Characteristics and consumer acceptance level of *Sargassum hystrix* nori

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**Abstract.** Nori is processed seaweed that is quite popular, including in Indonesia. The purpose of this study was to determine the characteristics and consumer acceptance level of nori from *Sargassum hystrix* seaweed. *S. hystrix* (in wet and/or dry form) was soaked in 0.01% NaOH, then blended into a slurry. *S. hystrix* slurry was molded in size 15x15 cm and dried in an oven (70°C, 3 hours). The analysis included thickness, hardness, proximate analysis, antioxidant activity with 2,2-Diphenyl-1-picrylhydrazyl (DPPH) and Ferric reducing antioxidant power (FRAP), antidiabetic activity, and hedonic tests. The results of this study indicate that the composition of the initial conditions of raw materials has a significant effect (P<0.05) on the characteristics and consumer acceptance level of *S. hystrix* nori. The best treatment was obtained on nori made from the initial raw material in wet form with the characteristics of a thickness of 0.34 mm, hardness of 335.21 gf, water content of 14.47%, ash content of 21.22%, protein content of 7.51%, fat content of 9.64%, total phenol content of 21.01 mg GAE/g, DPPH inhibition activity 62.77%, FRAP value 133.50 M/g, α-glucosidase inhibitory activity 43.81%, and consumer acceptance level of appearance 2.66, aroma 2.41, texture 3.06, flavour 3.26, and color 2.98.

1. Introduction
*Sargassum* sp. is a species of seaweed that belongs to the class Phaeophyceae or brown algae. One type of *Sargassum* which is very abundant in Indonesia is *Sargassum hystrix* [1]. This species of seaweed contains various bioactive compounds and high antioxidant activity. *S. hystrix* has the highest antioxidant activity compared to *S. polyceratium, S. angustifolium, S. filipendula, S. cinereum, S. siliculosum, S. meclure* [2]. The content of bioactive compounds in *S. hystrix* in the form of alkaloids, steroids, terpenoids, phenols, tannins, and saponins [3]. The antioxidant activity of fucoidan was also found in the brown seaweed *S. hystrix* [4]. Bioactive compounds that have a role as antioxidants, can inhibit the production of oxidative agents in the production of reactive oxygen species (ROS) by peripheral blood cells, inhibit oxidative exposure in the body and play a role in the process of lowering blood pressure [5].

One of the uses of seaweed as food is to become nori typical Japanese food which is in great demand in Indonesia. Nori is one of the processed seaweed products that has many enthusiasts in Indonesia. Nori is a genuine Japanese food from a group of sea vegetables that are rich in nutrients such as protein, minerals, and vitamins needed by the body. Consumption of nori in Indonesia is currently showing an increase. The raw material commonly used in the manufacture of nori is *Porphyra sp.* but these materials are not found in Indonesia because *Porphyra sp.* only grows in...
subtropical waters. The problem faced in meeting the demand for nori, namely the unavailability of seaweed *Porphyra* species as raw material in Indonesia, even though the need for nori in Indonesia is up to 80%[6]. Consumption of nori continues to increase in Indonesia, so to meet this need, most Japanese restaurant owners in Indonesia import the seaweed sheets directly from their country of origin.

It is necessary to look for other seaweed raw materials for nori production that can be cultivated or found in Indonesia [7]. Previous research on nori has been carried out using red seaweed *Porphyra marcossi*[8], dry and semi-dry *Eucheuma spinosum* [7], and a mixture of *Sargassum sp.* with *E. spinosum*[9], while research on making nori from *S. hystrix* has not been done. Therefore, it is necessary to conduct research on the manufacture of nori from *S. hystrix*. So, the purpose of this study was to determine the characteristics and level of consumer preference for *S. hystrix* nori.

2. Method

2.1. Research design

Nori was made in a traditional way based on method described by Freile-Pelegrin et al.[10] with modifications. This study used the completely randomized design (CRD) one factor. The treatment of raw materials used were wet *S. hystrix*, dry *S. hystrix*, and mixture between wet and dry *S. hystrix* (1:1). Wet *S. hystrix* used fresh *S. hystrix* raw materials which were cleaned using freshwater. Dried *S. hystrix* used fresh *S. hystrix* raw materials which were cleaned using fresh water and then air-dried for 5-7 days.

