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Characteristics of *Eucheuma denticulatum* and *Turbinaria conoides* porridge as body lotion materials

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Abstract Utilization of seaweed is driven by increasing seaweed production every year. Red algae and brown algae are the seaweeds that widely used in Indonesia. The characteristics, antioxidant activity and get the best combination of *Eucheuma denticulatum* and *Turbinaria conoides* seaweed porridge as body lotion materials were determined. The combination ratios of *E.denticulatum* and *T.conoides* were 1:1, 1:2, and 2:1, respectively. The best combination seaweed porridge of *E. denticulatum* and *T. conoides* found in ratio 1:2 with IC_{50} value was 173.72 mg/L, and total phenol was 455 mgGAE/g. IC_{50} and Loss on Drying (LoD) in lotion product was 280.17 mg/L and 82.47%, respectively. The sensory test results were neutral so that seaweed porridge can be used as raw materials of lotion.

Keywords: Antioxidant, Seaweed, Skincare, Phenol, LoD

Introduction

Indonesia is a seaweed producing country with great potential for developed. Indonesian seaweed production continues to grow every year. Seaweeds production data in Indonesia reached 3.9 million tons in 2010 and increased until it came 10.1 million tons in 2014 (KKP, 2015). The types of seaweeds widely used are brown (Ochrophyta, Phaeophyceae) and red (Rhodophyta) species. *Turbinaria* sp. is a species of brown seaweed whose potential is currently explored. *Turbinaria* sp. has benefits in health, microbiology, enzymology, and ecotoxicology (La Barre *et al*., 2010). *Turbinaria* sp. has several applications in the industrial sector, the cosmetic industry (Hafting *et al*., 2015). *Turbinaria* sp. has a phenolic compound content and a flavonoid compound content of 17.36 mg QE/g and is a potential source of antioxidants (Yanuarti *et al*., 2017). *Eucheuma denticulatum* (formerly *Eucheuma spinosum*) is a species of red seaweed that has economic value and an excellent opportunity to developed in the cosmetic field. *Eucheuma*

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denticulatum has an IC50 value of 64.27 mg/L and is considered a potent antioxidant (Damongilala *et al*., 2013). Both seaweeds contain bioactive compounds as a source of natural antioxidants (Podungge *et al*., 2018).

Chaetomorpha crassa has indicated to correlate positively between the total phenol content and antioxidant activity with three methods of antioxidant (DPPH, CUPRAC and FRAP). Antioxidant activity of green algae*Halimeda macroloba* with 2,2-diphenyl-1-picrylhydrazyl (DPPH) method were obtained IC_{50} 121. 445 ± 1.03 mg/L, the n-hexane extract have IC_{50} 181.945 ± 1.95 mg/L and ethyl acetate extract of IC_{50} 228.67 mg/L (Gazali *et al*., 2019). Both seaweed green algae as new antioxidant sources for human health.

Antioxidant compounds are compounds that can inhibit oxidation. One of the compounds that have the potential as antioxidant compounds in seaweed is phenolic compounds. Phenolic compounds have oxidizing properties that play a role in counteracting free radicals. Phenolic compounds have chromophore groups that can absorb UV light waves (Martiningsih *et al*., 2014). The high content of antioxidants and phenolic compounds in seaweed is very prospective for cosmetic preparations (Nurjanah *et al*., 2016). Cosmetic products that can produce by utilizing the antioxidant content of seaweed are lotions. The lotion is a type of cosmetic emollient or softener that contains a lot of water (Depkes, 1979). The cream is used on the external body to protect from exposure to excess UV rays, , which can cause the skin to become dry, burnt, and dark in colour.

