemical content, so that macroalgae can be used as a food source and a source of medicines such as anticoagulants, antibiotics, antihypertensive agents, dilatory agents , and insecticides (Dumilag, 2019; Dwimayasanti and Kurnianto, 2018; Hidayat et al., 2018; Kalani et al., 2019; Nurilmala et al., 2016; Sunarto, 2011; Yudasmara, 2011).

Macroalgae in Indonesia that have been identified are approximately 628 species out of 8,000 species in the world or around 7.9% of the world's macroalgae (Lüning, 1991; Phang et al., 2016). There are many types of macroalgae in Indonesian waters, but only a few have received attention for development, including *Eucheuma cotonii*, *Eucheuma spinosum*, *Gracillaria* sp, and *Caulerpa* sp. *Eucheuma* sp and *Gracillaria* sp are types of macroalgae that are widely produced in Indonesia, both naturally and cultivated. (Putra, 2019; Utami and Sayogo, 2021). In fact, there are still many types of macroalgae found in Indonesia whose benefits or potential can still be studied, such as *Sargassum*, Padina, Turbinaria, Hormophysa which are genera of Phaeophyta and are often considered as waste carried by the current (Santoso and Nugraha, 2008).

One of the Indonesian waters that is the distribution of macroalgae from Phaeophyta is the Kepulauan Seribu. In the Kepulauan Seribu, 7 species of *Sargassum*, 2 species of Padina, 3 species of Turbinaria and one species of Hormophysa were found. (Handayani and Widowati, 2016; Utami and Sayogo, 2021). Various studies on macroalgae in the Kepulauan Seribu are mostly still in the exploration stage of the types of macroalgae found on some of the islands in the Kepulauan Seribu cluster. Research on the chemical content of each macroalgae is still lacking. Several macroalgae exploration studies of the Kepulauan Seribu that have been conducted include macroalgae on Untung Jawa Island recorded 11 species (Marianingsih et al. , 2013) , 67 macroalgae species recorded from research along Jakarta Bay to the (Draisma et al. , 2018) , 27 macroalgae species recorded on Pari Island, 17 species in the southern part and 10 species in the northern part (Srimariana et al. , 2020) , 20 macroalgae species recorded on Semak Daun Island (Wulandari et al. , 2020) , and 29 macroalgae species recorded on Rambut Island (Handayani, 2022) .

Research related to the potential of macroalgae in the Kepulauan Seribu including *Padina australis* and *Eucheuma cotonii* from Tidung Island as sunscreen cream ingredients (Maharany et al. , 2017) ; Phytochemical, antibacterial and antioxidant activity tests of extracts of three Phaeophyceae macroalgae from Tidung Island, Kepulauan Seribu Coast (Handayani et al. , 2020) ; Phytochemical and antioxidant methanol extracts of *Gracilaria salicornia*, *Halimeda gracillis*, *Halimeda macroloba* , and *Hypnea asperi* from the Tidung Island Coastal Area (Widowati et al. , 2021) ; Literature study on the potential utilization and management of algae of the genus *Sargassum* found in the Kepulauan Seribu as medicinal ingredients (Utami and Sayogo, 2021) . The potential of macroalgae in the Kepulauan Seribu has not been studied much, so research on the phytochemistry and potential of macroalgae is important, considering that the Seribu Islands are located close to Jakarta Bay which is prone to pollution. High human activities such as fishing and transportation ports, as well as ship routes in Jakarta Bay can be a threat to the existence of macroalgae in the Kepulauan Seribu.

Phytochemical analysis is a test used to provide information on the types of chemical compounds contained in plants and can provide physiological effects. Information about active components is very useful for predicting their benefits for the human body. Phytochemical content is an organic compound produced by plants through secondary metabolism processes, which is non-essential for their growth and development (Monfil and Casas-Flores, 2014). Phytochemical substances function as determinants of pharmacological activity in plants. The many forms of phytochemical substances in plants provide various forms of pharmacological activity (Bhatti et al., 2022; Irawan et al., 2023). Phytochemical substances consist of three large groups, namely alkaloids, phenols, and terpenoids (Kaushik et al., 2021). With the content of phytochemical substances, macroalgae has the potential to be a source of medicinal ingredients that have bioactive benefits for humans (Lantah et al., 2017).

Based on this background, this study was conducted to determine the phytochemical compounds and potential of the macroalgae *Sargassum binderi*, *Sargassum cinereum*, *Padina australis*, and *Turbinaria conoides*. as a material drug.

METHOD

This research was conducted from February 2022 to August 2022 consisting of field research and laboratory research. Samples of *Sargassum binderi* , *Sargassum cinereum*, *Padina australis*, and *Turbinaria conoides* taken from the Seribu Islands (Coppejans et al., 2009). The bioactive material test of macroalgae was conducted at the Chemistry Laboratory of the Faculty of Biology and Agriculture, Universitas Nasional, Jl. Bambu Kuning, Pejaten, Pasar Minggu, South Jakarta. Screening test Phytochemical and saponin levels were carried out in the laboratory of the Research Center Plant Spices and Medicines, Bogor.

A. Withdrawal samples and preparation

Macroalgae samples were taken from locations in the Thousand Islands and then dried in the sun until dry. The dried samples were then taken to the lab for extraction and phytochemical testing.

B. Extraction macroalgae

Each species of dried macroalgae was ground with a grinder until smooth, then sieved using a 60mesh sieve. The ground powder was then macerated with 70% ethanol for 3 days and shaken for 5 minutes each day. The maceration results were filtered using filter paper and evaporated using a rotary evaporator to form a thick extract.