2.2. Materials

The materials used in this study including *S. hystrix* was taken in Teluk Awur, Jepara in August 2020, clean water, NaOH, salt, sugar, pepper, flavoring, fish sauce, olive oil and sesame oil. The tools used in this study include analytical balance (Adventure Ohaus USA), baking sheet, blender (Miyako BL-302, Philips HR2116), hot plate stirrer (F20500011 Velp AREC Heating Stirrer, Italy), and scoresheet.

2.3. Nori manufacturing

Nori was made by method as described by Freile-Pelegrin et al. [10]. A total of 50 g of wet/dry/mixed *S. hystrix* seaweed were soaked in water as much as 20 times the weight of seaweed, added with 1 gram of NaOH then soaked for 12 hours to soften the tissue. After that, rinse with clean water. The clean *S. hystrix* was then blended until it became a porridge. The porridge of *S. hystrix* was heated to form a gel and then spices were added to taste. Then printed on a baking sheet with a size of 15x15 cm and dried in the oven at a temperature of 70°C for 180 minutes.

2.4. Physical analysis (thickness and hardness)

The thickness test used the Ramasari et al. [7] method using a micrometer. The thickness of the whole nori was measured using a micrometer then the average was taken and determined as the thickness value. The nori hardness test used the method described by Lalopua [11] using Tensile Strength. Measurements were made by applying a compressive force to the nori so that a curve shows the texture of the nori. Hardness was expressed from the maximum strength to the first pressure or compression in grams of force (gf). The data obtained was then interpreted in graphical form using software on a computer.

2.5. Proximate analysis

Proximate analysis includes water content, ash content, crude protein, and fat. The water content analysis was done by using a moisture content analyzer instrument. Ash content testing was carried out using the AOAC method [12]. Crude protein analysis tested using SNI-01-2354.4-2006 method [13]. The fat content test used the SNI 2354.3-2010 method [14].
2.6. Phenolic analysis
Analysis of total phenol content used the method described by Kang et al. [15], using gallic acid as the standard curve. A total of 5 mg of nori extract was dissolved in 1 mL of distilled water, made 6x series dilutions with concentrations of 6.25, 12.5, 25, 50, 100 and 200 g/L. Each concentration of standard solution and extract was taken 10 l and put into a microplate 96 well plate, then added 50 g/l Folin-Ciocalteu reagent and incubated for 5 minutes. After that, 40 g/L 7.5% Na$_2$CO$_3$ was added and incubated for 2 hours in the dark and stored at room temperature. Then the absorbance was measured at a wavelength of 750 nm.

2.7. Antioxidant analysis
Antioxidant testing using DPPH and FRAP (Ferric Reduction Activity Power) analysis. The DPPH analysis used the method described by Pratiwi and Husni [16]. DPPH of 50 μL was prepared by dissolving DPPH with a concentration of 0.136 mM in methanol. The sample in methanol was mixed with 0.2 mL of extract in methanol at a concentration of 10 mg/ml. Vitamin C as a comparison was prepared in the same way as the sample. After that it was stored in a dark room at room temperature for 30 minutes. The absorbance of the final solution was measured by a spectrophotometer at a wavelength of 517 nm.

The FRAP test was carried out based on the method described by Pratiwi and Husni [16] involving the reduction reaction of Fe$^{3+}$ to Fe$^{2+}$. A solution of 10 mM/L 2,4,6-tripyridil-s-triazine (TPTZ) was prepared from 0.15 g of TPTZ dissolved in 40 mM/L HCl to exactly 50 mL. A solution of 40 mM/L HCl was made by dissolving 0.828 mL of concentrated HCl in 250 mL of distilled water. The TPTZ solution was stored at 4°C for a maximum of 1 day before being used. A solution of 20 mM/L FeCl$_3$·6H$_2$O was prepared by dissolving 0.54 g of FeCl$_3$·6H$_2$O in a volume of exactly 100 mL distilled water. The FeCl$_3$·6H$_2$O solution can be stored at 4°C for up to 1 day before being used. The preparation of FRAP reagent was realized by mixing 25 mL of acetate buffer, 2.5 mL of TPTZ solution and 2.5 mL of FeCl$_3$·6H$_2$O solution (10:1:1) and then by adding distilled water to exactly 100 mL. The standard solutions of FeSO$_4$·7H$_2$O (10,000 μM/L) were prepared by first dissolving 2.78 g of FeSO$_4$·7H$_2$O in 1,000 mL of distilled water, then by adjusting the concentrations at 50, 100, 150, 200, 250 and 300 ppm. Sample solutions from nori and vitamin C were prepared. A 20 μL sample solution was added to 150 μL of FRAP reagent in a 96-well microplate and then read at a wavelength of 595 nm using a UV-VIS spectrophotometer (Multiply Go). The standard FeSO$_4$ solution and vitamin C were treated the same way as the sample.

