

The Nori Gracilaria sp. with a Variation of Stabilizers as Healthy Food

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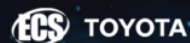
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The Nori *Gracilaria sp.* with a Variation of Stabilizers as Healthy Food

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Abstract. Nori is a traditional Japanese food made from red seaweed (Porphyra) which is currently still imported. In this study, nori was made from local seaweed raw materials, namely seaweed (*Gracilaria sp.*) With the addition of a texture stabilizer which aims to improve product quality, so that nori products with characteristics such as commercial nori are obtained. In making nori *Gracilaria sp.* In this case, the addition of texture-enhancing ingredients, including: chitosan, gelatin and pectin. This study aims to create a nori product that has a texture and taste that consumers like. Chitosan, gelatin and pectin are widely used as stabilizing / stabilizing components due to their ability to form a thin gel that can form products that are strong, elastic, flexible and difficult to tear. The research method used a factorial completely randomized design (CRD) with two factors and two replications. The first factor is the type of texture stabilizer: (chitosan, gelatin and pectin) and the second factor is the concentration of the addition of the texture stabilizer: (2%, 3%, 4%). The best research results were obtained in the addition of 3% gelatin stabilizer which produced nori with 5.42% moisture content, 4.53% ash content, 11.29% protein content, 12.40 (N) tensile strength with the highest ranking value. aroma 109, flavor 124 and texture 114.4.

Keywords: Nori, Seaweed, (*Gracilaria sp.*), Chitosan, gelatin, pectin

1. Introduction

Gracilaria sp. rarely used directly because the color is slightly brownish and difficult to dissolve when heated. But *Gracilaria sp.* It has elastic properties, is easy to shape and the price is also relatively cheap compared to carrageenan [1]. In Japan, the use of seaweed does not only function as a gelatin producer, but is also developed into pickles, vegetables, salads, wakame, kombu, and nori.

Nori is a traditional food made of red seaweed which is consumed after drying or roasting [2]. Nori comes from Japan, the raw material for making it is *Porphyra* red seaweed[3]. Nori currently consumed is still imported from Japan, Korea and China. In Indonesia, nori is much needed, especially in Chinese and Japanese restaurants, which serve ready-to-eat menus. The need for nori is so great and the limited availability of *Porphyra* seaweed which is only developed intensively in East Asia, so it is necessary to make nori from seaweed raw materials which are widely available in Indonesia, namely *Gracilaria sp.* Seaweed. Traditional nori making from *gracilaria sp.* Seaweed produces light green brownish colored nori, but has a brittle texture and does not coalesce, so other

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techniques **are** needed in making nori in order to obtain good quality nori. One alternative to making nori is to use the addition of a texture stabilizer which aims to improve the quality of the product so that nori is obtained which has the same characteristics as commercial nori [4].

The types of texture stabilizing materials that are possible to use in the manufacture of Nori *Gracilaria sp.*, including: chitosan, gelatin and pectin. The addition of a texture stabilizer is intended to improve the texture quality of nori through the formation of a gel as a binder, to obtain a texture similar to commercial nori in general. In this research, nori has been made from the basic ingredients of seaweed from the type of *Gracilaria sp.* with the addition of 3 types of texture stabilizer, namely: chitosan, gelatin and pectin with the aim of improving product quality, so that nori products from seaweed (*Gracilaria sp.*) can be obtained with good quality. The purpose of this study was to determine the effect of adding various types of texture stabilizer and the concentration of addition on the physicochemical and organoleptic qualities of Nori *Gracilaria sp.*.

2. Metodology

2.1. Research Materials

The raw material used *Gracilaria sp.* from BBAP Pasuruan, chitosan from shrimp skin, gelatin from cow bones and pectin from orange peel obtained from chemical shop. Materials for chemical analysis were distilled water, hexane solvent, K₂SO₄, HgO, H₂SO₄, NaOH, H₃BO₃, HNO₃, HCl, acetic acid, kjeldahl tablets, indicators (a mixture of 0.2% methylene red in alcohol and 0.2% methylene blue (in alcohol)).