C. Qualitative test of alkaloids

A total of 0.5 g of sample powder was put into a test tube, added 2 N HCl and distilled water with a ratio of 1:9. Then the sample was heated using a spiritus flask until boiling, after which it was filtered with filter paper into another test tube. The filtrate was divided into three different test tubes, then different reagents were added, namely Dragendorff, Wagner, and Mayer reagents as much as 10 drops in each different tube. Positive alkaloid indication by reagent Dragendorff to form sediment colored red-orange, with Wagner's reagent forms sediment colored brown-red, while Mayer's reagent forms sediment colored yellow (Tiwari et al., 2011) .

D. Qualitative test of flavonoids

A total of 0.5 g of sample was put into a test tube, then dissolved with 10 mL of 70% ethanol. The sample was heated with a spiritus flask then filtered using filter paper into a different test tube. The sample filtrate was added with 0.03 g of Mg powder and 0.5 mL of concentrated HCl. Positive flavonoid indication If color filtrate changes become reddish (Samejo et al., 2013).

E. Qualitative test tannin

A total of 0.5 g of sample was put into a test tube, then 10 mL of distilled water was added. The sample was heated with a spiritus flask until boiling then filtered with filter paper into a different test tube. The filtrate was divided into two different tubes, in the first tube a few drops of 0.1% FeCl3 were added and in the second tube 1% gelatin containing NaCl was added. Indication is tannin positive if it forms green-brown, blue, to black on the addition of FeCl 3 and the formation of sediment colored white on addition of gelatin (Samejo et al., 2013; Tiwari et al., 2011).

F. Qualitative test of saponins

A total of 1 g of sample was put into a test tube and then 10 mL of distilled water was added. The sample was heated with a spiritus flask, then the sample was cooled, then the sample was shaken for one minute until a foam formed that lasted for 10 minutes (Tiwari et al., 2011).

G. Quantitative test of flavonoids

The maximum wavelength is obtained by using the peak wavelength feature on the Labdex Double Beam Spectrophotometer LX242DS machine application. The maximum wavelength value is taken from the highest absorbance value in the absorbance reading of the quersetin sample with a predetermined concentration in the wavelength range of 400 - 800 nm.

The standard series of quercetin was prepared by dissolving 2.5 mg of quercetin in 25 mL of absolute ethanol as a100 ppm stock solution. then diluted with a series of concentrations of 100 ppm, 50 ppm, 25 ppm, 12.5 ppm, 6.25 ppm and 3.125 ppm each as much as 10 mL. Then, 1 mL of each concentration in the series was taken and added 3 mL of absolute ethanol, 0.2 mL of 10% AlCl3 0.2 mL of glacial acetic acid, and 5.6 mL of distilled water. Then the solution was left for 30 minutes. After that, the absorbance of the standard series was measured with a UV-Vis spectrophotometer at a predetermined maximum wavelength. Then, based on the absorbance data of the standard series obtained, a standard curve was made to determine the regression equation using formula y=a+bx (Dahlia and Ahmad, 2014; Haeria and Andi, 2016).

Flavonoid levels were tested by dissolving 25 mg of sample in 10 mL of absolute ethanol into a sample solution with a concentration of 2,500 ppm. Then, 1 mL was taken from the sample solution and 3 mL of absolute ethanol, 0.2 mL of 10% AlCl3, 0.2 mL of glacial acetic acid, and 5.6 mL of distilled water were added, then the sample was left for 30 minutes. After that, measure the absorbance using a UV-Vis spectrophotometer at a previously determined wavelength. The sample absorbance data obtained were used to calculate the levels using the regression equation that had been made (Ahmad et al., 2015; Syafarina et al., 2019). The absorbance data is used to calculate the total content using the equation as following (Wachidah, 2013; Winahyu et al., 2019):

$$\text{Concentration} = \frac{(X \times V)}{} \times Fp$$

$$\text{Content} = \frac{(X \times V) \times Fp}{W}$$

Information:
Content = mg/g
X = concentration (mg/L)
V = Sample volume (L)
Fp = Dilution factor
W = Extract weight (g)

H. Quantitative test tannin

The maximum wavelength is obtained by using the peak wavelength feature on the Labdex Double Beam Spectrophotometer LX242DS machine application. The maximum wavelength value is taken from the highest absorbance value in the absorbance reading of the tannic acid sample with a predetermined concentration in the wavelength range of 400 - 800 nm.

The tannin standard series was prepared by making a 100ppm tannic acid stock solution of 50 mL. A total of 5 mg of tannic acid powder was dissolved in 50 mL of distilled water, then diluted with a series of concentrations of 100 ppm, 50 ppm, 25 ppm, 12.5 ppm, 6.25 ppm and 3.125 ppm, each of which was 10 mL. A total of 0.5 mL of Folin Ciocalteu and 7.5 mL of distilled water were added to each concentration series, then left for 5 minutes. After that, 1.5 mL of 20% Na2CO3 was added to each series and allowed to become homogeneous by leaving it in a place that was not exposed to light for 30 minutes. Then, the absorbance of the series was measured at the maximum wavelength using a UV-Vis spectrophotometer and a standard calibration curve was made to determine the regression equation between the concentration and the standard absorbance using the formulay=a+bx (Aryantini, 2021; Chaovanalikit and Wrolstad, 2004; Makkar et al., 1993).