2.8. Inhibition activity of α-glucosidase
An inhibition α-glucosidase activity was performed as described by Husni et al.[17]. A test solution was made from 50 mL of 0.1 M KH$_2$PO$_4$, pH 7, 25 mL of 0.5 mM p-nitrophenyl-α-D-glucopyranoside, 10 mL of the nori extract at various concentrations, and 25 mL of 0.2 U/mL α-glucosidase. The solution was blended and bred at 37°C for 30 min. The reaction was blocked by the inclusion of 100 mL of 0.2 M Na$_2$CO$_3$. Inhibitory activity of enzyme was deliberated by the amount of p-nitrophenol formed by measurement the absorbance by a microplate reader at a wavelength of 405 nm. The absorbance were obtained and then used to calculate the inhibition activity of the enzyme.

2.9. Hedonic test
The hedonic test used 80 untrained panelists. Parameters observed include taste, aroma, texture, appearance, and color. The hedonic scale includes 5 scales, namely 1 = very dislike, 2 = dislike, 3 = normal, 4 = very much like, 5 = very dislike. Panelists will then write down the hedonic test result data on the scoresheet score.

2.10. Data analysis
The analysis was presented through descriptive analysis which was analyzed using the R-Studio application. Tests analyzed using ANOVA were test parameters that have met the assumptions of
parametric data including proximate testing. If there was a significance (P<0.05), the test is continued with HSD-Tukey.

3. Results and Discussion

3.1. Physical characteristic
The physical test of *S. hystrix* nori carried out in this study included a thickness test and a hardness test. The thickness of the nori obtained is 0.355 cm (Table 1). The thickness of the nori is comparable to the crispness of the nori. The thicker the nori, the less crispy the nori will produce [9]. The more dough used in making nori, the nori produced will also be thicker, heavier and not crunchy [18]. The results of the *S. hystrix* nori thickness test showed no significant difference between treatments (P<0.05). Research conducted by Faris et al. [9] resulted in nori made from *Sargassum* sp. which has a thickness of 0.347 mm. The results in this study are slightly thicker due to differences in printing sizes.

| Treatments                      | Thickness (cm) | Hardness (gf) |
|---------------------------------|----------------|---------------|
| Wet *S. hystrix*                | 0.35±0.00a     | 335.21±0.12a  |
| Dry *S. hystrix*                | 0.35±0.00b     | 365.17±3.02b  |
| Mixture of wet and dry *S. hystrix* (1:1) | 0.35±0.00c   | 318.37±5.73c  |

Table 1. The effect of raw materials condition on the physical character of *S. hystrix* nori.

Table 1 showed that the hardness of *S. hystrix* nori significantly different between treatments (P<0.05). The value is based on how much force is required to crush the test material. An increasing hardness value describes a texture that was getting harder and less crunchy than products that have a lower hardness value [19]. The difference in hardness in each treatment was caused by the water content and fat content of the nori that had been formed. The high water content of nori will cause the texture to be not crispy [11]. Fat functions as a shortening and influences texture, fat can improve physical texture such as expansion, texture softness, and aroma [20].

3.2. Proximate characteristic
The physical characteristics of *S. hystrix* nori carried out in this study included a water content, ash, protein and fat. Table 2 shows that the moisture content of *S. hystrix* nori was significantly different between wet *S. hystrix* treatments and the others (P<0.05). Nori with dry *S. hystrix* as raw material has a moisture content that is not significantly different from mixed raw materials. The highest value was owned by nori using wet *S. hystrix* raw material (14.72%) and the lowest value for nori using dry *S. hystrix* raw material (11.08%). In dry food products, water content is a critical characteristic that affects consumer acceptance of nori because it determines the texture (crispy) of nori. The high water content of nori will cause the texture to be not crispy [11]. Nori produced from brown seaweed *S. hystrix* in this study has a moisture content ranging from 14.72% - 11.08% where the smallest water content is owned by nori with dry *S. hystrix* raw materials. The lower the water content, the higher the crunchiness of the nori and conversely, the higher the water content, the lower the crunchiness of the nori [11].

