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Characteristics of Seaweed as Raw Materials for Cosmetics

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Abstract

Bioactive components found in seaweed is very prospective to be applied in cosmetics. One type of seaweed with unknown characteristics is *Caulerpa* sp. This study aimed to determine the content *Caulerpa* which can be a component of raw material for making cosmetic. The analysis were for the proximate with AOAC method, amino acids, vitamins A, B and E using by HPLC, phytochemical test method Harborne, antioxidant activity (DPPH) and total phenols (Folin-Ciocalteau). Proximate *Caulerpa* sp. showed that consecutive include water 76.065 %, 1.231 % ash, 3.73 % protein, 0.35 % fat, and carbohydrates 18.645 %. The dominant amino acids resulted was glutamate, histidine, arginine, aspartate, tyrosine, alanine, and valine [greater of 100 mg $\cdot$ (100 g)$^{-1}$]. 487.09 mg $\cdot$ (100 g)$^{-1}$ Vitamin A, Vitamin B 0.42 mg $\cdot$ (100 g)$^{-1}$, Vitamin E 2.22 mg $\cdot$ (100 g)$^{-1}$. Derived bioactive components consis of steroids, flavonoids, phenols hydroquinone and saponin, with total phenol at 0.0441 mg GAE $\cdot$ g^{-1} and antioxidant activity with IC_{50} of 451.27 mg $\cdot$ kg^{-1}.

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Keywords: Bioactive compound; *Caulerpa* sp; cosmetic

1. Introduction

Bioactive components found in seaweed is very prospective to be applied in cosmetics. One type of seaweed with unknown characteristics is *Caulerpa* sp. Seaweed that used in this study is *Caulerpa* sp. from Tual waters, Southeast Maluku, Indonesia. Tual marine area reaches 98.67 % of the total area of Tual City. Seaweed production in Tual is

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constantly increasing, in 2009 it amounted to 3 285 t, in 2010 amounted to 4 872.9 t, in 2011 amounted to 7 947.4 t, and in 2012 amounted to 8 953.32 t of dried seaweed (BPS, 2013). There are 203 species of green seaweed in Indonesia, which consist of seven orders, 19 families and 48 genera. One of genus is *Caulerpa* which consists of 34 species (Atmadja et al., 1996). According to Fithriani (2009), *Caulerpa racemosa* can be consumed as fresh vegetables. According to Talakua (2011), Arowi, Manokwari beach community already know that *Caulerpa racemosa* can be consumed, but people have not utilized that. Seaweed is also consumed as fresh vegetables or made into "urap" by coastal communities in the northern of Java island, especially in Central Java, Jepara, Pati, Juwana, and Rembang, but coastal communities in Bali generally consume seaweed by boiling it first. Santoso et al. (2002) states that seaweed which can be consumed contains insoluble dietary fiber which is composed of cellulose and hemicellulose. Seaweed is a natural substance that contains a variety of organic and inorganic substances which are beneficial to human health, contain vitamins and minerals that are very high which has been used in agriculture, industry pharmaceutical, biomedical, and nutraceutical (Marcia et al., 2004). According to Burtin (2003), generally seaweed contains large amounts of lipid levels were normal fibers, and has a low protein composition that is equal to 5 % to 15 %. Group of green and red seaweed contains a higher protein, i.e. 10 % to 30 % dry weight (Matanjun et al., 2009). *Caulerpa* sp. is a green seaweed that grows in shallow waters with tranquil water flow. *Caulerpa* sp. has chemical and biological spectrum that is quite extensive including antioxidant activity in counteracting free radicals (Sultana et al., 2011). Tual people's habits, the coast of Java people's, and Sulawesi people's eat *Caulerpa* sp. in the form of "urap" fresh seaweed, while the people of Bali process into "urap" through the boiling process beforehand. This study aimed to determine the content of Caulerpa that can be a component of raw material for making cosmetics.

2. Material and methods

2.1. Procedure analysis

The materials needed *Caulerpa* sp., H_2SO_4, boric acid (H_3BO_3), NaOH 40 %. HCl, n-hexane, ethanol, and methanol (p.a.), DPPH, and vitamin C. The tools used in this study include digital scales (Quattro), rotary vacuum evaporator (Eyela), orbital shaker (WiseShake), microplate, spectrophotometers (UV Vis RS 2500), desiccator, oven (Memmert), Soxhlet tube, Kjeldahl flask, Erlenmeyer flask, micro pipette (Eppendorf), mortars. Proximate analysis by AOAC (2011) phytochemical Harbone method and antioxidant activty by salazar method (Salazar-Aranda et al., 2011; Pramesti, 2013).

