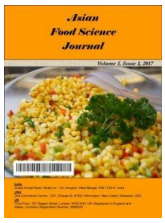

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# The Level of *Nori's* Relief Made from Raw Seaweed Mixed *Gelidium* sp. and *Eucheuma cottonii*

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***Authors' contributions***

*This work was carried out in collaboration among all authors. Authors DRA mainly performed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author EL designed the idea of the study, research material provider, performed the study and correcting the deficiencies in the first draft. Authors Iskandar and EA correcting the deficiencies in the first draft and managed the literature searches. All authors read and approved the final manuscript.*

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## ABSTRACT

**Aims:** This research aims to obtain the most preferred *Nori* made from the mixture of *Gelidium* sp. and *Eucheuma cottonii* seaweed.
**Study Design:** Research was conducted experimentally.
**Methodology:** The method used in this research was an experimental method with 5 mixed treatments of *Gelidium* sp. and *E. cottonii* with 20 semi-trained panelists involved in preference tests. The treatment was a mixture of *Gelidium* sp. and *E. cottonii* 90%: 10%, 80%: 20%, 70%: 30%, 60%: 40% and 50%: 50%. The observed variables consisted of hedonic tests namely appearance, aroma, texture, taste. Chemical tests were water content and crude fiber content.
**Results:** The results showed that the mixture of *Nori* made from seaweed *Gelidium* sp. and *Eucheuma cottonii* at 70%: 30% proportions was the most preferred over other treatments, with a

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moisture content of 15.35% and the crude fiber content of 5.36%. The median value of hedonic *Nori* test of *Gelidium* sp. and *Eucheuma. cottonii* on appearance and texture 9 was very preferred, the value of aroma and taste 7 were also preferred.
**Conclusion** The mixture of *Nori* made from seaweed *Gelidium* sp. and *Eucheuma. cottonii* 70%: 30% was most preferred by panelists.

*Keywords: Hedonic; moisture; panelists; seaweed.*

## 1. INTRODUCTION

Seaweed is a marine plant that is classified as multicellular algae (algae) *thallophyta* division. Unlike perfect plants in general, seaweed has no roots, stems, and leaves. Seaweed lives on the ocean floor that can be penetrated by sunlight so that a variety of colors are then used to classify seaweed. In general, edible seaweed is a type of blue algae (*Cyanophyceae*), green algae (*Chlorophyceae*), red algae (*Rhodophyceae*) and brown algae (*Phaeophyceae*) [1].

Considering the availability of abunandt types of seaweed under still very limited management, the research of *Gelidium* sp. *Nori* products should be conducted to meet food products from local seaweed species. *Gelidium* sp. currently available in Indonesia is only used as a producer that is important in the food and non-food industries. Utilization of *Gelidium* sp. apparently not only used as industrial raw materials but also can be developed into food products such as *Nori*.

*Nori* is a traditional Japanese food made from *Phorphyra* sp. red seaweed. Japan produces 600 thousand tons of *Phorphyra* sp. annually where 75% of the total production is processed into thin sheet nori which is consumed after drying and baking [2] but this seaweed is rarely cultivated in Indonesia because of *Porphyra* sp. live in a subtropical climate.

Making *Nori* from seaweed type *Gelidium* sp. experiencing problems, constraints *Nori Gelidium* sp. this turned out not to merge or not stick between one fiber to another fiber, so it must be mixed with types of seaweed that contain more gel so that *Nori* from *Gelidium* sp. this can form textures and form *Nori* sheets.

In general, *Gelidium* sp. contain 14 to 20 g of water, 0.4 g of fat from 16.1 to 12.5 g of protein, 10.5 to 13.5 g of fiber and 3.5 to 8.5 gr of mineral in 100 g [3]. *Gelidium* sp. including one type of seaweed that produces agar. which can be used in the food industry and chemicals, which are used in canning fish and meat to prevent damage, making ice cream, drinks, milk, cakes, sweets, cosmetic ingredients, the paint industry, insecticides and prevent cancer and anti agents aging. Agar content in *Gelidium* sp. ranges from 12-48% [4] The quality of agar depends on the strength of the raw material which can be influenced by several factors such as: intrinsic factor (type of seaweed), environmental factors (temperature and salinity during seaweed growth), harvesting factor (temperature, mixing with other types of seagrasses), post-harvest (seaweed) storage conditions used.