| Treatments                      | Water (%) | Ash (%) | Protein (%) | Fat (%) |
|---------------------------------|-----------|---------|-------------|---------|
| Wet *S. hystrix*                | 14.48a    | 21.22a  | 7.51a       | 9.65a   |
| Dry *S. hystrix*                | 11.08b    | 18.57b  | 6.13d       | 8.66b   |
| Mixture of wet and dry *S. hystrix* (1:1) | 11.49b    | 12.39c  | 6.38c       | 9.03c   |
| *S. hystrix* extract           | 10.99c    | 18.79b  | 7.08b       | 0.34d   |

Table 2. The effect of raw materials condition on proximate *S. hystrix* nori.
The effect of treatment on the ash content of *S. hystrix* nori is shown in Table 2. The lowest ash content of *S. hystrix* nori which comes from a mixture of wet and dry *S. hystrix* (12.39%), and the highest on nori made of wet *S. hystrix* (21.22%). The results of statistical analysis showed that the treatment had a significant effect (P<0.5) on the ash content. The difference in ash content was due to the wet and dry conditions of the raw material *S. hystrix*. The longer drying process will reduce ash content due to the possibility of many minerals being damaged and lost [21]. Another factor that can affect the difference in ash content is the location and time of harvesting the raw materials. Seaweed was one of the foodstuffs that contain high enough minerals because of its ability to absorb minerals from its environment [22]. The ash content of *S. hystrix* nori is higher than that of nori from a mixture of *Sargassum crasifolium* and *Spirulina platensis* (5.66-7.46%) [23]. This is due to the high ash content of *S. hystrix* alginate which is 21.80% - 23.95% of the total weight [24]. The addition of food additives such as salt can also increase the amount of minerals in nori.

Table 2 shows that the treatment had a significant effect (P<0.5) on protein content of *S. hystrix* nori. The highest protein content was in nori made from wet *S. hystrix* (7.51%) and the lowest was in nori made from dry *S. hystrix* (6.12%). The difference in protein in each treatment was caused by the drying process for dry *S. hystrix* raw materials. The drying process using high temperatures for a longer time results in protein loss [25]. The protein content of nori as a result of this study was higher than that of nori (6.55%) a mixture of *S. crasifolium* and *S. platensis* extract [23]. This is because the protein content of *S. hystrix* is higher [3].

The highest fat content was found in nori made from wet *S. hystrix* (9.64%) and the lowest was in nori made from dry *S. hystrix* (8.65%). Table 2 shows that the treatment had a significant effect (P<0.5) on the fat content of nori. The fat content of the three treatments was greater than the fat content of the *S. hystrix* extract (0.33%). This increase in fat content can occur due to the addition of sesame oil and olive oil ingredients. The more addition of sesame oil, the higher the fat content [26, 27]. The fat content in this study was higher than that of nori from *S. crasifolium* and *S. platensis* extract (4.46%) [23] due to the addition of sesame and olive oil ingredients.

3.3. Phenolic content

The phenol content of *S. hystrix* nori can be seen in Table 3. The highest total phenol content of nori with wet *S. hystrix* raw material (21.22 mg GAE/g) and the lowest in nori with dry *S. hystrix* raw material (14.71 mg GAE/g). The higher the value of mg GAE/g, the higher the phenolic compounds contained in it. Polyphenols have strong antioxidant properties and can prevent oxidative stress associated with cancer (Mulia et al, 2016) [28]. The different phenol values in each treatment were caused by different raw materials used in the manufacture of nori. Decrease in total phenol was caused by phenol being damaged by temperature treatment continues to increase, phenolic compounds are thermosensitive substances so that allows hydrolysis to occur [29]. Drying process *S. hystrix* dry using room temperature for 5 days which causes reduced levels of phenolic acid compared to fresh wet seaweed. After that *S. hystrix* both wet and dry that has been blended must be boiled first so that the gelation process occurs when it is in the form of a slurry and in the oven to form a sheet.