This test was carried out by making a sample solution, 25 mg of sample in 10 mL of distilled water. Then, 0.5 mL of sample was taken and mixed with 0.5 mL of Folin Ciocalteu and 7.5 mL of distilled water. The sample solution was left for 5 minutes then 1.5 mL of 20% Na 2 CO 3 solution was added. The sample was homogenized by leaving it in a place that was not exposed to light for 30 minutes. Then, the absorbance of the sample solution was measured using a UV-Vis spectrophotometer at a previously determined wavelength. (Chaovanalikit and Wrolstad, 2004) . The absorbance data is used to calculate the total content using the equation as following (Wachidah, 2013; Winahyu et al., 2019):

$$\text{Concentration} = \frac{(X \times V)}{W} \times Fp$$

Information:
Content = mg/g
X = concentration (mg/L)
V = Sample volume (L)
Fp = Dilution factor
W = Extract weight (g)

I. Quantitative test of saponins

Saponin levels were tested with dissolve 250 mg of sample to in pumpkin measure 25 ml, then added aquadistillate until 1/4volume of the flask and shaken with a shaker for

2 hours. After that, the volume is adjusted until the marking on the pumpkin and stored for 24 hours. Then, the filtrate filtered and dripped onto the plate aluminum sheet silica gel 60 GF 254 as much as 5 µl with a material dissolved saponin comparator in aquadistillate with concentration of 100 ppm as much as 5 µl. Then, eluted with use eluent CHCl 3: ethanol: ethyl acetate to the eluent limit 15 cm long. After that, the TLC plate is left dry and measured with the Camag 3 TLC Scanner tool on length 301 nm wave (Balittro).

Data Analysis

Quantitative test results Phytochemicals are entered into Ms Excel, then analyzed descriptively to see what content has the potential. as well as comparing between samples to see highest content.

.

RESULT

A. Qualitative test phytochemicals

The results obtained from screening phytochemicals in samples macroalgae conducted in the laboratory of the Research Center Plant Spices and Medicines show that all sample macroalgae positive contain group phytochemicals of alkaloids, saponins, tannins and flavonoids, results screening phytochemicals that can seen in table 1.

Table 1. Screening Data Phytochemicals Macroalgae

Phytochemicals	***Padina australis***	***Sargassum binderii***	***Turbinaria conoides***	***Sargassum cinereum***
Alkaloid	+	+	+	+
Saponins	+	+	+	+
Tannin	+	+	+	+
Flavonoid	+	+	+	+

B. Quantitative test of flavonoids

Determination results in a long wave maximum obtained with measure absorbance quercetin 100 ppm in the range long 300-600 nm wave is 415 nm with mark absorbance 0.832 as mark peak. Standard curve made with measure absorbance series standard quercetin at length 415 nm wave. Concentration and absorbance data Then made in form curve regression, curve the can seen in figure 1.

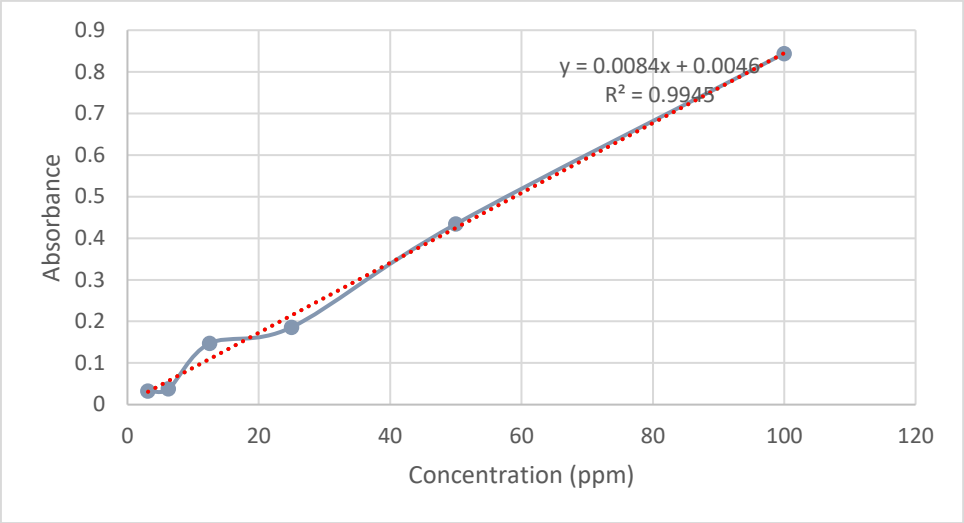

Figure 1. Standard Series Curve Quercetin

Based on the curve mentioned, it was obtained formula linear regression y = 0.0084x + 0.0046 which will be used for determining equivalent flavonoid levels of quercetin in the sample. Test results of flavonoid levels with UV-Vis spectrophotometer at a long wavelength 415 nm wave can be seen in table 2.

Table 2 . Macroalgae Flavonoid Content Data

Sample (g)	Absorbance	Level (ppm)	Concentration (mg QE/g extract)	%
PA 0.025	0.25	28.9	115.4	11.53
SB 0.025	0.5	58.17	232.7	23.27
TC 0.025	0.4	46.51	185.7	18.56
SC 0.025	0.04	4.45	17.81	1.78

Information:
PA: *Padina australis*
SB: *Sargassum binderi*
TC: *Turbinaria conoides*
SC: *Sargassum cinereum*
Absorbance data results from extract samples processed with the formula measurement level, so that obtained flavonoid levels in equivalent samples with quercetin as the comparison.

C. Quantitative test tannin

Determination results in long wave maximum obtained with measure absorbance sour 100 ppm soil in the range long wave 400-800 nm is 775 nm with mark absorbance 0.420 as mark peak. Standard curve made with measure absorbance series standard sour land as solution comparator in length 775 nm wave. Concentration and absorbance data Then made in form curve regression, curve the can seen in figure 2.