*Eucheuma cottonii* is one type of red seaweed (*Rhodophyceae*) which is widely cultivated by the people of Indonesia. This type of red algae has been renamed *E. alvarezii* [5]. However, because the carrageenan produced is the carrageenan kappa fraction, this species is taxonomically changed to *Kappaphycus alvarezii*, the name of the region "cottonii" is generally better known in the world of national to international trade [6].

Carrageenan, which is a hydrocolloid compound which is a long chain polysaccharide compound extracted from seaweed species of caraginophytes, such as *Eucheuma* sp., *Chondrus* sp., *Hypnea* sp., and *Gigartina* sp. Carrageenan can be divided into three types namely iota-karaginan, kappa-carrageenan, and lambda-carrageenan. All three differ like of the type of gel and its reaction to protein. Kappa-carrageenan forms a strong gel (rigid), whereas iota-karaginan forms a gel that is smooth (flaccid) and easily formed. Also, each carrageenan is produced by different types of seaweed. The solubility of carrageenan in water is influenced by several factors, including temperature, the presence of other organic compounds, salt that dissolves in water, and the type of carrageenan itself [7].

As a result, *Gelidium* sp. mixed with *Eucheuma cottonii*, because of the type of *Eucheuma* sp. used as a binder to form textures. These two types are not yet known for the best concentration, so research is needed regarding

the best concentration of *Gelidium* sp. and *E. cottonii* which can be accepted by consumers.

## 2. MATERIALS AND METHODS

### 2.1 Period and Place of Research

The research was conducted from February 2019 until March 2019. Organoleptic tests were carried out in the Laboratory of Fisheries Product Processing Faculty of Fisheries and Marine Sciences, University of Padjadjaran, Bandung, Indonesia. Physical tests and chemical tests conducted at the Laboratory of Research and Biological Resources and Biotechnology Research Institute at the Society (LPPM), Bogor Agricultural Institute, Bogor. Indonesia. Between February 2019 and March 2019.

### 2.2 Materials and Tools

The equipment and materials used to make *Nori* in this research were as follows: Blender Basin, Baking sheet, Filter, Electric scales, Plastic Spatula, Oven, Beaker glass, Small bowl, Label sticker, Seaweed (*Gelidium* sp.), Seaweed (*E. cottonii*), Rice water, Clean water, Salt pepper, Sugar Flavoring, Sesame oil, Olive oil, and Fish sauce.

### 2.3 Treatments

The formulation was divided into five constitutions, namely:

a) *Gelidium* sp.: *Eucheuma cottonii* at 90%: 10% respectively
b) *Gelidium* sp.: *Eucheuma cottonii* at 80%: 20% respectively
c) *Gelidium* sp.: *Eucheuma cottonii* at 70%: 30% respectively
d) *Gelidium* sp.: *Eucheuma cottonii* at 60%: 40% respectively
e) *Gelidium* sp.: *Eucheuma cottonii* at 50%: 50% respectively