Table 3. Effect of raw materials condition on total phenol, antioxidant and anti-diabetic activities of *S. hystrix* nori.

| Treatments                        | Total phenol (mg GAE/g) | Antioxidant DPPH (%) | Antioxidant FRAP (µM/g) | Inhibition of α-glucosidase (%) |
|-----------------------------------|------------------------|----------------------|-------------------------|-------------------------------|
| Wet *S. hystrix*                  | 21.01<sup>a</sup>      | 62.76<sup>a</sup>    | 133.50<sup>a</sup>      | 43.81<sup>b</sup>             |
| Dry *S. hystrix*                  | 14.71<sup>b</sup>      | 53.28<sup>c</sup>    | 161.83<sup>a</sup>      | 24.97<sup>d</sup>             |
| Mixture of wet and dry *S. hystrix* (1:1) | 16.67<sup>c</sup> | 57.28<sup>c</sup>    | 145.69<sup>b</sup>      | 38.61<sup>c</sup>             |
| Vitamin C                         |                        | 81.94<sup>b</sup>    | 94.13<sup>d</sup>       | -                             |
| Acarbose                          |                        | -                    | -                       | 90.57<sup>a</sup>             |
3.4. Antioxidant activity

The results of antioxidant DPPH and FRAP can be seen in Table 3. The lower the value of μM/g, the higher the antioxidant activity in FRAP methods. The comparison the highest antioxidant in the treatment of S. hystrix base material is still lower compared with vitamin C. Vitamin C is a very pure compound that acts as an antioxidants [30], while the sample of S. hystrix nori is a compound that is still in the form of crude extracts are not pure compounds.

Drying of raw material for S. hystrix seaweed in this study using wind drying where the seaweed is placed at room temperature for 5 days. Previous research reported that fresh samples of Spirulina sp. contains antioxidants higher phenols and flavonoids compared to the dry sample, it means that This is thought to be due to the fact that polyphenol compounds are generally susceptible to high oxidation causing a decrease in the amount after drying [31]. Drying processes with higher temperatures which causes its degradation of phenolic compounds that cause a decrease in antioxidant activity. Degradation of phenolic compounds and antioxidant activity is accelerated due to the increasing temperature storage. [32]

3.5. Inhibition activity of α-glucosidase

Data on the inhibitory activity of α-glucoside by S. hystrix nori are shown in Table 3. The inhibitory activity of α-glucosidase nori of wet S. hystrix, dry S. hystrix, and a mixture of dry and wet S. hystrix, respectively, was 43.81%, 24.97%, 38.61%, and statistically significantly different (P>0.05). The difference in α-glucosidase inhibitory activity in each treatment was due to the different levels of phytochemicals contained in each treatment. Flavonoids are useful in inhibiting α-glucosidase [32]. Secondary metabolites such as tannins, saponins and phenols inhibit the activity of the α-glucosidase.

The antioxidant value will be directly proportional to the inhibition of α-glucosidase. These antioxidants can protect pancreatic cells from free radicals produced in hyperglycemic conditions. Antioxidants will bind to free radicals so that they can reduce insulin resistance [33].

3.6. Hedonic test

Hedonic test is one of the methods used in sensory assessment. In research that requires sensory assessment with a hedonic test used to determine the most preferred treatment by the panelists. Hedonic test can strengthen the test results of how consumer acceptance of the food products studied [34]. The effect of treatment on the appearance of S. hystrix nori is shown in Table 4. The lowest hedonic value was obtained by the treatment of nori made from wet S. hystrix (2.66) and the highest was to nori made from dry S. hystrix (2.95). The nori treatment made from dry S. hystrix was preferred by the panelists because it was easier to crumble compared to other treatments so as to produce a smoother dough. In addition, the lower water content makes the dried S. hystrix nori have a denser shape. Nori made from E. cotonii, the value of the largest appearance parameter was nori with dry raw materials [7].

The aroma of S. hystrix nori was strongly influenced by the treatment used (Table 4). The resulting nori has a slightly fishy smell typical of seaweed. Seasoning added during the manufacturing process in the form of sesame oil can reduce the fishy smell of nori [35]. The highest hedonic aroma value was in nori made from dry S. hystrix (2.90) and the lowest was in nori made from wet S. hystrix (2.41). This is because nori uses dried S. hystrix as raw material and has a less fishy aroma than other treatments. The fishy smell that arises is due to the presence of amine compounds contained in the raw materials. Dried E. cotonii-based nori was also reported to have the highest aroma value [7].