2.2. Research methods

The experimental design used was a completely randomized design (CRD) with a two-factor factorial pattern, namely, the type of stabilizer: (chitosan, gelatin and pectin) and the second factor was the concentration of stabilizer: (2%, 3%, 4%) The data obtained were analyzed by analysis of variance and Duncan test (DMRT) with $p = 0.05$. The methodology of nori production was clean seaweed cooked in boiling water for 3 minutes or until the seaweed looks wilted. The seaweed is cooled, then blended for 20 seconds until it becomes pureed. The seaweed pulp was weighed 50 g each. Printing and coating with stabilizing materials (gelatin, chitosan and pectin) in the form of thin rectangular sheets in a bamboo mat framed with a 14 x 12 x 3 cm square wood mold in each stabilizing container. Nori sheets were dried using a cabinet dryer at 40 ° C for 4 hours. The dry nori was fried in boiling cooking oil by dipping it for 2 seconds with 2 frying times.

3. Result and Discussion

3.1. Ash and water content of Nori *Gracilaria sp.*

The water content of the nori had a moisture content of 7.32% - 9.35%. The stabilizer is a hydrogel which only absorbs and easily releases water, resulting in the low water content of nori *Gracilaria sp.* [5] The hydrogel is a network of polymer rings capable of absorbing large amounts of water without dissolving in water. Hydrogel is insoluble in water but it only absorbs and release water and nutrients proportionately when needed. [6] The water content increases with the addition of a stabilizer because the solution can absorb water molecules so that it will increase the water content of product.

While the ash content of nori can be seen in Figure 1, it can be seen that the higher the concentration of adding a stabilizer, the value of the ash content in the nori will increased. This was due to the increase in the amount of mineral contained in the stabilizer solution so that it will increased the ash content. Nori with the addition of chitosan and gelatin as a stabilizer has a fairly low ash content. This is presumably because the mineral contained in chitosan and gelatin has a low ash value so that nori was produced a low ash content. According [7] the ash content of gelatin ranges from 2% - 4%. The ash content of chitosan ranges from 5% - 6% [8].

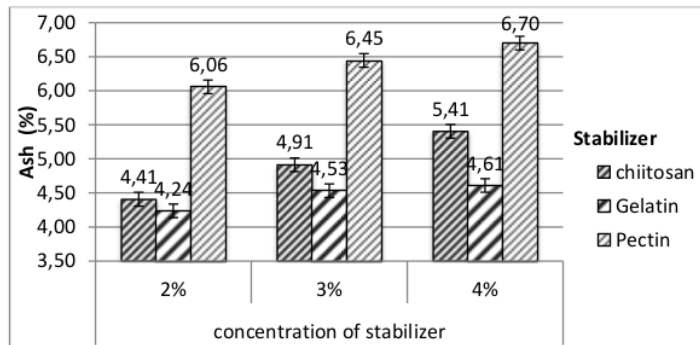


Figure 1. The relationship between the type and concentration of a stabilizer on the ash content.

Nori coated with pectin stabilizer had the highest ash content value, this was presumably due to the high mineral content contained in pectin. The ash content of pectin ranged from 6.5% - 8.9% [9].

3.2. Protein Content

The difference in the type of stabilizer showed a significant level of protein content (Figure 2). The protein content coated with gelatin stabilizer had the highest protein content. This was because the ingredients of gelatin are amino acids so that they can increase the value of protein in nori. Gelatin protein content ranges from 84% - 86% [10].

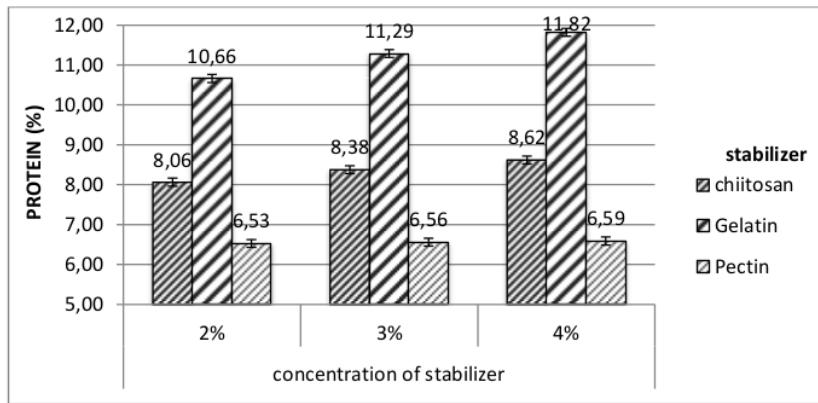


Figure 2. The relationship between the type and concentration of stabilizer on nori protein