### 2.4 Procedures

Research procedures were according to [8] that have been modified. This research procedure begins with the preparation of tools and materials, preparation of *Nori*, treatment and observation. The following are the stages. Preparation of dried seaweed material *Gelidium* sp. and *E. cottonii* weighed as much as 50 g and cleaned of dirt attached. The second stage, namely preparation for making *Nori*, starts from soaking in rice water with the aim to soften the dried seaweed network. Rice water used is 1000 mL, soaking is done for 1 x 24 hours. Then the next day, soaked in clean water for 2 x 24 hours, every 1 x 24 hours clean water must be replaced immediately. Clean water used as much as 1500 mL. Seaweed that has been cleaned, then weighed according to treatment and added as much as 200 ml of clean water, then crushed seaweed using a blender for 2 minutes. The puree is put into a baking dish and seasoned with salt such as 0.2 g, 1 g sugar, 0.3 g flavoring, pepper 0.2 g, olive oil 2 mL, sesame oil 2 mL and fish sauce 2 mL. Puree is cooked using low heat for 10 minutes. Puree was measured using a measuring cup as much as 80 mL and poured on a baking sheet. The pan used has a size of 17 x 23 cm (outer size) and 15 x 20 cm (inner size). The puree in a baking pan was flattened using a plastic spatula. The puree thickness is calculated approximately 1 mm. Put in the oven with a setting of 70°C for 3 hours. The final stage in this research is observation, testing is done that is the hedonic level test

### 2.5 Observation Parameters

The parameters for observing the level of preference included color, aroma, texture and taste. Thesed were tested by 20 semi-trained panelists. Panelists can respond with varying degrees of liking. The scale used in organoleptic (hedonic) tests ranges from 1-9, namely: 1 (very dislike), 3 (dislike), 5 (neutral), 7 (like), 9 (very like). The acceptance limit for panelists' preference level is ≥ 5, i.e. if the test product has a value equal to 5 or more than 5 then the test product is liked by the panelists and if the product being tested receives a value of ≤5 then the product is declared not accepted by the panelists [9].

### 2.6 Data Analysis

Analysis for organoleptic testing used a two-way analysis of the Friedman test variance with the Chi-square test [10]. If the price of Hc <x2α (K-1), then accept H0 and reject H1, and if the price of Hc> x2α (K-1), then H0 is rejected and H1 is accepted. If H1 is accepted, then the treatment gives a real difference and the test is continued to find out the median values that are not the same and to find out the differences between treatments with multiple comparison tests. The test method used to determine the selected product was the Bayes method. The Bayes Method is one technique that can be used to

analyze in the best decision-making of many alternatives to producing gains that take into account various criteria [9]. The results obtained are then discussed descriptively.

#### 2.6.1 Hedonic test

Hedonic test is a test that aims to determine the level of consumer preferences for a product. There were 20 panelists in the hedonic test. Tests on the level of preference include appearance, aroma, taste and texture. Consumer favorite values, namely: 9 (really like); 7 (likes); 5 (neutral / ordinary); 3 (don't like it); and 1 (very dislike) [9].

#### 2.6.2 Chemical test

Chemical tests are carried out for the most preferred products. Chemical tests on *Nori* include the following.

*2.6.2.1 Moisture Content (AOAC 1995)* [11]

A total of 1 g of sample was weighed in a saucer. Put it in the oven at 105°C, for 8 hours, then weigh the water content calculated using the formula:

Moisture Content = {sample weights (fresh-dried)}/ Fresh sample weights x 100%

*2.6.2.2 Crude Fiber Levels (AOAC 1995)* [11]

A total of 1 gram of sample was dissolved with 100 mL of $H_2SO_4$ 1.25%, heated to boiling and then continued with destruction for 30 minutes then filtered with filter paper and with the Buchner curving deadlock 3 times. The residue was redistributed with 1.25% NaOH for 30 minutes. Then filter with the above method and rinse successively with 25 ml of boiling 1.25% $H_2SO_4$, 25 mL of water three times and 25 mL of residual alcohol and filter paper transferred to a porcelain cup and dried in a 130°C oven for 2 hours after cold residue along with the porcelain cup are weighed (A), then put in a 600°C furnace for 30 minutes, cooled and re-weighed (B).