Aroma is the smell of a food product, the smell itself is a response when volatile compounds from a food enter the nasal cavity and are sensed by the olfactory system [34]. Aroma is a parameter that can be felt by the human sense of smell which can also affect the level of liking someone to the food being tested. The highest aroma parameter produced by nori using dried S. hystrix because it has a less fishy aroma than other treatments. The fishy smell that comes due to the presence of amine compounds contained in the raw material [7].
Table 4. The effect of raw materials differences on consumer acceptance of S._hystrix nori.

| Treatments                        | Hedonic parameters |
|-----------------------------------|--------------------|
|                                   | Appearance | Aroma | Color  | Texture | Flavour |
| Wet S._hystrix                    | 2.66<sup>a</sup> | 2.41<sup>a</sup> | 2.98<sup>a</sup> | 3.06<sup>a</sup> | 3.26<sup>a</sup> |
| Dry S._hystrix                    | 2.95<sup>a</sup> | 2.90<sup>b</sup> | 2.76<sup>a</sup> | 2.20<sup>b</sup> | 2.34<sup>b</sup> |
| Mixture of wet and dry S._hystrix | 2.86<sup>a</sup> | 2.58<sup>b</sup> | 2.56<sup>a</sup> | 2.29<sup>b</sup> | 2.75<sup>b</sup> |

Table 4 shows that the treatment had a significant effect on the color hedonic value of S._hystrix nori. The highest color hedonic value was found in nori made from wet S._hystrix, while the smallest hedonic value nori made from a mixture of dry and wet S._hystrix. Nori made from wet S._hystrix produces a brownish green, while nori made from dry S._hystrix tends to be dark green. The green color that appears is because although S._hystrix is a brown seaweed, it still has chlorophyll which gives food its green color. _Sargassum_ is usually characterized by the presence of a brown pigment that covers the green color [36]. The color difference in each treatment was also caused by differences in the water content of the _S. hystrix_ raw material.

Table 4 also shows that the treatment had a significant effect on the texture hedonic value of _S. hystrix_ nori. Nori made from wet _S. hystrix_ has the highest hedonic texture value, while the lowest texture value was nori made from dry _S. hystrix_. Texture of nori is determined by the elements that make it up. The texture produced by the wet _S. hystrix_ tends to be crisper and smoother than the other nori treatments. Meanwhile, nori made from dry _S. hystrix_ is less attractive to panelists because the resulting texture is harder and crumbles easily. Chamidah [23] states that water content can determine the texture of nori. In this study, the treatment had a significant effect on the water content. Research conducted by Ramasari et al. [7] explained that there was no significant difference between treatments between dry nori and semi-dried nori this was because the difference in water content was not significantly different so that all products were acceptable to the panelists.

The treatment had also a significant effect on the hedonic flavour value of _S. hystrix_ nori (Table 4). Nori made from wet _S. hystrix_ has the highest hedonic flavour value, while the lowest flavour value was nori made from dry _S. hystrix_. The flavour of nori with the basic ingredient of wet _S. hystrix_ was more salty and savory, while in other samples it was more salty and less savory. The savoury flavour was different between treatments due to differences in protein content of the materials. The flavour of nori is influenced by the amino acid components sourced from seaweed and the spices used. The combination of amino acids from seaweed and spices contributes to the flavour and aroma of nori [11].

Flavour is a parameter that determines consumer acceptance that can be felt by the senses of taste. Flavour is the most considered criterion because the delicious taste will be an important point in a product [30]. Taste that comes out of nori with the wet _S. hystrix_ is more salty and savory. While the other samples tasted more salty and savory less felt. The savory taste is different between treatments due to differences in protein content in it. The taste of nori is influenced by the amino acid components sourced from seaweed and spices used. Combination of amino acids from seaweed and seasonings contribute to the value of taste and aroma of nori [11].

4. Conclusion

Differences in the condition and composition of raw materials have a significant effect on the characteristics and level of consumer acceptance of _S. hystrix_ nori. The best condition and composition for producing nori was wet _S. hystrix_ which has the characteristics of a thickness of 0.34 mm, a hardness of 335.21 gf, water content 14.47%, ash content 21.22%, protein content 7.51%, fat content 9.64%, total phenol content 21.01 mg GAE/g, DPPH inhibitory activity 62.77%, FRAP value 133.50 M/g, α-glucosidase inhibitory activity 43.81%. Consumers prefer nori from wet _S. hystrix_ raw materials with a value of appearance 2.66, aroma 2.61, texture 3.06, flavour 3.26, and color 2.98.
Acknowledgments
The authors are grateful to the Faculty of Agriculture, for funding this research through Lecturer and Student Collaboration Research Grant 2021, with contract number 2099/PN/PT/2021.

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