The protein content coated with chitosan stabilizer had lower protein content than nori with gelatin. This was presumably because chitosan is a type of polysaccharide, but it still has a protein content that comes from the raw material for making chitosan, namely shrimp skin. [11] the average of chitosan protein content ranges 15-20%. Nori protein content coated with pectin had the lowest protein content. This was presumably because pectin is a polysaccharide compound so that there is no additional of protein content. [12] Pectin is an acidic complex polysaccharide that is present in varying amounts, widely distributed in plant tissue.

3.3. Tensile Strength

In Figure 3 showed that the higher the concentration of the addition of stabilizer, increasing the higher tensile strength value of nori. This was thought to be due to the increase in hydrocolloid components (chitosan, gelatin and pectin) as gels contained in the solution of the texture-stabilizing material so that the interaction force between the molecular matrices contained in the texture stabilizer is getting stronger, so that it can increase the tensile strength of the nori produced. The value of the tensile strength of the film is influenced by the formulation of the gelling agent, the stronger the gel is formed, the higher the tensile strength value [13].

The difference in the type of stabilizer shows that the gelatin has the highest first tensile strength value, namely 13.10 N. This is presumably because gelatin has a high gel strength value. Gelatin has a gel strength of 3.90 N [14]. Nori with the addition of pectin had a lower tensile strength value than gelatin, namely 12.60 N. This is presumably because pectin had a lower gel strength level than gelatin. The strength of the gel on orange peel pectin is 3.22 N. Nori with the addition of a chitosan had the lowest tensile strength value, namely 11.70 N. This is suspected because chitosan had the lowest gel strength level than gelatin, and pectin to produce nori with the lowest tensile strength [15]. The strength of the gel in shrimp shell chitosan is 2.4 N [16]. The tensile strength value is influenced by the formulation of the materia [17]. The factors that influence the tensile strength of a material are the total dissolved solids and the molecular interactions therein [18].

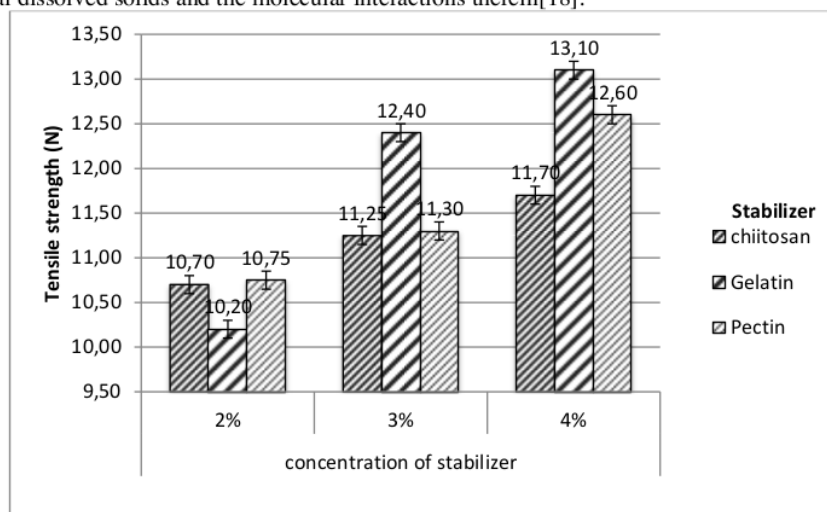


Figure 3. The relationship between the type and concentration of stabilizer on the tensile strength of nori.