Information Gross fiber weight = W – W°

Information:

W = weight of residue before burning in the furnace
= A- (weight of cup filter paper): A: residual weight + filter paper + cup

$W^0$ = residual weight after burning in the furnace
= B - (cup weight): B: residual weight + cup

Crude Fiber Levels = (weights crude fiber)/ Sample weight x 100%

## 3. RESULTS AND DISCUSSION

### 3.1 Hedonic Test

#### 3.1.1 Appearance

Organoleptic tests included appearance, aroma, texture and taste. Preference test was conducted to determine the level of panelists preference of the products produced. Visibility is the first parameter that is pleasant to appreciate in a product. Observation of *Nori* appearance from seaweed *Gelidium* sp. and *E. cottonii* presented in Table 1.

The highest average value of panelists' preference level for the appearance of *Nori* from a mixture of *Gelidium* sp. and *Eucheuma cottonii*, in *Gelidium* sp. and *E. cottonii* 70%: 30% with a dark brownish brown appearance and a flatter surface or not many holes, while the lowest average in the treatment of *Nori* mixture *Gelidium* sp. and *E. cottonii* containing at 90%: 10% with dark green appearance and uneven surface with many holes. *Nori* treatment of *Gelidium* sp. and *E. cottonii* 80%: 20% with a green appearance and uneven surface and many holes on the *Nori* sheets. *Nori* treatment of *Gelidium* sp. and *E. cottonii* 60%: 40% with a rather light green appearance and uneven surface and many holes on the *Nori* sheets. *Nori* treatment of *Gelidium* sp. and *E. cottonii* 50%: 50% with light green appearance and a flat surface on *Nori* sheets.

#### 3.1.2 Aroma

Aroma is one of the factors that influence panelists on a product. Aroma assessment aims to determine the deliciousness of the product based on the sense of smell. The results of observations of *Nori* aroma from mix of *Gelidium* sp. and *E. cottonii* seaweed are presented in Table 2.

Panelist assessment of the average *Nori* aroma of *Gelidium* sp. and *Eucheuma cottonii* with differences in addition have an average range of 5.4 to 6.1 the average value of the highest aroma that is at the addition of 70%: 30% with a distinctive aroma of seaweed with a flavoring aroma, while the lowest value is the treatment

90%: 10% with less fragrant aroma but still specific seaweed odor. The aroma of seasoning in the manufacturing process is slightly more dominant than the typical aroma of seaweed. The test results obtained from the Friedman statistical test showed that the 90%: 10% treatment to 50%: 50% treatment was not significantly different. It is suspected that in each treatment the scent that is less smelled from the processing.

According to Rezekiana [12], seasonings are all additives that improve the flavor of the product and can affect the aroma. However, according to [13] that the aroma that can be felt by the sense of smell depends on the ingredients and ingredients added to the food. The aroma that can be generated by volatile components, but the volatile component can be lost during the processing process, especially heat.

### 3.1.3 Texture

Texture is one of the parameters of consumer preference for food products. Evaluation of this parameter aims to determine the level of panelist acceptance of the level of elasticity or flexibility of a product that can be assessed by the sense of touch, namely from the stimulation of touch. Hedonic test results on the average *Nori* texture of *Gelidium* sp. and *Eucheuma cottonii* are presented in Table 3.

Panelist assessment of the *Nori* texture of *Gelidium* sp. and *Eucheuma cottonii* averaged between 4.0 and 8.3, meaning that the texture of some treatments on *Nori* mixture *Gelidium* sp. and *E. cottonii* can still be accepted by people who are judges. The average value of *Nori* texture of *Gelidium* sp. and *E. cottonii* with the addiction treatment of 60%: 40% and 50%: 50% were not significantly different from the treatment of 80%: 20%, while the treatment of *Gelidium* sp. and *E. cottonii* 70%: 30% received relatively higher values and significantly different from *Gelidium* sp. and *E. cottonii* 60%: 40% and 50%: 50% but not significantly different from the treatment of 80%: 20%. The highest average value of mixed *Nori* textures of 70%: 30% has a value of 8.3 with a median of 9 which has a flexible and elastic texture. Whereas *Nori* mixture *Gelidium* sp. and *E. cottonii* with 90%: 10% treatment had the lowest median value of 3 and an average of 4.0. This means that the treatment of 90%: 10% is significantly different from the treatment of 80%: 20%, 70%: 30%, 60%: 40%, and 50%: 50%.