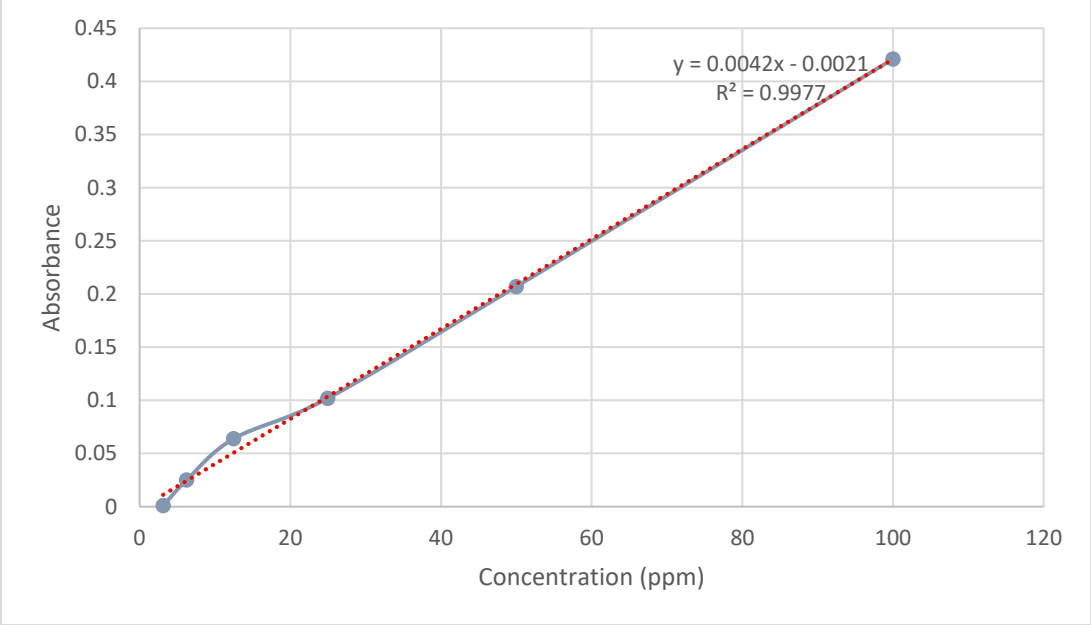

Figure 2. Standard Series Curve of Tannin

Based on the curve mentioned, it was obtained formula linear regression y = 0.0042x – 0.0021 which was used for determination level tannin equivalent to sour tannite in the sample. Test results level tannin with UV-Vis spectrophotometer at a long wavelength 775 nm wave can seen in table 3.

Table 3. Macroalgae Tannin Content Data

Sample (g)	Absorbance	Level (ppm)	Concentration (mg TAE/g extract)	%
PA 0.025	0.03	8.41	67.2	6.72
SB 0.025	0.04	9.12	73.01	7.3
TC 0.025	0.1	26.38	210.68	21.06
SC 0.025	0.02	5.46	43.68	4.36

Information:
PA: *Padina australis*
SB: *Sargassum binderi*
TC: *Turbinaria conoides*
SC: *Sargassum cinereum*

Absorbance data results from extract samples processed with formula measurement level, so that obtained level tannin in an equivalent sample with sour land as the comparison.

D. Quantitative test of saponins
saponin levels tests carried out in the Research Center laboratory Plant Spices and Medicines can be seen in table 4.

Table 4. Macroalgae Saponin Content Data

Sample (g)	Level (%)
PA 0.25	0.69
SB 0.25	1.29
TC 0.25	0.66
SC 0.25	0.86

Information:
PA: *Padina australis*
SB: *Sargassum binderi*
TC: *Turbinaria conoides*
SC: *Sargassum cinereum*

E. Phytochemical levels sample and potential as material drug

Every species of macroalgae has their own level content different phytochemicals can seen in table 5.

Table 5. Phytochemical Content of Samples

Types of macroalgae	Phytochemical content (%)		
	Tannin	Flavonoid	Saponins
Sargassum binderii	7.3	23.27	1.29
Sargassum cinereum	4.36	1.78	0.86
Padina australis	6.72	11.53	0.69
Turbinaria conoides	21.06	18.56	0.66

Activity phytochemicals as material drug under review from a number of results study related activity pharmacological properties possessed by each group of phytochemicals. Results of the study can be seen in table 6 below.

Table 6. Activities Pharmacological Macroalgae

Phytochemicals	Activity pharmacological	Reference
Alkaloid	anticancer, antibacterial, antiviral, antifungal, cytotoxic to herbivore, analgesic, relaxant muscle	Bribie (2018) Salminen *et al.* (2011) Thawabteh *et al.* (2019)
Saponins	Activity hemolytic, antifungal, anti-inflammatory, antibacterial, antiparasitic, antitumor, antiviral	Barbosa (2014) Simões *et al.* (1999) Sparg *et al.* (2004) Traore *et al.* (2000)

Tannin	Antioxidant, antibacterial, antiviral, anticarcinogenic, anti-inflammatory, antiallergic, vasodilator	Gollucke *et al.* (2013) Nile and Park (2014) Pizza (2008) Smeriglio *et al.* (2017)
Flavonoid	Antioxidant, antiatherosclerotic, anti-inflammatory, antithrombogenic, antitumor, antiosteoporotic , antiviral, antibacterial, antifungal	Agrawal (2011) The Last Supper (2018) Samanta *et al.* (2011)

DISCUSSION

Qualitative test results show that group phytochemicals include alkaloids, flavonoids, tannins, and saponins in each sample. Quantitative test results show that level highest tannin owned by sample *Turbinaria conoides* (21.06%), flavonoids by *Sargassum binderi* (23.27%), and saponins by *Sargassum binderi* (1.29%).