3.4. Organoleptic Test

The addition of 2% gelatin as a stabilizer resulted in the aroma of nori with the highest level of preference, namely 116 (Table 1). There was a decrease in the natural aroma of fresh seaweed during the processing process. The fresh seaweed had a characteristic aroma that was slightly fishy. In addition, adding too much stabilizer can reduce the distinctive aroma of nori, even though the stabilizer used does not have a specific distinctive aroma. The use of too much stabilizer will reduce the aroma of the product, because the original aroma of the product will be replaced by the aroma of the texture stabilizer [19].

Table 1. The average value of preference for nori organoleptic

Treatment	Number of Ranking			
	Type of Stabilizer	concentration (%)	Aroma	taste
chitosan	2	102,5	107	99
chitosan	3	102	87,5	99
chitosan	4	96	85	89
Gelatin	2	116	110,5	112,5
Gelatin	3	109	124	114,5
Gelatin	4	96	106	88,5
Pectin	2	99	97,5	111,5
Pectin	3	95	94	103,5
Pectin	4	83,5	93	84

The addition of 3% gelatin stabilizer resulted the highest preference in taste and texture values. This is because the nori from the treatment has the right nori taste, which is savory and not too bland. [20] The savory taste of nori is produced from the seaweed content itself. The savory taste (umami) of nori is due to the content of free amino acids (alanine, glutamic acid, taurine and aspartate acid). The seaweed contains several amino acids besides beneficial nutritional content, including glutamic acid, glycine and alanine which play a role in creating taste [1].

The texture of nori has a coarse texture, resembling paper and is dark green in color, the texture and color of the nori is influenced by the type of seaweed used in making nori[21]. The addition of a texture stabilizer can increase the hardness due to the increased level of viscosity and gelling of the texture stabilizer solution [22].

3.5. Shelf Life of Nori

The purpose of the storage test for nori products was to study and determine the characteristics and physico-chemical properties of the quality of nori produced during storage. The best treatment of nori with the addition of 3% gelatin as a stabilizer. Storage was carried out by packaging using an aluminum foil pouch at room temperature and testing the moisture content and tensile strength of nori every week for 1 month. Water content is an important factor which has a very big effect on the physical properties and durability of a processed product. This is related to the nature of water which can affect chemical, microbiological, enzymatic changes, and changes in the physical properties of food.

The nori moisture content with the addition of gelatin 3% was increased in succession at each storage week, although not too significant (Table 2). Commercially produced nori has a moisture content of 7-15%, then the nori is packaged in a plastic bag [23]

Table 2. Shelf life of nori

Storage time	Water content (%)	Tensile strength
Week 0	11.90 ^a ± 0.14	12.40 ^a ± 0.14
Week 1	11.95 ^{ab} ± 0.07	12.10 ^{ab} ± 0.14
Week 2	12.00 ^{ab} ± 0.14	12.00 ^{ab} ± 0.14
Week 3	12.10 ^{bc} ± 0.14	11.95 ^{bc} ± 0.07
Week 4	12.40 ^{bc} ± 0.14	11.90 ^d ± 0.14

Tensile strength is the maximum strain that the sample can still accept before breaking. Tensile strength shows a measure of nori resistance and is a quality parameter. Nori is included in the snack group along with chips, crackers, chips and flakes. The characteristics of nori in general that consumers like are crunchy (not tough), but also not easily crushed (not brittle). If the tensile strength of the nori decreases, the nori becomes less crunchy and its compactness is lost. The resulting tensile strength is influenced by the formulation of the material. The factors that influence the tensile strength of a material are the total dissolved solids and the molecular interactions therein[18].

4. Conclusion

Nori is a traditional food made of red seaweed which is consumed after drying or roasting. One alternative to making nori is to use the addition of a texture stabilizer which aims to improve the quality of the product so that nori is obtained which has the same characteristics as commercial nori. Nori *Gracilaria* sp. with the addition of 3% gelatin is the best treatment with the characteristics of water content of 5.42%, ash content of 4.53%, protein content of 11.29%, tensile strength 12.40 (N), and with the results of organoleptic testing the aroma rating value of 109, the taste ranking value was 124 and the texture ranking value was 114.5.

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