Formulation and characterization of body scrub using marine alga *Halimeda macroloba*, chitosan and konjac flour

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**Abstract.** Body scrub is a cosmetic product that contains slightly rough material that can remove dead skin cells. Natural ingredients such as *Halimeda macroloba* is potential to be used as scrub. *H. macroloba* deposits CaCO\(_3\) in the thallus which makes the texture of *Halimeda* flour is rougher than that of other flour so that it is potentially used as a scrub. The emulsion-forming agent for body scrub can use konjac flour. Konjac flour contains high glucomannan which can used as emulsifier. This study aimed to determine the characteristics of body scrub using *H. macroloba* and konjac flour. Formulation of body scrub in this study was carried out by mixing water base (propylene glycol, glycerine, aquadest) and oil base (cetyl alcohol, stearic acid, DEA, perfume) at temperatures of 70 °C and 80 °C. Afterwards the mixture was added with 3% of *H. macroloba* and 2% of konjac flour. Body scrub produced in this study contained moisture of 58.49-75.15%, viscosity 10 106.67-14 900.00 cP, pH 6.48-6.93, whiteness 67.74%-95.96%, and spread ability 1.63-2.17 cm. The highest macro mineral content was calcium (Ca) with an average of 8.24 mg g\(^{-1}\), while the highest micromineral was iron (Fe) with an average of 16.85 ppm. The most preferred formula for colour and aroma based on the result of hedonically assessment was formula 2 (fresh *H. macroloba* with chitosan 2%), while the most preferred for thickness and texture was formula 5 (dried *H. macroloba* with chitosan 2%).

**Keywords:** Amorphophallus; calcium; chitosan; formula; mineral.

1. Introduction

Seafood Body scrub is a body care product that contains slightly rough material or known as cosmetic abrasiver which can remove dead skin cells [1]. The basic ingredients of body scrub are the same as cleansing creams in general, but there are additional ingredients, namely coarse grains that are abrasiver in order to remove dead skin cells [2]. Body scrub ingredients can be made from synthetic and natural ingredients. Body scrub natural ingredients are generally apricot seeds, walnuts, almonds, etc, while synthetic ingredients are polyethylene and oxidised polyethylene [3]. People in the last few
decades have begun to choose cleansing products from natural ingredients because it is safer and rarely cause irritation. One of the natural ingredients from aquatic products that potential to be used as body scrub material is *Halimeda macroloba*. *H. macroloba* is one of green seaweed genus Halimeda with harder thallus texture due to its high mineral content [4]. *H. macroloba* seaweed can deposit calcium carbonate (CaCO3) in its thallus. This seaweed became the main producer of CaCO3 and deposited it in the form of aragonite [5]. The presence of CaCO3 in *H. macroloba* makes the texture of Halimeda flour was slightly coarser than most flour so that it potential to be used as raw material of scrubs or granules that will remove dead skin cells.

Besides scrubbing agent body scrub contains emulgator and preservative. Emulgator commonly used in body scrubs is triethanolamine (TEA). TEA is a chemical that is widely used in topical or cosmetic product for emulsion forming [6]. The use of TEA in the body scrub formula can be substituted with natural ingredients namely konjac flour. Konjac flour is produced from porang tubers. Porang (*Amorphophallus* sp.) is a type of tuber plants that widely grows in Indonesia. Konjac flour contains high glucomannan [7]. The research of Yanuriati et al. [8] showed that glucomannan extraction from porang yielded 65.23%. Glucomannan has high fibre content and can function as an emulgator in body scrub. The preservative commonly used in body scrubs is methyl paraben. Methyl paraben is a synthetic preservative that is added to many cosmetic products and it is quite dangerous. The maximum limit of methyl parabens in cosmetic product is 0.4% [9]. Methyl paraben can be substituted with natural preservatives, such as chitosan. Chitosan is a non-toxic polysaccharide obtained from deacetylation of chitin of crustaceans and insects exoskeleton [10]. Kong et al. [11] states that chitosan has antibacterial properties because of its polycationic structure that is able to interact electrostatically with the surface of bacteria, causing intracellular leakage of bacterial cells. This study was conducted to characterize the body scrub which formulate using marine alga *H. macroloba*, chitosan and konjac flour.