A. Phytochemicals in macroalgae

Based on results screening phytochemicals in sample macroalgae, each sample contains four group phytochemicals consisting of alkaloids, tannins, flavonoids, and saponins. Some from results the Already in accordance with research that has ever been done previously, but There is a number of difference namely in *Sargassum cinereum* which only contains alkaloids, and *Turbinaria conoides* that are not contains alkaloids and tannins, while for species specific *Sargassum binderi* not yet There is results screening phytochemicals that are carried out (Alamsyah et al., 2014; Nurrahman et al., 2020; Yanuarti et al., 2017). Whereas for study with the genus *Sargassum* already Once done, on the results research that has been done, content composition phytochemicals from the genus *Sargassum* sp. show results positive in screening for alkaloids, flavonoids, tannins, and saponins, but a number of the results also show different results. The results obtained vary because of the existence of different solvent and location taking samples (Damayanti et al., 2021; Fatimah et al., 2019; Herawati and Pudjiastuti, 2021).

Alkaloids consist of a number of classes based on ring heterocyclic compounds and its precursor. Alkaloids are compound metabolite secondary extracted from various species of plant including macroalgae which is plant level low. This alkaloid compound is pharmacologically useful for human life. Based on studies that have been done, alkaloid compounds have activity pharmacological as anticancer, antibacterial, antiviral, and antifungal. In addition, alkaloids are cytotoxic to herbivores in certain. Alkaloids are also known as natural analgesic narcotics and muscle relaxants (Bribi, 2018; Salminen et al., 2011; Thawabteh et al., 2019).

Flavonoids are compound metabolite secondary found in plants with group main in the form of flavones, flavonones , catechins, and anthocyanins. Flavonoids are known to play a role for protecting plants from an environment that is antimicrobial, agent detoxification, germination seeds, resistance to dryness and protection from exposure to UV rays. Flavonoids are known own activity pharmacological like antioxidant, anti-atherosclerosis, anti- inflammatory, anti -thrombogenic, anti-tumor, anti- osteoporotic,

antiviral, antibacterial, and antifungal (Agrawal, 2011; Alfaridz, 2018; Samanta et al., 2011).

Tannin is a compound metabolite secondary that can be found easily in nature because it is very commonly owned by ordinary plants used as material medicines. Tannins are grouped in two groups, namely tannin hydrolyzed and tannin condensed. Tannins are known to have their own characteristic antibacterial Because known can react with proteins on the membrane bacteria in a way irreversible. In addition tannin is also known own characteristic antioxidant, antiviral, anticarcinogenic, anti-inflammatory, anti-allergic, and vasodilator (Gollucke et al., 2013; Nile and Park, 2014; Pizzi, 2008; Smeriglio et al., 2017).

Saponin is a compound metabolite secondary in nature surfactants and can be found in plants that live on land and also sea. Saponins are known nature toxic if entered to in body through the vein directly, but characteristic toxicity weaken if entered orally Some results study show that saponins have ability for break erythrocytes (activity hemolytic), anti-inflammatory, antifungal, antibacterial, antiparasitic, antitumor (activity cytotoxic), and antiviral (Barbosa, 2014; Simões et al., 1999; Sparg et al. 2004; Traore et al., 2000).

B. Potential macroalgae

Sargassum binderi* and *Sargassum cinereum

Research results show that *Sargassum binderi* and *Sargassum cinereum* have content phytochemicals consisting of alkaloids, flavonoids, saponins, and tannins (table 1). Therefore that, *Sargassum binderi* and *Sargassum cinereum* have potential as material drug like anticancer, antibacterial, antiviral, antifungal, cytotoxic to herbivore, analgesic, relaxant muscle, activity hemolytic, anti-inflammatory, antiparasitic, antitumor, antioxidant, antiallergic, vasodilator, antiatherosclerotic , antithrombogenic, and antiosteoporotic.

Based on results testing quantitative, *Sargassum binderi* own flavonoid content (23.27%) and saponin (1.29%) which is higher tall compared to sample other so that can more potential as material drug antioxidant, antiatherosclerotic, anti-inflammatory, antithrombogenic, antitumor, antiosteoporotic, antiviral, antibacterial, antifungal, and antiparasitic. In addition, it can become a material tester of the presence of saponins in a plant or drugs with characteristic hemolytics (table 6). *Sargassum cinereum* own higher saponin content high (0.86%) while compound phytochemicals other is the least among other samples, so that can potentially more big become material drug for antifungal, anti-inflammatory, antibacterial, antiparasitic, antitumor, and antiviral. In addition it can become material tester the presence of saponins in a plant or drugs with characteristic hemolytic (table 7b)

Study about potential material drugs in the genus *Sargassum* which have done show results that *Sargassum* can used as material base for antioxidant, cholinesterase inhibitor, neuroprotective, anticancer, antipyretic, analgesic, anti-inflammatory, hepatoprotective, antiviral, anticoagulant, and anti-inflammatory activities immunomodulation (Yende et al., 2014).

Padina australis

Research results show that *Padina australis* own content phytochemicals consisting of alkaloids, flavonoids, saponins, and tannins (table 1). Therefore that, *Padina australis* own potential as material drug like anticancer, antibacterial, antiviral, antifungal, cytotoxic to herbivore, analgesic, relaxant muscle activity hemolytic, anti-inflammatory, antiparasitic antitumor, antioxidant, antiallergic, vasodilator, antiatherosclerotic, antithrombogenic, and antiosteoporotic.

Based on results testing quantitative, *Padina australis* own sufficient content high in every group compound with the highest flavonoid compound (11.53%), so that can more potential as material drug antioxidant, antiatherosclerotic, anti-inflammatory, antithrombogenic, antitumor, antiosteoporotic, antiviral, antibacterial, and antifungal (table 6).