The use of active ingredients found in seaweed for cosmetic applications used in extract form. The use of extracts in cosmetic preparations has disadvantages, namely, it produces waste, is quite expensive, and produces less yield. One other alternative to reduce the impact of this extra use is to use seaweed porridge. Seaweed porridge is safer, more economical, environmentally friendly, and zero waste. The application of seaweed porridge in the cosmetic products, namely, sunscreen cream (Nurjanah *et al*., 2017; Yanuarti *et al*., 2017; Nurjanah *et al*., 2019), skin lightening creams (Sari *et al*., 2019; Dolorosa *et al*., 2019), masks, lip balm (Nurjanah *et al*., 2018), peel off masks and body lotion. The application of *Turbinaria conoides* and *Eucheuma denticulatum* as raw material for body lotion products has never studied before. The purpose of this research was to determine the characteristics, antioxidant activity and get the best combination of *Eucheuma denticulatum* and *Turbinaria conoides* seaweed porridge as body lotion materials.

Materials and methods

Time and place of research

The research project was conducted from February to July 2018. The study was carried out at the Laboratory of Aquatic Products Raw Materials, Department of Aquatic Product Technology, Faculty of Fisheries and Marine Sciences, IPB University.

Sample collection and preparation

Eucheuma denticulatum (Rhodophyta) and *Turbinaria conoides* (Ochrophyta, Phaeophyceae) were taken from Serang waters, Banten, Indonesia. The fresh samples were cleaned from sand and foreign matter and washed with seawater. After that, the sample was transported to the laboratory using a plastic container. In the following process, the samples were dried for 5-6 days to reduce water content and maintain the chemical content of seaweed (Masduqi *et al*., 2014).

Porridge seaweed production

The dried seaweed was washed and soaked for 12 hours with demineralized water. The seaweed was soaked, then homogenized using a blender. *Eucheuma denticulatum* and *Turbinaria conoides* seaweed porridge was mixed in a ratio of 1:1, 1:2, and 2:1. The seaweed mixing was then analysed for pH, antioxidants, phytochemicals, total phenol and viscosity. The research was carried out in two replications. The best testing results was used as the reference for determining the ratio of the added *E. denticulatum* and *T. conoides* porridge into body lotion production.

Body lotion production

Seaweed body lotion was based on the method of Mishra *et al*. (2014). The process starteds with preparing the oil phase (stearic acid, liquid paraffin, emulate, cetyl alcohol, and nipagin) and the water phase (glycerin, nipasol, tri-amine ethanol, and demineralized water) then mixed and heated at ±75 ℃ until homogeneous. The mixture was added with the best ratio of *T. conoides*, and *E. denticulatum* porridge, then added fragrance and stirred slowly at 40 ℃. The expected result was then analyzed for LoD, sensory, physic evaluation,

mechanical test and skin moisture. The research carried out in two repeated experiments.

Statistical analysis

The experimental design was a Completely Randomized Design (CRD). Data were presented as a mean ± standard deviation (SD). Analysis of the data was performed using an analysis of variance (ANOVA) with the statistical software SPSS Statistics 23.0. The obtained data were tested for normality and homogeneity before ANOVA analysis was carried out. Data analysis were performed by Analysis of Variance (ANOVA) a 95% confidence interval ($\alpha = 0.05$). The significant results was further tested by Duncan's Multiple Range Test (DMRT).

Results

Characteristics of seaweed porridge

Moisture content

The moisture content of seaweed porridge was analyzed from the respective ratios of 1:1, 1:2, and 2:1. The results of moisture content were different for each combination of seaweed porridge. The highest water content was seaweed porridge *E. dentilacatum* and *T. conoides* which a ration of 2:1 was 96.28% and the smallest was seaweed porridge *E. dentilacatum* and *T. conoides* with a ratio of 1:2 was 95.02% . The combination of seaweed porridge with a ratio of 1: 1, 1:2, and 2:1 which had affected ($p < 0.05$) on the moisture content of the seaweed porridge. All treatments had significantly different effects (Table 1).