According to Edwards [14] the largest component of food is water 55-85%, so that the component can affect the structure and texture of the processed foodstuff. *Euchuema cottonii* ripening which aims to remove carrageenan from the cell wall until the extraction process is modified to form a film-like texture.

**Table 1. Average *Nori* appearance based on seaweed mix *Gelidium* sp. and *Eucheuma cottonii***

| Condition mix *Gelidium* sp. (%) and *E. cottonii* (%) | Median | Average |
|---|---|---|
| 90 : 10 | 3 | 3,5 a |
| 80 : 20 | 5 | 5,7 b |
| 70 : 30 | 9 | 8,2 c |
| 60 : 40 | 5 | 5,3 b |
| 50 : 50 | 6 | 5,9 b |

*Note: The treatment that has a real level with the same letter shows no significant difference according to the F test at 95% confidence level*

**Table 2. Average aroma of *Nori* based on a mixture of seaweed *Gelidium sp.* and *Eucheuma cottonii***

| Condition mix *Gelidium* sp. (%) and *E. cottonii* (%) | Median | Average |
|---|---|---|
| 90 : 10 | 5 | 5,4 a |
| 80 : 20 | 5 | 5,7 a |
| 70 : 30 | 7 | 6,1 a |
| 60 : 40 | 6 | 6,0 a |
| 50 : 50 | 5 | 5,6 a |

*Note: The treatment that has a real level with the same letter shows no significant difference according to the F test at 95% confidence level*

### 3.1.4 Taste

Taste is also an important factor in the organoleptic assessment of a product. Consumer acceptance of food products on these characteristics is usually used as a determining factor. Taste assessment aims to determine the panelist's assessment of a product using the taste buds.

According to Soekarto [9] the acceptance of each panelist to a type of product is generally strongly influenced by the characteristics of taste, although the other parameters are good, if it has a disliked taste then the product will be rejected. The average hedonic test on the *Nori* flavor of *Gelidium* sp. and *Eucheuma cottonii* are presented in Table 4.

Based on panelists' assessments of *Nori* flavors ranging from 5.0 to 7.2 it means that the product is neutral or ordinary and preferred. The lowest average value occureds in the treatment of adding 90%: 10% and the average is preferred in the treatment of 80%: 20%, 70%: 30%, 60%: 40% and 50%: 50%. *Nori* treatment of *Gelidium* sp. and *Eucheuma cottonii* 90%: 10% were not significantly different from the treatment 60%: 40% and 50%: 50% and the treatment was not significantly different from the 80%: 20% treatment. However, this treatment was not significantly different from 70%: 30% treatment. The 70%: 30% treatment was significantly different from the 90%: 10% treatment 80%: 20%, 50%: 50% and the 70%: 30% treatment got the highest average of 7.2 score.

In general, *Gelidium* sp. has a protein content of 16.1 - 12.5 gr [3], *Eucheuma cottonii* has a protein content of 2.69% [15] that can cause the formation of a good taste in the mixture's *Nori*. During the heating process, the protein will be denatured into free amino acids and one amino acid, glutamic acid so that it can cause a delicious taste [16].

Most sea weeds contain quite a lot of aspartic acid and glutamic acid in the total composition of amino acids [17]. Types of seaweed tested in vitro from soluble base proteins and water including green seaweed (*Chlorophyta*), red (*Rhodophyta*) and brown (*Phaeophyta*).

## 3.2 Bayes Method

The data of the pair comparison test results on the criteria of appearance, aroma, texture and taste of the mixture of *Gelidium sp.* and *Eucheuma cottonii* from 20 panelists. Completion of the results of the pairwise comparison was done by manipulating the weighting matrix of the appearance, aroma, texture, and flavor characteristics of *Gelidium* sp. and *E. cottonii*.