Study about potential material drugs in the genus *Padina australis* which have done show results that *Padina australis* can used as material base for antibacterial, antidiabetic, elastase inhibitor, tyrosinase inhibitor, and antioxidant (Arguelles and Sapin, 2022; Hassan et al., 2021; Setha et al., 2013).

Turbinaria conoides

Research results show that *Turbinaria conoides* own content phytochemicals consisting of alkaloids, flavonoids, saponins, and tannins (table 1). Therefore that, *Turbinaria conoides* own potential as material drug like anticancer, antibacterial, antiviral, antifungal, cytotoxic to herbivore, analgesic, relaxant muscle, activity hemolytic, anti-inflammatory, antiparasitic, antitumor, antioxidant, antiallergic, vasodilator, antiatherosclerotic, antithrombogenic, and antiosteoporotic.

Based on results testing quantitative, *Turbinaria conoides* own content the highest tannin than sample others (21.06%), so that can more potential as material drug antioxidant, antibacterial, antiviral, anticarcinogenic, anti-inflammatory, antiallergic, and vasodilator agents (table 6).

Study about potential material drugs in the genus *Turbinaria* which has done show results that *Turbinaria* . can used as material base for tyrosinase inhibitor, antibacterial, antioxidant and screen agent solar (Arguelles and Sapin, 2020; Yanuarti et al., 2021).

CONCLUSION

Based on results research that has been done about content phytochemicals macroalgae and potential material the medicine, can conclude that:

1. All samples contain compound phytochemicals, alkaloids, tannins, flavonoids, and saponins.
2. The highest phytochemical compounds the level in sample *Sargassum binderi* and *Padina australis* is flavonoid compounds (23.27% and 11.53%), while compound the highest phytochemicals the level in sample *Sargassum cinereum* and *Turbinaria conoides* is compound tannins (1.78% and 21.06%).
3. Macroalgae tested own potential as material drug for antioxidant, antibacterial, antiviral, anticarcinogenic, anti-inflammatory, antiallergic, vasodilator agent, antiatherosclerotic, antithrombogenic, antitumor, antiosteoporotic , antiviral, and antifungal

ACKNOWLEDGMENT

Acknowledgments are given to the Center for Marine and Coastal Studies of the Universitas Nasional, as the research funder, as well as the Management of the Kepulauan Seribu for the assistance and permission granted during the research

REFERENCES

Agrawal A. (2011). Pharmacological Activities of Flavonoids: a Review. *Int. J. Pharm. Sci. Nanotechnol* 4: 1394-8

Ahmad AR, Juwita J, Ratulangi SAD. (2015). Penetapan Concentration Fenolik dan Flavonoid Total Ekstrak Metanol Buah dan Daun Patikala (Etlingera elatior (Jack) RM SM). *Pharmaceutical Sciences and Research* 2: 1

Alamsyah HK, Widowati I, Sabdono A. (2014). Aktivitas Antibakteri Ekstrak Rumput Laut *Sargassum cinereum* (jg agardh) dari Perairan Pulau Panjang Jepara Terhadap Bakteri Escherichia coli dan Staphylococcus epidermidis. *Journal of Marine Research* 3: 69-78

Alfaridz F. (2018). Review Jurnal: Klasifikasi dan Aktivitas Farmakologi dari Senyawa Aktif fFavonoid. *Farmaka* 16

Arguelles E, Sapin A. (2022). Bioactive Properties and Therapeutic Potential of *Padina australis* Hauck (Dictyotaceae, Ochrophyta). *International Journal of Agricultural Technology* 18: 13-34

Arguelles E, Sapin AB. (2020). Bioprospecting of *Turbinaria ornata* (Fucales, phaeophyceae) for cosmetic application: Antioxidant, tyrosinase inhibition and antibacterial activities. *J. Int. Soc. Southeast Asian Agric. Sci* 26: 30-41

Aryantini D. 2021. Aktivitas Antioksidan dan Kandungan Tanin Total Ekstrak Etanol Daun Kupu-Kupu (*Bauhinia purpurea* L..). *Jurnal Farmagazine* 8: 54-60

Barbosa ADP. (2014). An Overview on the Biological and Pharmacological Activities of Saponins. *International Journal of Pharmacy and Pharmaceutical Sciences* 6: 47-50

Bhatti MZ, Ismail H, Kayani WK. (2022). Plant Secondary Metabolites: Therapeutic Potential and Pharmacological Properties. *Secondary Metabolites: Trends and Reviews*: 201

Bribi N. (2018). Pharmacological Activity of Alkaloids: a Review. *Asian journal of botany* 1: 1-6

Chaovanalikit A, Wrolstad R. (2004). Total Anthocyanins and Total Phenolics of Fresh and Processed Cherries and Their Antioxidant Properties. *Journal of food science* 69: FCT67-FCT72

Coppejans E, Leliaert F, Dargent O*, et al.* (2009). *Sri Lankan seaweeds: Methodologies and field guide to the dominant species*: Belgian National Focal Point to the Global Taxonomy Initiative

Dahlia AA, Ahmad AR. (2014). Penetapan Concentration Flavonoid Total dari Ekstrak Etanolik Daun Benalu Mangga (*Dendrophthoe pentandra* L. Miq). *Jurnal Fitofarmaka Indonesia* 1

Damayanti A, Riyadi P, Dewi E. (2021). *Characteristic and boactive potential of brewed Sargassum* sp*. with the additional bay leaf (Syzygium polyanthum)*. Presented at IOP Conference Series: Earth and Environmental Science.