Table 1. Moisture content of seaweed porridge *E. denticulatum* and *T. conoides*

Ratio of sample	Moisture content (%)
1:1	$95{,}71^{b}$
1:2	$95{,}02^{c}$
2:1	$96{,}28^{a}$

Note : Superscript font different groups showed a significant difference ($P<0.05$)

pH value

pH measurement is recorded the degree of acidity of the seaweed porridge used as the raw material for the body lotion. The highest pH value from seaweed porridge combination of *E. spinosum* : *T. conoides* at the ratio of 1:1 was pH 6.25 and the smallest of *E. spinosum* : *T.* conoides at the ratio of 2:

1 was pH 6.02. The results showed that the difference in the ratio of seaweed porridge had no significant effect (P<0.05) on the pH value of the seaweed porridge (Figure 1).

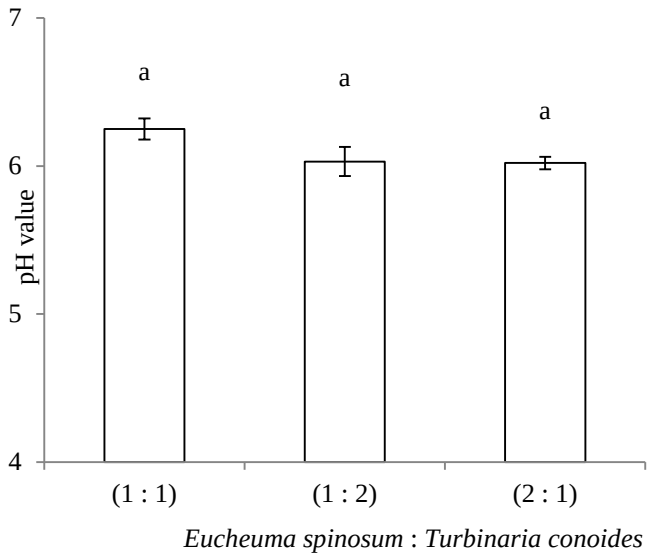


Figure 1. pH value of seaweed porridge combination *E. denticulatum* and *T. conoides*

Bioactive compound

Phytochemical testing found the content of bioactive compounds in seaweed porridge. The results of phytochemical testing show that seaweed porridge combination *E. denticulatum* and *T. conoides* found phenol, flavonoid, and saponin compounds (Table 2).

Viscosity

Viscosity test is recored the viscosity level of the seaweed porridge. The results showed that the viscosity of *E. spinosum* and *T. conoides* seaweed porridge with a ratio of 1:1, 1:2, and 2:1. The combination of seaweed porridge with a ratio of 1: 1, 1:2, and 2:1 had affected (p <0.05) in viscosity values. The results showed that the combination of 1:1 was significantly differed from the combination of 1:2 and 2:1 (p<0.05), the combination of 1:2 was significantly different from the combination 2:1 (p <0.05). The highest viscosity value was obtained in the combination of *E. spinosum* and *T. conoides* (2:1) of 6,665 cP (Figure 2).

Table 2. The bioactive compound of seaweed porridge combination *E. denticulatum* and *T. conoides*

Parameter	Method Test	*E.denticulatum* : *T. conoides* (1:1)	*E.denticulatum* : *T. conoides* (1:2)	*E.denticulatum* : *T. conoides* (2:1)	Positive results
Alkaloids	Dragendroff	-	-	-	Red-orange precipitate
	Mayer	-	-	-	White precipitate
	Wagner	-	-	-	Brown precipitate
Flavonoids		+	+	-	Red, yellows, orange
Phenol		-	+	-	Green, green-blue
Steroids		-	-	-	Blue
Saponin		-	+	+	Foam