2. Materials and Method

2.1. Samples Preparation and Formulation of Body Scrub

Samples of marine alga *H. macroloba* were collected from Kepulauan Seribu Island, Indonesia. The samples used were fresh and dried algae. Fresh *H. macroloba* was washed then chopped and crushed to be a pulp using a blender. The stages of preparation of dried *H. macroloba* were the same as preparation of fresh *H. macroloba*. The seaweed pulp was then dried using freeze dryer.

Body scrub was made in six formulas. Formula 1, 2, and 3 used fresh *H. macroloba*, while formula 4, 5, and 6 used dried *H. macroloba*. Formulation of body scrub was carried out by mixing water base (propylene glycol, glycerine, aquadest) and oil base (cetyl alcohol, stearic acid, DEA, perfume) at temperatures of 70°C and 80°C then the water base and oil base were mixed to form a cream. Afterwards the mixture was added with 3% of *H. macroloba*, konjac flour, and preservative (methyl paraben or chitosan). The body scrub then analyzed. Analysis includes moisture content, minerals, viscosity, acidity, whiteness, spreadability, hedonic, and irritation test. The body scrub formulation can be seen in Table 1.

2.2. Characterization of Body Scrub

Characterization of body scrub containing *H. macroloba* and konjac flour includes moisture content, mineral content, viscosity, pH, whiteness, spreadability, and hedonic test. Moisture content of body scrub was analyzed by oven method refers to AOAC (2012), mineral content was measured by Atomic Absorption Spectroscopy (AAS) refers to AOAC (2012), viscosity was analyzed by Brookfield viscometer, pH was analyzed by pH meter, whiteness by Color Analyzer. Spreadability was measured by spread ability apparatus (scaled glass plate and 50 and 100 g weight), the procedur refers to Yuliati and Binarjo [12]. Hedonic test was carried out on 30 panelists. Parameter of hedonic test include color, aroma, consistency, texture, and smearing ability.
Table 1. Formulation of body scrub.

| Material                  | Control | Formula (% w/w) |
|---------------------------|---------|-----------------|
|                           |         | 1               | 2   | 3   | 4   | 5   | 6   |
| *Halimeda macroloba*      |         | 3               | 3   | 3   | 3   | 3   | 3   |
| Konjac flour              |         | 2               | 2   | 2   | 2   | 2   | 2   |
| Chitosan                  |         | -               | 2   | 3   | -   | 2   | 3   |
| Methyl paraben            |         | -               | 0.12| -   | 0.12| -   | -   |
| Cetyl alcohol             |         | 1               | 1   | 1   | 1   | 1   | 1   |
| Stearic acid              |         | 15              | 15  | 15  | 15  | 15  | 15  |
| Propylene glycol          |         | 5               | 5   | 5   | 5   | 5   | 5   |
| Glycerin                  |         | 5               | 5   | 5   | 5   | 5   | 5   |
| DEA                       |         | 1               | 1   | 1   | 1   | 1   | 1   |
| Perfume                   |         | 0.5             | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Aquadest                  |         | 36.25           | 33.69| 32.75| 32.25| 67.38| 65.5 | 64.5 |

2.3. Data Analysis

Characteristics of body scrub include moisture content, mineral content, viscosity, acidity, color, and spread ability were analyzed by one-way ANOVA and hedonic test by Kruskal Wallis Test. Analysis were conducted using SPSS. The results that show the differences are continued with the Duncan Test.

3. Result and Discussion

3.1. Characteristics of Body Scrub

Body scrub was made into six different formulas, that are formula 1 (fresh *H. macroloba* with preservative methyl paraben 0.12%), formula 2 (fresh *H. macroloba* with preservative chitosan 2%), formula 3 (fresh *H. macroloba* with preservative chitosan 3%), formula 4 (dried *H. macroloba* with preservative methyl paraben 0.12%), formula 5 (dried *H. macroloba* with preservative chitosan 2%), and formula 6 (dried *H. macroloba* with preservative chitosan 3%). Characterization of body scrub containing *H. macroloba* and konjac flour includes moisture content, mineral content, viscosity, pH, whiteness, spreadability, and hedonic test (Table 2 and Table 3). Body scrub products can be seen in Figure 1.

Body scrub products from *H. macroloba* seaweed and konjac flour are made in cream form (Figure 1). Cream belongs to the type of oil-in-water (M/A) emulsion. Body scrub cream preparations are made from oil-based and water-based ingredients. The oil base includes stearic acid, cetyl alcohol, diethanolamide (DEA) and perfume, while the water base includes distilled water, glycerin, and propylene glycol.