Draisma SG, Prud'homme van Reine WF, Herandarudewi SM*, et al.* (2018). Macroalgal Diversity Along an Inshore-offshore Environmental Gradient in the Jakarta Bay–Thousand Islands reef complex, Indonesia. *Estuarine, Coastal and Shelf Science* 200: 258-69

Dumilag RV. (2019). Edible Seaweeds Sold in the Local Public Markets in Tawi-Tawi, Philippines. *Philippine Journal of Science* 148

Dwimayasanti R, Kurnianto D. (2018). Komunitas Makroalga di Perairan Tayando-Tam, Maluku Tenggara. *OLDI (Oseanologi dan Limnologi di Indonesia)* 3: 39-48

Fatimah S, Aliman H, Daud N. (2019). Phytochemical Screening of *Sargassum* sp and in vitro Seed Germination Test. *Indonesian Journal of Science and Technology* 4: 48-54

Gollucke AP, Aguiar Jr O, Barbisan LF*, et al.* (2013). Use of grape polyphenols against Carcinogenesis: Putative Molecular Mechanisms of Action Using in vitro and in vivo Test Systems. *Journal of Medicinal Food* 16: 199-205

Haeria H, Andi T. (2016). Penentuan Concentration Flavonoid Total dan Aktivitas Antioksidan Ekstrak Etanol Daun Bidara (*Ziziphus spina-christi* L.). Journal of Pharmaceutical and Medicinal Science (1): 57-61

Handayani S, Widowati R. (2016). Inventarisasi dan Identifikasi Makroalga di Pulau Tidung Kepulauan Seribu Dalam Upaya Menggali Sumber Daya Hayati Potensial. *Prosiding Seminar Nasional Biodiversitas Untuk Kesehatan dan Keberlanjutan Kualitas Ekosistem*: pp. 1-9

Handayani S. (2022). Inventory and Description of Macroalgae In Rambut Island Kepulauan Seribu DKI Jakarta. *Journal of Tropical Biodiversity* 2: 133-51

Hassan IH, Pham HNT, Nguyen TH. (2021). Optimization of ultrasound-assisted extraction conditions for phenolics, antioxidant, and tyrosinase inhibitory activities of Vietnamese brown seaweed (*Padina australis*). Journal of Food Processing and Preservation 45: e15386

Herawati D, Pudjiastuti P. (2021). Effect of Different Solvents On The Phytochemical Compounds of *Sargassum* sp. From Yogyakarta and East Nusa Tenggara. Presented at Journal of Physics: Conference Series

Hidayat T, Nurjanah MN, Anwar E. (2018). Karakterisasi Rumput Laut Tropika Dari Kepulauan Seribu Sebagai Sumber Bahan Baku Kosmetik The Characterization Of Tropical Seaweed From Kepulauan Seribu As Sources Of Cosmetic Raw Materials. *CR Journal* 04: 49-62

Irawan WK, Kurniawaty E, Rodiani R. (2023). Zat Metabolit Sekunder dan Penyembuhan Luka: Tinjauan Pustaka. *Jurnal Agromedicine* 10: 26-30

Kalani W, Emiyarti, Ira. (2019). Pola Distribusi Makroalga Pada Ekosistem Lamun Dan Karang Di Perairan Desa Wawatu Kecamatan Moramo Utara. *Sapa Laut* 4: 41-52

Kaushik B, Sharma J, Kumar P*, et al.* (2021). Phytochemical properties and pharmacological role of plants: secondary metabolites. *Biosciences Biotechnology Research Asia* 18: 23

Lantah PL, Montolalu LA, Reo AR. (2017). Kandungan Fitokimia dan Aktivitas Antioksidan Ekstrak Metanol Rumput Laut Kappaphycus alvarezii. *Media Teknologi Hasil Perikanan* 5: 73-9

Lüning K. (1991). *Seaweeds:* their Environment, Biogeography, and Ecophysiology: John Wiley & Sons

Maharany F, Nurjanah SR, Anwar E*, et al.* (2017). Kandungan Senyawa Bioaktif Rumput Laut *Padina australis* dan *Eucheuma cottonii* Sebagai Bahan Baku Krim Tabir Surya. Jurnal Pengolahan Hasil Perikanan Indonesia 20: 10-7

Makkar HP, Blümmel M, Borowy NK*, et al.* (1993). Gravimetric Determination of Tannins and Their Correlations with Chemical and Protein Precipitation Methods. Journal of the Science of Food and Agriculture 61: 161-5

Marianingsih P, Amelia E, Suroto T. (2013). Inventarisasi dan Identifikasi Makroalga di Perairan Pulau Untung Jawa. *Prosiding SEMIRATA 2013* 1

Monfil VO, Casas-Flores S. (2014). Molecular Mechanisms of Biocontrol in Trichoderma spp. and their Applications in Agriculture. In Biotechnology and Biology of Trichoderma, pp. 429-53: Elsevier

Nile SH, Park SW. (2014). Edible Berries: Bioactive components and their effect on human health. *Nutrition* 30: 134-44

Nurilmala M, Hidayat T, Sudirdjo F. (2016). Characteristics of Seaweed as Raw Materials for Cosmetics. *Aquatic Procedia* 7: 177-80

Nurrahman NWD, Sudjarwo GW, Putra ON. (2020). Skrining Fitokimia Metabolit Sekunder Alga Cokelat (*Padina australis*) dari Kepulauan Poteran Madura. Journal of Pharmaceutical Care Anwar Medika (J-PhAM) 2: 60-9

Phang S-M, Yeong H-Y, Ganzon-Fortes ET*, et al.* (2016). Marine algae of the South China Sea Bordered by Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam. Raffles Bulletin of Zoology