Note: (+) Detected, (-) Not detected

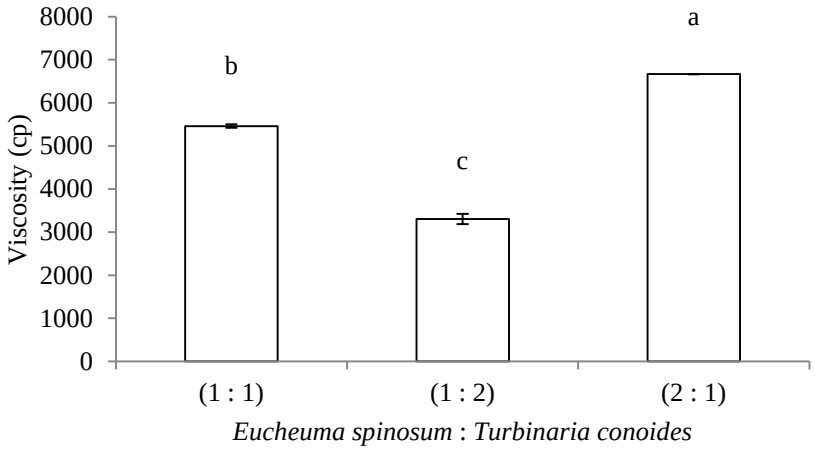
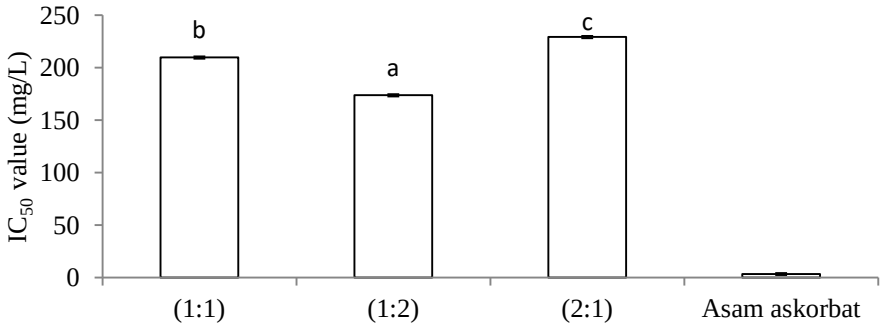


Figure 2. Viscosity of seaweed porridge combination *E. denticulatum* and *T. conoides*

Antioxidant activity

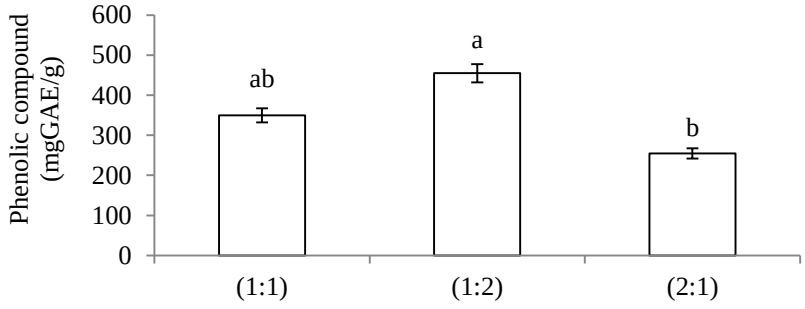
Antioxidant testing is recorded the percentage of inhibitors of free radical activity. IC_{50} is the concentration of a sample that can inhibit 50% of free radicals from DPPH. The antioxidant activity of *E. delicantum* and *T. conoides* seaweed porridge with a ratio of 1:1, 1:2, and 2:1 were 209.6822 mg/L,

173.7287 mg/L, and 229.1771 mg/L, respectively. The results showed that the combination of seaweed porridge with a ratio of 1:1, 1:2, and 2:1 had affected ($p < 0.05$) in antioxidant activity. It showed that the combination of 1:1 was significantly different from the combination of 1:2 and 2:1 ($p<0.05$), the combination of 1:2 was significantly different from the combination of 2:1 ($p < 0.05$). The best IC_{50} value was obtained in the ratio of 1:2 after that ratio 1:1 and the last ratio of 2:1 (Figure 3).