Moisture content of body scrub ranged from 58.49%–75.15%. The results of the analysis of variance showed that differences in the body scrub formula had a significant effect on the body scrub moisture content (p<0.05) (Table 2). Duncan test results showed that the body scrub moisture content of formula 5 was significantly different from other formulas except for formula 6. The low moisture content in formula with fresh *H. macroloba* is due to the amount of water added in formula with fresh *H. macroloba* was half of amount of water added in the formula with dried *H. macroloba*, to form semisolid cream with good consistency for body scrub with fresh H. macroloba. Moisture content of body scrub was also influenced by water content of *H. macroloba*. Fresh *H. macroloba* has water content of 86.78 ± 0.43%, while dried *H. macroloba* has a water content of 3.82 ± 0.66%. The water content of fresh *H. macroloba* is already high enough so that aquadest added to the formula with fresh *H. macroloba* are less than the formula with dried *H. macroloba* in order to avoid runny texture. The moisture content of both body scrubs with fresh and dried *H. macroloba* decreases with increasing chitosan concentration. Islam et al. [13] states that the higher concentration of chitosan added, the moisture content of the product will decreases; this decrease is due to the high chitosan ability to bind water. Water content is related to water binding capacity, the higher the chitosan water binding...
capacity, the lower the product water content. The ability to bind water to chitosan is due to the presence of a hydrophilic group, the hydroxyl group.

Figure 1. Body scrub product. (a) formula 1; (b) formula 2; (c) formula 3; (d) formula 4; (e) formula 5; (f) formula 6.

Table 2. Physical and chemical characteristics of body scrub.

| Formula | Moisture content (%) | Viscosity (cP) | pH   | Whiteness (%) | Spreadability (cm) |
|---------|----------------------|---------------|------|---------------|--------------------|
| 1       | 64.28<sup>c</sup>   | 12990.00<sup>c</sup> | 6.50c | 95.96<sup>c</sup> | 1.87<sup>c</sup>   |
| 2       | 60.98<sup>d</sup>   | 14306.67<sup>b</sup> | 6.51c | 83.66<sup>b</sup> | 1.83<sup>c</sup>   |
| 3       | 58.49<sup>c</sup>   | 14900.00<sup>a</sup> | 6.56b | 76.41<sup>c</sup> | 1.70<sup>d</sup>   |
| 4       | 75.15<sup>a</sup>   | 10106.67<sup>f</sup> | 6.48c | 67.74<sup>f</sup> | 2.17<sup>a</sup>   |
| 5       | 71.59<sup>b</sup>   | 12030.00<sup>e</sup> | 6.91a | 71.24<sup>e</sup> | 2.00<sup>b</sup>   |
| 6       | 70.46<sup>b</sup>   | 12346.67<sup>d</sup> | 6.93a | 72.38<sup>d</sup> | 1.63<sup>d</sup>   |

Note: different superscript letters indicated significant differences (P < 0.05).

The average value of body scrub viscosity ranges from 10106.67-14900.00 cP. The results of the analysis of variance showed that differences in the body scrub formula had a significant effect on the viscosity of the body scrub (p<0.05) (Table 2). Duncan's further test results showed that the viscosity of formula 1 was significantly different from all formulas. The viscosity of all formulas was in accordance with SNI 16-4399-1996 about cosmetic products which states that the viscosity of cosmetic products ranges from 2000-50000 cP. The viscosity of body scrub with fresh *H. macroloba* was higher than the viscosity of body scrub with dried *H. macroloba*. This is due to the amount of water added to the body scrub formula with fresh *H. macroloba* was less than that of the body scrub with dried *H. macroloba*, so that the viscosity of the body scrub with fresh *H. macroloba* was higher. The addition of konjac flour in the body scrub can increase the thickness of the body scrub. Konjac flour contains high glucomannan. The glucomannan content of konjac flour can reach 65.23% [8]. Glucomannan is a gel-shaped polysaccharide containing glucose and manosa which can be used as a thickening agent, gelling agent, and emulsifier in cosmetic products. Glucomannan in konjac flour can form a thick solution in water, thereby increasing the viscosity of the body scrub. Glucomannan can absorb water up to 200 times the volume of glucomannan [14]. Besides konjac flour, body scrub viscosity can also influenced by the addition of *H. macroloba*. Bilan and Usov [15] reported that *Halimeda* contains water-soluble sulfated polysaccharides containing uronic acid. This polysaccharide from *Halimeda* is similar to musilago, which is a hydrocolloid composed of a mixture of...
monosaccharides and uronic acid which can form a thick solution and can expand in water. The existence of this hydrocolloid can make the cream thick so that the viscosity of the cream is quite high.