**Table 3. Average *Nori* surface texture based on treatment of seaweed mix of *Gelidium* sp. and *Eucheuma cottonii***

| Condition mix *Gelidium* sp. (%) and *E. cottonii* (%) | Median | Average |
|---|---|---|
| 90 : 10 | 3 | 4,0 a |
| 80 : 20 | 7 | 6,7 bc |
| 70 : 30 | 9 | 8,3 c |
| 60 : 40 | 6 | 5,8 b |
| 50 : 50 | 6 | 6,1 b |

*Note: The treatment that has a real level with the same letter shows no significant difference according to the F test at 95% confidence level*

**Table 4. Average *Nori* surface sense based on treatment of *Gelidium* sp. and *Eucheuma cottonii***

| Condition mix *Gelidium* sp. (%) and *Eucheuma cottonii* (%) | Median | Average |
|---|---|---|
| 90 : 10 | 5 | 5,0 a |
| 80 : 20 | 7 | 6,4 bc |
| 70 : 30 | 7 | 7,2 c |
| 60 : 40 | 6 | 6,0 ab |
| 50 : 50 | 7 | 6,0 ab |

*Note: The treatment that has a real level with the same letter shows no significant difference according to the F test at 95% confidence level*

Based on the Table, the calculation of criteria weights ranging from appearance to taste from *Nori* mixture *Gelidium* sp. and *Eucheuma cottonii* produce the value that taste is the most important criterion for determining the final decision of a panelist in *Nori Gelidium* sp. and *E. cottonii* with a baseline weight criteria value of 0.534, while panelists assessed the appearance and texture with criteria weights of 0.228 and 0.140 followed by aroma criteria weight values of 0.097. This shows that other assessments are good but if the taste of the mixture is *Gelidium* sp. and *E. cottonii* is not favored by panelists, the product will be rejected by panelists.

Bayes method is one of the methods used to analyze in making the best decision of many alternatives or treatments by considering criteria. The calculation results in determining the best treatment by considering the criteria for appearance, aroma, texture and taste of the mixture of *Gelidium* sp. and *E. cottonii* are presented in Table 6.

**Table 5. Weighted criteria for *Nori Gelidium* sp. And *Eucheuma cottonii***

| Criteria | Weight criteria |
|---|---|
| Appearance | 0,228 |
| Aroma | 0,097 |
| Texture | 0,140 |
| Flavor | 0,534 |

The calculation Table using Bayes method shows that the mixture *Gelidium* sp. and *Eucheuma cottonii* at 70%: 30% obtained the highest alternative value of 7.74 followed by *Gelidium* sp. and *E. cottonii* at 50%: 50% have an alternative value of 6.44, followed by *Gelidium* sp. and *E. cottonii* at 80%: 20% have an alternative value of 6.35, followed by *Gelidium* sp. and *E. cottonii* at 60%: 40% have an alternative value of 5.77, and the lowest value of 4.26 by *Gelidium* sp. and *E. cottonii* at 90%: 10% based on the observed preference test parameters, differences in the mixture of *Nori Gelidium* sp. and *E. cottonii* with a ratio of 70%: 30% is the best treatment and was most preferred by panelists.

## 3.3 Chemical Testing

### 3.3.1 Moisture content

Moisture test was carried out on *Nori* from *Gelidium* sp. mixed with *Eucheuma cottonii* at 70%: 30%. The results of the analysis of the water content obtained in the mixture of *Gelidium* sp. and *E. cottonii* was 15.35%. Drying *Nori* using oven results in some free water coming out and evaporating, resulting in a decrease in water content. The low moisture content of *Nori* products influences the texture of crispness or suppleness in *Nori*. When compared to general commercial *Nori* products (4.47%), the water content of the mixture of *Gelidium* sp. and *Eucheuma cottonii* obtained different results. This shows that the type of seaweed affects the water content of *Nori* products. Different seaweed affects the amount of water content that is bound to the fiber.