Eucheuma spinosum : *Turbinaria conoides*

Figure 3. IC_{50} value of seaweed porridge combination *E. denticulatum* and *T. conoides*



Eucheuma spinosum : *Turbinaria conoides*

Figure 4. The total phenolic compound of seaweed porridge combination *E. denticulatum* and *T. conoides*

Total phenolic compound

The highest total phenol value was obtained in the ratio of 1:2 with a value of 455 mgGAE/g, while in the ratio of 1:1 was 350 mgGAE /g and the smallest value in the ratio of 2:1 was 255 mgGAE/g. The results showed that the difference in the ratio of seaweed porridge had a significant effect ($P<0.05$) on the total phenol content. The results showed that the combination of 1:1 was

significantly different from the combination of 2:1 ($p<0.05$), the combination with 1:2 ratio did not significantly different from the combination of 2:1 and 1:1 (Figure 4).

The best combination of seaweed porridge E. denticulatum and T. conoides

The best combination of seaweed porridge refered to the results of testing parameters of pH, viscosity, total phenol, and antioxidant activity. The test results showed that the best phenolic compound and antioxidant activity (IC_{50}) value was obtained in a combination of 1:2 seaweed porridge. The all result of testing parameters of pH, viscosity, total phenol, and antioxidant activity can be seen in Table 3.

Table 3. The result of all parameter test in combination of seaweed porridge

Parameter	***E. denticulatum* : *T. conoides* seaweed porridge ratio**		
	1:1	**1:2**	**2:1**
Viscosity (cP)	5.460 ± 42,42	3.305 ± 7,071	6.665 ± 120,2
pH	6,25 ± 0,07	6,03 ± 0,09	6,02 ± 0,04
Phenolic compound (mgGAE/g)	350 ± 42,42	455 ± 35,35	255 ± 21,21
IC_{50} (mg/L)	209,68 ± 0,79	173,72 ± 0,52	229,17 ± 0,36

Characteristics of body lotion

Loss on drying (LoD)

Loss on Drying (LoD) in body lotion showed the shrinkage weight of the lotion after heating using the oven. Loss on drying testing had different results in each sample. The highest to lowest LoD values were control (+) or commercial products with a value of 98.55%. The control (-) or samples without additional seaweed was 82.76%, and samples with the addition of seaweed were 81.47%. The results showed that the addition of seaweed porridge had a significant effect ($P <0.05$) on the resulting loss on drying body lotion. The results stated that commercial products were significantly different from negative control and lotions with the addition of seaweed porridge ($p<0.05$), lotions with the addition of seaweed porridge were significantly different from negative controls ($p<0.05$) (Table 4).

Table 4. Loss on Drying of body lotion

Sample	Loss on drying (%)
Commercial body lotion	98.55[a]
Body lotion without seaweed porridge	82.76[b]
Body lotion with seaweed porridge	81.47[c]

Note : Superscript font different groups showed a significant difference (P<0.05)

Physic evaluation and IC_{50}

Physical evaluation on the lotion made must meet the standards of SNI-16-3499-1996. The made lotion had a homogeneous appearance. The pH test on the lotion got a value of 7.46 and the viscosity value of the lotion was 6.000 cP. It meets the standards set by SNI-16-3499-1996 which stated that lotions standards must have a homogeneous appearance with a pH of 4.5-8 and a viscosity of 2,000-50,000 cP. The IC_{50} value of the lotion product with the addition of seaweed porridge was 280.17 mg/L (Table 5 and Figure 5).

Table 5. Physic evaluation and IC_{50} of body lotion

Parameter	Result	Standard
Appearance	Homogenous	Homogenous
pH	7.46 ± 0.106	4.5-8.0
Viscosity (cP)	6000	2000-50000
IC_{50} (mg/L)	280.17	-

Figure 5. Appearance of the body lotion combination of seaweed porridge *E. denticulatum* and *T. conoides* (1:2)

Body lotion stability

A mechanical test was recorded the phase change of the emulsion. The parameters showed the color change, odour change, and phase separation. The results showed that there were no changes in each of the samples tested (Figure 6).