The pH of body scrub ranged from 6.48-6.93. The results of the analysis of variance showed that the differences in the body scrub formula had a significant effect on the pH \((p<0.05)\) (Table 2). Duncan’s further test results showed the pH of formula 1 was not significantly different from formula 2 and 4 but was different from other formulas. Formula 5 was also not significantly different from formula 6, but it was significantly different from other formulas. The pH of all formulas was in the range of pH of cosmetic product in accordance with SNI 16-4339-1996 (4.5-8.0). Cosmetic products according to Faradiba et al. [16] must have pH that suits with the physiological pH of the skin (4.5-7.5). The pH of body scrubs was not much different from the physiological pH of the skin, thus body scrubs produced in this study is safe to use.

Whiteness of body scrubs ranges from 67.74-95.96%. The results of the analysis of variance showed that the difference in the body scrub formula had a significant effect on the whiteness of body scrub \((p<0.05)\) (Table 2). Duncan’s further test results show that the whiteness of formula 1 was significantly different from all other formulas. The highest whiteness was found in formula 1 (fresh \(H.\) macroloba, methyl paraben 0.12%). The whiteness of body scrub is influenced by the raw material and the composition of the supporting materials used in the formula. The color of the body scrub using dried \(H.\) macroloba is greener than the color of the body scrub using fresh \(H.\) macroloba so that it whiteness is lower than the body scrub using fresh \(H.\) macroloba. \(H.\) macroloba has green thallus color due to the content of the dominant green pigment derived from the chlorophyll contained [17].

The results of the analysis of variance showed that the difference in the body scrub formula had a significant effect on the spread ability of the body scrub \((p<0.05)\) (Table 2). Duncan’s further test results show that the spread ability in formula 1 was significantly different from all formulas except for formula 2. Formula 3 was not significantly different from formula 6 and was significantly different from all other formulas. Formula 4 has the highest spread ability, this is due to the highest moisture content in formula 4 and the lowest viscosity compared to other formulas. Kurniasih [18] stated that the lower the viscosity of the cream, the smaller the diameter of spread ability. The spread ability of the body scrub decreases with increasing chitosan concentration, because the increase in the concentration of chitosan will increase the viscosity of the cream, so the spread ability is lower. Chitosan can hold water in its structure and spontaneously form a gel in the product so that the product becomes thicker [19].

### Table 3. Minerals content of body scrub.

| Mineral | Kadar mineral (ppm) |
|---------|---------------------|
|         | Formula             |
|         | 1                   | 2                   | 3                   | 4                   | 5                   | 6                   |
| Ca      | 3564.93\(^{f}\)    | 4983.23\(^{c}\)    | 5340.71\(^{d}\)    | 10931.71\(^{c}\)   | 12731.83\(^{a}\)   | 11866.21\(^{b}\)   |
| K       | 2117.28\(^{a}\)    | 1918.37\(^{c}\)    | 2012.40\(^{b}\)    | 1341.17\(^{d}\)    | 1361.38\(^{d}\)    | 1173.40\(^{e}\)    |
| Na      | 918.25\(^{a}\)     | 851.14\(^{b}\)     | 866.58\(^{b}\)     | 597.56\(^{a}\)     | 703.39\(^{c}\)     | 622.19\(^{d}\)     |
| Mg      | 31.23\(^{f}\)      | 161.38\(^{b}\)     | 207.51\(^{a}\)     | 40.88\(^{e}\)      | 119.79\(^{e}\)     | 142.78\(^{e}\)     |
| Fe      | 6.21\(^{d}\)       | 17.75\(^{b}\)      | 23.44\(^{a}\)      | 12.50\(^{d}\)      | 18.95\(^{b}\)      | 22.27\(^{e}\)      |
| Zn      | 2.63\(^{b}\)       | 1.11\(^{c}\)       | 1.51\(^{d}\)       | 1.96\(^{a}\)       | 2.34\(^{bc}\)      | 2.33\(^{b}\)       |
| Cu      | 0.49\(^{bc}\)      | 0.42\(^{bc}\)      | 0.55\(^{b}\)       | 0.37\(^{c}\)       | 0.55\(^{b}\)       | 1.35\(^{a}\)       |