### 3.3.2 Crude fiber levels

The level of crude fiber test was only carried out on the research of *Nori* mixture *Gelidium* sp. and *Eucheuma cottonii* selected or the best results in organoleptic (hedonic) tests. The results of crude fiber analysis are worth 5.36% while the fiber content in *Porphyra* sp. *Nori* is 7.5%. The difference in fiber content between *Nori* mixture *Gelidium* sp. and *E. cottonii* with *Nori* from *Porphyra* sp. caused by the fiber content in the product's raw material. Even this agrees with result of other research [18] that the mixture of *Eucheuma cottonii* and *Ulva lactuca* contains different ingredients from commercial *Nori* in general.

## 3.4 Overall Observation Results

The overall results of observations on the difference in comparison between *Nori* mixture of seaweed types *Gelidium* sp. and *Eucheuma cottonii* are presented in Table 7.

The hedonic test results showed that the treatment of making *Nori* mixture *Gelidium* sp. and *Eucheuma cottonii* 70%: 30% with a different mixture of each addition of *Gelidium* sp. and *E. cottonii* is the most preferred panelist and has the highest value. But in the treatment of mixture *Nori Gelidium* sp. and *E. cottonii* 90%: 10% appearance and texture of this treatment were rejected by the panelists, but the aroma and taste are still neutral.

Chemical test results stated 70%: 30% treatment on *Nori* mixture *Gelidium* sp. and *Eucheuma cottonii* has a moisture content of 15.35% and crude fiber content of 5.36%. This is because by drying using an oven at a temperature of 70 0C able to evaporate enough water and not damage the levels of crude fiber contained in *Nori*.

**Table 6. Calculation of the Bayes method**

| The conditions | Criteria | | | | Alternative value | Priority value |
|---|---|---|---|---|---|---|
| | Appearance | Aroma | Texture | Flavor | | |
| 9 : 1 | 3 | 5 | 3 | 5 | 4.26 | 5 |
| 8 : 2 | 5 | 5 | 7 | 7 | 6.35 | 3 |
| 7 : 3 | 9 | 7 | 9 | 7 | 7.74 | 1 |
| 6 : 4 | 5 | 6 | 6 | 6 | 5.77 | 4 |
| 5 : 5 | 6 | 5 | 6 | 7 | 6.44 | 2 |
| Weighted criteria | 0.228 | 0.097 | 0.140 | 0.534 | | |

**Table 7. Overall observations per treatment**

| Observations | 90% :10% | 80%:20% | 70%:30% | 60%:40% | 50%:50% |
|---|---|---|---|---|---|
| **Hedonic** | | | | | |
| Appearance | 3 | 5 | 9 | 5 | 6 |
| Aroma | 5 | 5 | 7 | 6 | 5 |
| Texture | 3 | 7 | 9 | 6 | 6 |
| Flavor | 5 | 7 | 7 | 6 | 7 |
| Moisture Content | - | - | 15,35% | - | - |
| Crude Fiber Content | - | - | 5,36% | - | - |
| Alternative Value | 4,26 | 6.35 | 7,74 | 5.77 | 5.44 |

Based on all the later parameters observed, especially when seen from the hedonic test the results of the whole treatment with different treatments shows that. *Nori* mixture from *Gelidium* sp. and *Eucheuma cottonii* at 70%: 30% was the most preferred *Nori* compared to various other treatments.

## 4. CONCLUSIONS

Based on these research results the treatment of mixing *Gelidium* sp. and *Eucheuma cottoniii* at 70%: 30% wa the most, prefered panelists. *Nori* mixture of *Gelidium* sp. and *E. cottonii at* 70%: 30% hads a value of appearance of 9 which is most preferred with dark brownish brownish characteristic, a flatter surface or not many holes, scent worth 7 means that it is liked by the distinctive smell of seaweed with flavoring, texture value 9 with flexible and elastic characteristics and taste worth 7 means it is preferred to have a bitter after-taste and flavoring.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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