Figure 6. The result of stability test body lotion

Skin moisture

The skin moisture test was recorded the effect use body lotion to the skin moisture value. The scale of skin moisture values was 0-27% dry, 28-37% slightly dry, 38-47% moist, 48-57% humidity, and > 57% very moist. The test results showed a decrease in the percentage value of skin moisture at the 0th min to the 15th min after observation. The results showed that body lotion with the addition of seaweed porridge reached 53.4% in the 0th min and decreased to 51.9 in the 15th min after observation. The results showed that the time observation had a significant effect ($P < 0.05$) on the resulting skin moisture of body lotion. The results stated that 0th min after observation were significantly different from 5th min, 10th min, and 15th min after observation ($p<0.05$) (Figure 7).

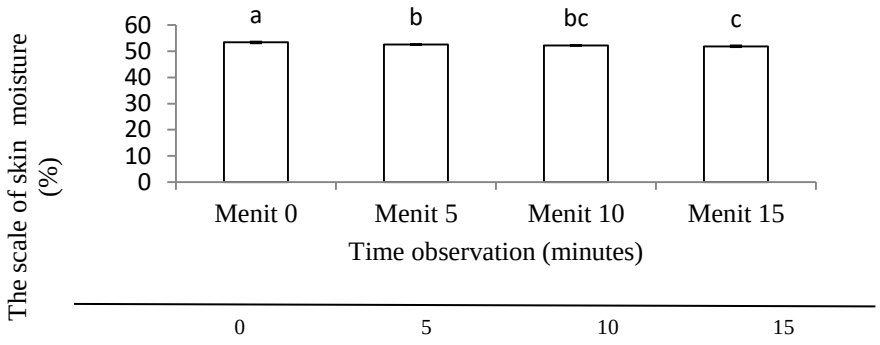


Figure 7. The result of skin moisture body lotion

Sensory analysis

Sensory test was recorded in the negative control lotion without seaweed, positive control (commercial products), and addition of seaweed porridge. The Kruskal Wallis test results at the level of $\alpha = 0.05$ indicated that the addition of seaweed porridge affected the panelists preference for the appearance and color of the resulting body lotion but did not affect the panelists preference for odour and texture. Applying body lotion with the addition of seaweed porrigde found a neutral value for color and appearance parameter (Table 6).

Table 6. Sensory of seaweed body lotion

Parameter	Formula with seaweed	Formula without seaweed	Comercial
Appearance	3.2	4.03	4.26
Colour	3.2	4.03	4.33
Odour	3.83	4.03	4.33
Texture	3.96	4.03	3.86

Discussion

The highest moisture content obtained in the combination of *E. denticulatum* : *T. conoides* (2 : 1) was 96.28%, and the smallest value was obtained in the ratio of *E. denticulatum* : *T. conoides* (1:2) of 95.02%. Research conducted by Nurjanah *et al*. (2018) stateds that the moisture content in the seaweed porridge of *Kappaphycus alvarezii* (formerly *Eucheuma cotonii*) and *T. conoides* is 93.75% and 92.30%, respectively. The moisture content was affected of soaked treatment in seaweed. The seaweed has hydrocolloid properties and it has the ability to absorb the water as much as possible (Amaliah *et al*., 2016). Addition of demineralized water in the process of making seaweed porridge has an effect on the moisture content.

The pH value obtained in seaweed porridge with a ratio of *E. denticulatum* : *T. conoides* (1:1) was 6.25, and the ratio of *E. denticulatum* : *T.* conoides (2: 1) was 6.02. The pH value in each combination of seaweed porridge tends to be neutral, and this is due to the soaking of seaweed using demineralized water. Desmiart *et al*. (2017) stated that the pH value in demineralized water is 5-7. The pH value obtained is in accordance with SNI number 16-4399-1996, , which states that the pH of cosmetics must be in the range of 4.5-8.0.