Pizzi A. (2008). Tannins: Major Sources, Properties and Applications. In Monomers, Polymers and Composites from Renewable Resources, pp. 179-99: Elsevier

Putra S. (2019). Analisis Kelayakan Usaha Budidaya Rumput Laut Alga Merah (*Glacilaria* Sp) Di Desa Cendi Manik Kecamatan Sekotong Kabupaten Lombok Barat. Universitas Mataram

Salminen KA, Meyer A, Jerabkova L*, et al.* (2011). Inhibition of Human Drug Metabolizing Cytochrome P450 Enzymes by Plant Isoquinoline alkaloids. *Phytomedicine* 18: 533-8

Samanta A, Das G, Das SK. (2011). Roles of Flavonoids in Plants. Carbon 100: 12-35

Samejo MQ, Sumbul A, Shah S*, et al.* (2013). Phytochemical Screening of *Tamarix dioica* Roxb. ex Roch. Journal of Pharmacy Research 7: 181-3

Santoso L, Nugraha YT. (2008). Pengendalian Penyakit Ice-ice untuk Meningkatkan Produksi Rumput Laut Indonesia. Jurnal Saintek Perikanan 3: 37-43

Setha B, Gaspersz FF, Idris APS*, et al.* (2013). Potential of Seaweed *Padina* sp. as a Source of Antioxidant. International Journal of Scientific and Technology Research 2: 221-4

Simões C, Amoros M, Girre L. (1999). Mechanism of Antiviral Activity of Triterpenoid Saponins. Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives 13: 323-8

Smeriglio A, Barreca D, Bellocco E*, et al.* (2017). Proanthocyanidins and Hydrolysable Tannins: Occurrence, dietary intake and pharmacological effects. British journal of pharmacology 174: 1244-62

Sparg S, Light M, Van Staden J. (2004). Biological Activities and Distribution of Plant Saponins. Journal of ethnopharmacology 94: 219-43

Srimariana E, Kawaroe M, Lestari D*, et al.* (2020). Biodiversity of Macroalgae in Pari Island. Presented at IOP Conference Series: Earth and Environmental Science

Sunarto S. (2011). Keragaman Rumput Laut yang Bernilai Ekonomi di Pulau Pari Kepulauan Seribu. *Jurnal Dinamika Pendidikan* 4: 104-11

Suparmi, Sahri A. (2009). Knowing the potential of seaweed: Study of the utilization of seaweed resources from industrial and health aspects. *Sultan Agung Journal* 44: 95-116

Syafarina M, Taufiqurrahman I, Edyson E. (2019). Perbedaan Total Flavonoid Antara Tahapan Pengeringan Alami dan Buatan pada kstrak daun binjai (Mangifera caesia)(Studi pendahuluan terhadap proses pembuatan sediaan obat penyembuhan luka). *Dentin* 1

Thawabteh A, Juma S, Bader M*, et al.* (2019). The biological activity of natural alkaloids against herbivores, cancerous cells and pathogens. *Toxins* 11: 656

Tiwari P, Bimlesh K, Mandeep K*, et al.* (2011). *Phytochemical Screening and Extraction*. *International Pharmaceutica Sciencia* 1

Traore F, Faure R, Ollivier E*, et al.* (2000). Structure and Antiprotozoal Activity of Triterpenoid Saponins from *Glinus oppositifolius*. Planta Medica 66: 368-71

Utami TP, Sayogo BH. (2021). Studi Literatur Potensi Pemanfaatan dan Pengolahan Alga Genus *Sargassum* yang Terdapat di Kepulauan Seribu Sebagai Bahan Obat. Archives Pharmacia 3: 41-8

Wachidah LN. (2013). Uji Aktivitas Antioksidan Serta Penentuan Kandungan Fenolat dan Flavonoid Total dari Buah Parijoto (*Medinilla speciosa* Blume).

Widowati R, Handayani S, Suprihatin ILR. (2021). Phytochemicals and antioxidant of methanol extract of *Gracilaria salicornia*, *Halimeda gracilis*, *Halimeda macroloba*, and *Hypnea asperi* from Tidung island coastal region. European Journal of Molecular & Clinical Medicine 8: 1-12

Winahyu DA, Retnaningsih A, Aprillia M. (2019). Penetapan Concentration Flavonoid Pada Kulit Batang Kayu Raru (*Cotylelobium melanoxylon* P.) dengan Metode Spektrofotometri *uv-vis. Jurnal Analis Farmasi* 4

Wulandari SA, Marhaeni B, Meinita MDN. (2020). Macroalgae Community Structure at Semak Daun Island, Kepulauan Seribu, Indonesia. *Omni-Akuatika* 16: 21-5

Yanuarti R, Nurjanah N, Anwar E*, et al.* (2017). Kandungan senyawa penangkal sinar ultra violet dari ekstrak rumput laut Eucheuma cottonii dan *Turbinaria conoides*. Majalah Ilmiah Biologi BIOSFERA: A Scientific Journal 34: 51-8

Yanuarti R, Nurjanah N, Anwar E*, et al.* (2021). Evaluasi fisik sediaan krim tabir surya dari bubur rumput laut Kappaphycus alvarezii dan *Turbinaria conoides*. *Jurnal FishtecH* 10: 1-8

Yende SR, Harle UN, Chaugule BB. (2014). Therapeutic potential and health benefits of *Sargassum* species. *Pharmacognosy reviews* 8: 1

Yudasmara GA. (2011). Analisis Komunitas Makroalga di Perairan Pulau Menjangan Kawasan Taman Nasional Bali Barat. Widyatech Jurnal Sains dan Teknologi 11: 90-9