Note: different superscript letters indicated significant differences \((P < 0.05)\)

The results of the analysis of variance show that differences in the body scrub formula had a significant effect on the micro mineral content \((p<0.05)\) (Table 3). Duncan’s further test results showed that the Fe content of formula 2 was significantly different from other formulas except formula 5, the Fe content of formula 3 was also significantly different from other formulas except formula 6. The Zn content of formula 5 was not significantly different from formula 6 but was significantly different from other formulas. The Cu content of formula 1 was not significantly different from the other formulas except formula 4 and 6. The highest Fe content was 23.44 ppm, the highest Zn content was
2.63 ppm, and the highest Cu content was 1.35 ppm. Micro minerals contained in the body scrub can be beneficial for the skin as nutrients for the skin. Pawlikowski and Hreska [20] stated that Cu with vitamin C and Zn can help the formation of elastin. Zn can also control oil production, cure acne, and protect skin from UV rays.

Ca content of body scrub ranged from 3.56-12.73 mg g⁻¹, K content ranged from 1.17-2.12 mg g⁻¹, Na content ranged from 0.60-0.92 mg g⁻¹, and Mg content ranged from 0.03-0.21 mg g⁻¹. The results of the analysis of variance showed that differences in body scrub formula had a significant effect on the macro mineral content (p<0.05). Duncan's further test results showed that the Ca content of formula 1 was significantly different from all other formulas, the K content of formula 4 was significantly different from other formulas except formula 5, the Na content of formula 2 was significantly different from other formulas except formula 3, and the Mg content of formula 1 was significantly different from all other formulas. Mineral Ca of body scrub has a greater value than other minerals. High Ca content in the body scrub comes from H. macroloba. Halimeda is the main producer of Ca which is deposited in the form of aragonite. Halimeda contains Ca which can reach 124 mg g⁻¹ [21]. Ca minerals can help stimulate the formation of antioxidants and regulate skin pigments to protect them from the sun's UV rays [20].

The results of Kruskal Wallis analysis show that differences in body scrub formula had a significant effect on panellist acceptance on the body scrub colour (p<0.05) (Table 4). Duncan's further test results showed that the panelists' preference for the colour of formula 1 was not significantly different from all the other formulas except for formula 4. The most preferred colour was formula 2 with value of 5.90 (rather prefer). The colour of the body scrub is affected by the colour of H. macroloba seaweed and porang flour. H. macroloba has green colour while konjac flour was white. Besides scrubs, stearic acid used also affects the colour of the product. Morwanti [22] stated that stearic acid used in formulas will make the colour of the cream tend to be whiter.

The average value of the panelists' preference for aroma ranged from 5.33-5.80 (rather prefer). This shows that panelists liked the aroma of all formulas. The results of Kruskal Wallis analysis show that differences in body scrub formula did not have a significant effect on panelist acceptance on the aroma of body scrub (p>0.05) (Table 4). The aroma that panelists like was caused by the addition of perfume to the body scrub. Luthfiyana et al. [23] stated that pleasant and easily recognizable aroma will generally be preferred over aromas that are not recognized.

The results of Kruskal Wallis analysis show that differences in body scrub formulas have a significant effect on panelist acceptance on the consistency of body scrubs (p<0.05) (Table 4). Duncan's further test results shows that panelist preference for formula 1 is significantly different from formula 4, 5, and 6 but not significantly different from formula 2 and 3. Panelist preference value for consistency of all formulas ranges from 4.37-5.93 (rather prefer). Panelists preferred body scrubs with dried H. macroloba over the body scrub with fresh H. macroloba. Consistency of body scrub is affected by the addition of konjac flour. Konjac four contains high glucomannan. Glucomannan content in konjac flour can reach 70.70%. Glucomannan is a polysaccharide containing glucose and manose which can form gel and makes a high viscosity in a product. Glucomannan is used as a thickening agent and emulgator in the food, medicine and cosmetics industries [14]. The addition of konjac flour to the formula results in better cream consistency. Body scrub cream becomes thicker after adding konjac flour. Besides the addition of konjac flour, chitosan added to the formula can

| Formula | Color | Aroma | Consistency | Texture | Smearing ability |
|---------|-------|-------|-------------|---------|-----------------|
| 1       | 5.77a | 5.77a | 4.37b       | 4.23a   | 4.33b           |
| 2       | 5.90b | 5.80a | 4.67b       | 4.03d   | 4.70b           |
| 3       | 5.80b | 5.70a | 4.80b       | 4.73c   | 4.37b           |
| 4       | 5.43b | 5.47a | 5.80a       | 5.40b   | 6.17a           |
| 5       | 5.70ab| 5.33a | 5.93a       | 6.10a   | 6.10a           |
| 6       | 5.67ab| 5.40a | 5.70a       | 6.07a   | 5.90a           |