The bioactive compound results obtained are different from the research conducted by Yanuarti *et al*. (2017), which stated that *T. conoides* extract positively contained phenols, flavonoids, triterpenoids, steroids and saponins.

The results obtained from the research of Podungge *et al*. (2018) stated that *E. denticulatum* is positive for alkaloids, steroids, saponins, phenols, and flavonoids. Phenol is a secondary metabolite compound derived from plants. Seaweed contains phenolic compounds , which can act as antioxidants (Farasat *et al*., 2014). Flavonoids are compounds that function as antioxidants. Flavonols, flavones, and anthocyanins are flavonoid compounds that serve as antioxidants (Radam *et al*., 2016). Saponins are lipid terpenoids with four carbon bases and have an O-H group that can be used as antioxidants (Krisna *et al*., 2014).

The results obtained from measuring the viscosity of *E. denticulatum* and *T. conoides* seaweed porridge with a ratio of 1:1, 1:2, 2:1. The results showed that the combination of seaweed porridge with a ratio of 1: 1, 1:2, and 2:1 affected ($p < 0.05$) on the resulting viscosity value. The highest viscosity value was obtained in the combination of *E. denticulatum* and *T.* conoides (2:1) of 6,665 cP. This result was influenced by the more significant amount of *E. denticulatum* seaweed porridge. *E. denticulatum* seaweed has hydrocolloids (Fathmawati *et al*., 2014), which can be used as a thickener and gelling agent so that the 2:1 combination of seaweed porridge has a higher viscosity value.

The results showed that the combination of seaweed porridge with a ratio of 1:1, 1:2, and 2:1 affected ($p < 0.05$) on the resulting antioxidant activity. The results stated that the combination of 1:1 seaweed porridge was significantly different from the combination of 1:2 and 2:1 seaweed porridge ($p < 0.05$), the combination of seaweed porridge with a ratio of 1:2 was substantially different from the combination of seaweed porridge ocean 2:1 ($p < 0.05$). The average results obtained from antioxidant testing of *E. denticulatum* and *T. conoides* seaweed porridge with a ratio of 1:1, 1:2, and 2:1 were 209.6822 mg/L, 173.7287 mg/L, and 229.1771 mg/L. The best IC_{50} value was obtained in the ratio of *T. conoides*: *E. denticulatum* (2:1) because *T. conoides* had greater antioxidant activity than *E. denticulatum*.

IC_{50} values less than 50 mg/L classified as strong, 50-100 mg/L moderate, 150-200 mg/L weak and more than 200 mg/L very weak, that the sample with a ratio (1:2) has activity weak antioxidants, in contrast, the ratio (1:1) and (2:1) has very weak antioxidant activity. The weak antioxidant activity was caused of samples, and the use of seaweed porridge still contains other compounds that can inhibit the performance of antioxidants (Wikanta *et al*., 2005). The results of the research by Deepak *et al*., (2017) stated that the IC_{50} value of *Turbinaria ornata* extract was 116.5 mg/L. The IC_{50} value of *E. denticulatum*, according to Podungge *et al*. (2018) was 223.305 mg/L. Functional salt FRAP antioxidant activity of *T. conoides* ranged from 39.12 to 55.31 μM trolox/g and CUPRAC ranged from 98.50 to 113.95 μM trolox/g, in

contrast, the functional salt from *Padina minor* has FRAP antioxidant activity ranging from 18.19 to 24.67 μM trolox/g and CUPRAC 40.05-53.05 μM trolox/g (Nurjanah *et al*., 2020).