2.2. Amino acid analysis

Amino acid analysis was performed using HPLC brand Varian 940-LC in four stages, namely the stage of making protein hydrolyzate, drying phase, derivatization phase and injection phase (amino acid analysis). First step were making a protein hydrolyzate by homogenized sample (0.1 g), and 5 mL 6N HCl was added to it, which then were heated (100 °C for 24 h) and then filtered. Second phase were drying filtered sample, to which 30 mL of mixed solution of methanol, sodium acetate, and trietylamino (2:2:1) were added, then dried until all the solvent evaporates. Third phase were derivatization Derivatization solution of 30 mL were made from a mixture of methanol, picoltiocianat (PITC) and triethylamine (TEA) with ratio (3:3:1), then is allowed to sit for 20 min and then 10 mL of 1 M sodium acetate buffer plus were added. Derivatization process was concluded so that the detector are able to detect substances present in the sample. Final phase were injection into the HPLC of standard solution and begins with mixing the stock solution with the standard solution and borate buffer (1:1). A total of 5 mL of the solution was injected into the HPLC within 30 min. The same steps were carried out on a sample by mixing the borate buffer with the stock solutions (1:1). The mixture was injected into the HPLC to detect all the amino acid. Amino acid content in the material is calculated by dividing multiplication of area of the sample, Concentration of standard amino acids ($mg \cdot mL^{-1}$), dilution factor and molecular weight of each amino acid by wide and of weight standard sample area and multiplythem by 100 %. HPLC used P1 Cotag column, Motion phase used acetonitrile and phosphate buffers, wavelength were 272 nm, and flow rate were $0.5\ mL \cdot min^{-1}$.

3. Result and discussions

Proximate *Caulerpa* sp showed that consecutive include water 76.065 %, 1.231 % ash, 3.73 % protein, 0.35 % fat, and carbohydrates 18.645 %. The dominant amino acids was glutamate, histidine, arginine, aspartate, tyrosine, alanine, and valine [greater of 100 mg · (100 g)$^{-1}$] (Table 1). 487.09 mg · (100 g)$^{-1}$ Vitamin A, Vitamin B and 0.42 mg · (100 g)$^{-1}$, Vitamin E 2.22 mg · (100 g)$^{-1}$ (Table 2). Derived bioactive components consis of steroids, flavonoids, phenols hydroquinone and saponin, with total phenol at 0.0441 mg GAE · g^{-1} and antioxidant activity with IC_{50} of 451.27 mg · kg^{-1} shown in Table 3 and Table 4.

Table 1. Amino acid *Caulerpa* sp.

Amino acid	Fresh (mg · (100g)$^{-1}$)*
Histidine	195 ± 16.97
Arginine	165 ± 72.83
Treonine	76 ± 18.38
Valine	104 ± 11.31
Metionine	30.5 ± 9.19
Isoleusine	42.5 ± 14.85
Leusine	38 ± 12.73
Fenilalanine	74 ± 21.21
Lisine	65 ± 35.36
Aspartate	169 ± 26.87
Glutamate	365 ± 56.57
Serine	45 ± 2.83
Glisine	37 ± 0.00
Alanine	114.5 ± 9.19
Proline	55 ± 0.00
Tirosine	125 ± 21.21
Sisteine	58 ± 18.38

*) Mean ± SD

Table 2. Vitamine content *Caulerpa* sp.

Vitamine	Fresh (mg · (100g)$^{-1}$)*
A	487.09
B_1	0.42
E	2.22

*) Mean ± SD

Table 3. Bioactive compund *Caulerpa* sp.

Parameter	*Caulerpa* sp.		Change color	
	U1	U2		
Alkaloid				
Meyer	-	-	-	-
Wagner	-	-	-	-
Dragendroff	-	-	-	-
Steroid	+	+	Blue	Blue
Triterpenoid	-	-	-	-
Flavonoid	+	-	yellow	-
Fenol hidroquinon	+	+	Green	Green
Saponin	+	+	Foam	Foam
Tanin	-		-	-

(+)= detection (-)= n detection u1= reply 1 u2=reply 2

Table 4. Antioxidant activity *Caulerpa* sp.

Parameter	IC_{50} (%)
Caulerpa sp. fresh	452.37 ± 8.29
Vitamin C(*)	3.71 ± 0.27
Caulerpa lentillifera(**)	356.12

*control positive **[10]

Amino acid is very important to healthy human. Now, the research showed that amino glutamat acid can be regeneration sel and antiinflamatory. Beside that, glutamate acid is used to maintain healthy skin. More over, glutamate acid has potential component to material cosmetics. This research also showed that *Caulerpa* contains high vitamin E . Vitamin E or tocopherol are very important to healthy skin. Cosmetic commercial sure to take a vitamin E component. Although, *Caulerpa* contained low vitamin E, but raw *Caulerpa* can be used as material cosmetics. Phytochemical test for *Caulerpa* containt saponin, fenolhidroquinon, and steroid Bioactive compound fenolhidroquinon also potential to material cosmetics.

Antioxidant activity *caulerpa* showed that 452.37 %. If compared with control, antioxidantactivty for *Caulerpa* it is very low. And then, if compared with Maulida (2007) research, antioxidant activity is still low. According to Mollyneux (2004) determined strong or low activty antioxidant. If higher than 200 %, so antioxidant very low. If it is lower than 200 %, the activity antioxidant strong, and very strong. However, *Caulerpa* still offers potential to have strong antoxidant activity if determined with different method and purification.

4. Conclusion

Caulerpa sp. form tual Kei island has potential for cosmetic material because it contains bioactive compound and then can prevent for free radical by antioxidant content. Moreover, the research can be developed to a lot of assay especelly inhibitor tyrosinase to determine the potential of caulerpa to inhibit melanin pigment.

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