Note: different superscript letters indicated significant differences (P < 0.05).
provide a thick cream consistency of body scrub. Wisuda et al. [24] reported that chitosan has a hydrophilic group which makes chitosan hygroscopic so that it can bind water in the cream and increase the viscosity of cream.

The results of Kruskal Wallis analysis show that differences in body scrub formulas have a significant effect on panellist acceptance on the texture of body scrubs (p<0.05) (Table 4). The average value of panellists’ preferences for body scrub textures ranges from 4.03-6.10 (neutral-prefer). Duncan's further test results show that formula 1 is significantly different from all other formulas except formula 2. Formula 5 is not significantly different from formula 6 but is significantly different from all other formulas. The most preferred texture was found in formula 5 with value of 6.10 (prefer). Panellist assessment showed that panellists tended to like the texture of body scrub with dried *H. macroloba* and chitosan as preservative. The texture of body scrub is quite soft with granules that are slightly rough when applied to the skin. Granules found in the body scrub comes from *H. macroloba*. *H. macroloba* contains high calcium. The result of mineral analysis of body scrub showed that body scrub contains calcium ranged from 3.56-12.73 mg g⁻¹. The presence of calcium in *H. macroloba* makes the texture of *H. macroloba* flour slightly rough than flour in general. Granules of *H. macroloba* can function as scrubs on body scrub creams. Isfianti and Pritasari [25] stated that the characteristics of a good scrub cream have a rough texture that can help exfoliate dead skin cells. The function of scrubs on the body scrub is as a physical exfoliating agent that physically removes dead skin cells. The body scrub texture is also affected by the scrub particle size. The size of scrub particles will affect the effectiveness of scrub in removing dead skin. Yuliati and Binarjo [12] reported that 20 mesh scrub particle size was more effective in removing dead skin than 30 mesh and 40 mesh sizes. The smaller the scrub size, the more surface area derived in contact with the skin. The size of the scrub particles that are not too large will reduce friction with the skin so that it does not give pain when applied. Body scrub with dried *H. macroloba* is preferred by panellists. The scrub particle size of dried *H. macroloba* was 18 mesh. This size provides a good texture and is comfortable when applied to the skin surface by panellists.

The results of Kruskal Wallis analysis show that differences in body scrub formulas have a significant effect on panellist acceptance on the smearing ability (p<0.05) (Table 4). The average value of the panellists’ preference for smearing ability ranged from 4.33-6.17 (neutral-prefer). Duncan's further test results show that formula 1 was not significantly different from formula 2 and 3 but is significantly different from other formulas. Formula 4 is not significantly different from formulas 5 and 6 but is significantly different from formulas 1, 2, and 3. Panelists prefer the smearing ability of all body scrub formulas that use dried *H. macroloba*. This result was in accordance with the results of hedonic evaluation of the consistency and texture parameters. The texture and consistency of the body scrub with dried *H. macroloba* was preferred by the panelists. Sampebarra [26] stated that the better the consistency and texture of the cosmetic product, the better the smearing ability produced. The body scrub in this study had a good consistency and thickness so it was comfortable and easy to spread evenly on the surface of skin by the panelists.

4. Conclusion

Characteristics of body scrub using marine alga *H. macroloba*, chitosan and konjac flour were containing an average moisture of 66.83%, viscosity of 12.780 cP, pH 6.65, whiteness of 77.90%, and spread ability of 1.87 cm. The highest macro mineral content was calcium (Ca) and the lowest was iron (Fe). The difference in the formula of body scrub resulted a significant effect on the moisture content, mineral content, viscosity, pH, whiteness, spread ability, color, consistency, texture, and smearing ability of the body scrub. The best body scrub formula based on the result of hedonically assessment was body scrub that uses dried *H. macroloba*.

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