The results obtained from the total phenol test were different for each treatment. The highest value was obtained in the ratio (1:2) with a value of 455 mgGAE/g, in contrast, in the ratio (1:1) the result was 350 mgGAE / g and the smallest value in the ratio (2:1) was 255 mgGAE/g. The obtained results were higher than the study results by Yanuarti *et al*. (2017) , which stated that the total phenol from *T. conoides* extract was 211 mgGAE/g. Kusmiyati *et al*. (2015) noted that total phenol has a positive correlation to its antioxidant activity. Total phenol has a positive correlation with antioxidants because phenolic compounds play a role in preventing oxidation. Vermerris and Nicholson, (2006) stated that phenolic compounds could donate hydrogen atoms, which make free radicals into more stable compounds.

Loss on drying testing has different results in each sample. The highest to lowest LoD values were control (+) or commercial products with a value of 98.55%, control (-) or samples without additional seaweed was 82.76%, and samples with the addition of seaweed were 81.47%. The obtained results showed that the sample with the addition of seaweed porridge can hold water better. The hydrocolloid content in seaweed porridge can reduce water evaporation because hydrocolloids can absorb water and retain the water content in the lotion. Hydrocolloid compounds consist of polysaccharide compounds and are hydrophilic. Hydrocolloid compounds used as a gelling agent, stabilizer, and emulsifier (Loupatty, 2010).

Seaweed has hydrocolloid compounds that can be used as a gelling agent, stabilizer, and emulsifier (Loupatty, 2010), the two phases of the body lotion can be homogeneous and more stable. The pH test on the body lotion got a value of 7.46, and the viscosity value was 6.000 cP. It was in accordance with the standards set by SNI-16-3499-1996, which stated that lotions that meet the standards must have a homogeneous appearance, have a pH of 4.5-8; and a viscosity of 2,000-50,000 cP. Viscosity affects the spreadability of the product, the higher the viscosity value, the lower the spreadability (Sayuti, 2015). The IC_{50} value of the body lotion product with the addition of seaweed porridge was 280.17 mg/L. The IC_{50} value of a substance is related to the bioactive compound content it contains.

A mechanical test was performed to determine the phase change of the emulsion. The tests carried out showed that tested no changes in each of the sampel. The stability of the body lotion is related to the shelf life of the lotion. The factor that affects the stability of the body lotion is the mixing temperature of the oil and water phases (Mitsui,1997). The different temperatures during

mixing will cause the two phases not to mix properly and the stability of the body lotion will be reduced. The addition of seaweed porridge also affects the manufacture of lotions, because it has a hydrocolloid compound used as a gelling agent, stabilizer, and emulsifier (Loupatty, 2010).

The scale of skin moisture values were (0-27%) dry, (28-37%) slightly dry, (38-47%) moist, (48-57%) more humid, and (> 57%) very moist. The results showed that the use of lotion with the addition of seaweed porridge reached 53.4% in the 0th minute and decreased to 51.9 in the 15th min. Seaweed functions as an emulsifier, thickener and stabilizer so that the water and oil phases can be homogeneous. The stability of the two phases in the body lotion can affect the quality of the lotion in maintaining skin moisture because of the strong bonds between the constituent molecules. Body lotion emulsion, namely oil-in-water emulsion, is a good form of emulsion to produce a soft layer on the skin and can reduce evaporation (Sondari, 2007).

Sensory testing includes several parameters, namely appearance, colour, odour, and texture (Sulistiyo , 2006). The sensory results ranged from neutral to liking. Body lotion with the addition of seaweed porridge had met the standards set by SNI (Indonesia standard for body lotion). The addition of seaweed porridge affected the panellists preference for the appearance and colour of the resulting body lotion but did not affect the panellists preference for odour and texture. Applying body lotion with seaweed porridge still had a neutral value for colour and appearance parameter.

The best combination of *E. denticulatum* and *T. conoides* seaweed porridge were obtained at a ratio of 1: 2 with a pH value of 6.03, viscosity of 3.305 cP, IC_{50} of 173.72 and total phenol 455 mgGAE / g. The characteristics of the body lotion with the addition of seaweed porridge (1:2) had a pH value of 7.46, viscosity of 6,000 cP, IC_{50} 280.17 and the value of a loss on drying 81.47%.

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