

Data Article

Formatted: Tab stops: 2.44", Left

The Level of Nori's Relief Made From Raw Seaweed Mixed *Gelidium Sp* And *Eucheuma cottonii*

ABSTRACT

Aims: This research aims to obtain the most preferred *n*Nori made from the mixture of *Gelidium sp* and *Eucheuma cottonii* seaweed.

Study design: Research was conducted *experimentally*

Place and Duration of Study: The Laboratory of Fisheries Product Processing at the Faculty of Fisheries and Marine Sciences, Padjadjaran University and the Laboratory of Biotechnology and Biotechnology Research LPPM Bogor Agricultural Institute from February to March 2019.

Methodology: The method used in this research was an experimental method with 5 mixed treatments of *Gelidium sp* and *Eucheuma cottonii* with 20 semi-trained panelists *were repeated involved in preference tests*. The treatment was a mixture of *Gelidium sp* and *Eucheuma 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 *are-were* water content and crude fiber *content*.

Results: The results showed that the mixture of *n*Nori made from seaweed *Gelidium sp* and *Eucheuma cottonii* *at* 70%: 30% *proportions was the most* preferred over other treatments, with a moisture content of 15.35% and the crude fiber content of 5.36%. The median value of hedonic *n*Nori test of *Gelidium sp* and *Eucheuma cottonii* on appearance and texture 9 *is-was* very preferred, the value of aroma and taste 7 *is-were also* preferred.

Conclusion *†*The mixture of *n*Nori made from seaweed *Gelidium sp* and *Eucheuma cottonii* 70%: 30% *is-was* most preferred by panelists.

Formatted: Font: Italic

Keywords: [*Mixture, Eucheuma cottonii, Gelidium sp, 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) [5].

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

Formatted: Font: Italic

Formatted: Font: Italic

Formatted: Font: Italic

34 | In general, *Gelidium* sp. containsing 14 - 20 grams of water, 0.4 grams of fat from 16.1 to
35 | 12.5 grams of protein, 10.5 to 13.5 grams of fiber and 3.5 to 8.5 grams of mineral in 100
36 | grams [21]. *Gelidium* sp. includesing one type of seaweed that produces agar. Gelatin
37 | content in *Gelidium* sp. ranges from 12-48% [11] The quality of agar depends on the strength
38 | of the raw material which can be influenced by several factors such as: intrinsic factor (type
39 | of seaweed), environmental factors (temperature and salinity during seaweed growth),
40 | harvesting factor (temperature, mixing with other types of seagrasses), post-harvest
41 | (seaweed) storage conditions ~~obtained~~used.

Formatted: Font: Italic

Formatted: Font: Italic

Formatted: Font: Italic

43 | *Eucheuma cottonii* is one type of red seaweed (Rhodophyceae) which is widely cultivated by
44 | the people of Indonesia. This type of red algae has been renamed *Eucheuma alvarezii* [6].
45 | However, because the carrageenan produced is the carrageenan kappa fraction, this
46 | species is taxonomically changed to *Kappaphycus alvarezii*, the name of the region "cottonii"
47 | is generally better known in the world of national to international trade [4].

Formatted: Font: Italic

Formatted: Font: Italic

Formatted: Font: Italic

49 | Carrageenan, which is a hydrocolloid compound which is a long chain polysaccharide
50 | compound extracted from seaweed species of caraginophytes, such as *Eucheuma* sp.,
51 | *Chondrus* sp., *Hypnea* sp., ~~A~~and *Gigartina* sp. Carrageenan can be divided into three types
52 | namely iotakaraganan, kappa-carrageenan, and lambda-carrageenan. All three differ like of
53 | the type of gel and its reaction to protein. Kappa-carrageenan forms a strong gel (rigid),
54 | whereas iotakaraganan forms a gel that is smooth (flaccid) and easily formed. Also, each
55 | carrageenan is produced by different types of seaweed. The solubility of carrageenan in
56 | water is influenced by several factors, including temperature, the presence of other organic
57 | compounds, salt that dissolves in water, and the type of carrageenan itself [10].

Formatted: Font: Italic

Formatted: Font: Italic

Formatted: Font: Italic

Formatted: Font: Italic

Comment [U1]: in

59 | 2. MATERIAL AND METHODS

61 | 2.1 Time-Period and Place of Research

62 | The research was conducted from February 2019 until March 2019. Organoleptic tests were
63 | carried out in the Laboratory of Fisheries Product Processing Faculty of Fisheries and
64 | Marine Sciences, University of Padjadjaran. Physical tests and chemical tests conducted at
65 | the Laboratory of Research and Biological Resources and Biotechnology Research Institute
66 | at the Society (LPPM), IPB, between February 2019 and March 2019.

68 | 2.2 Materials and Tools

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

Formatted: Font: Italic

Formatted: Font: Italic

Formatted: Font: Italic

74 | 2.3 Research methods Treatments

75 | ~~The results of the hedonic test were statistically analyzed using the Friedman Test and the~~
76 | ~~Bayes Method.~~ Theis formulation ~~is was~~ divided into five ~~parts~~constitutions, namely:

Formatted: Font: Italic

78 | a. *Gelidium* sp. : *Eucheuma cottonii* at 90%: 10% respectively

79 | b. *Gelidium* sp. : *Eucheuma cottonii* at 80%: 20% respectively

80 | c. *Gelidium* sp. : *Eucheuma cottonii* at 70%: 30% respectively

81 | d. *Gelidium* sp. : *Eucheuma cottonii* at 60%: 40% respectively

82 | e. *Gelidium* sp. : *Eucheuma cottonii* at 50%: 50% respectively

Formatted: Font: Italic

Formatted: Font: Italic

Formatted: Font: Italic

83 | 2.4 Procedures

84 | Research procedures were according to [20] that have been modified. This research
85 | procedure begins with the preparation of tools and materials, preparation of ~~n~~Nori, treatment
86 | and observation. The following are the stages. Preparation of dried seaweed material
87 | Gelidium sp. and Euचेuma cottonii, weighed as much as 50 grams and cleaned of dirt
88 | attached. The second stage, namely preparation for making ~~n~~Nori, starts from soaking in rice
89 | water with the aim to soften the dried seaweed network. Rice water used is 1000 mL,
90 | soaking is done for 1 x 24 hours. Then the next day, soaked in clean water for 2 x 24 hours,
91 | every 1 x 24 hours clean water must be replaced immediately. Clean water used as much as
92 | 1500 mL. Seaweed that has been cleaned, then weighed according to treatment and added
93 | as much as 200 ml of clean water, then crushed seaweed using a blender for 2 minutes. The
94 | puree is put into a baking dish and seasoned with salt such as 0.2 g, 1 gram sugar, 0.3 g
95 | flavoring, pepper 0.2 g, olive oil 2 mL, sesame oil 2 mL and fish sauce 2 mL. Puree is
96 | cooked using low heat for 10 minutes. Puree was measured using a measuring cup as much
97 | as 80 mL and poured on a baking sheet. The pan used has a size of 17 x 23 cm (outer size)
98 | and 15 x 20 cm (inner size). The puree in a baking pan was flattened using a plastic spatula.
99 | The puree thickness is calculated approximately 1 mm. Put in the oven with a setting of 70°C
100 | for 3 hours. The final stage in this research is observation, testing is done that is the hedonic
101 | level test

102

103 | 2.5 Observation Parameters

104 | The parameters for observing the level of preference included color, aroma, texture and
105 | taste. Thesed were teTested on-by 20 semi-trained panelists. Panelists can respond with
106 | varying degrees of liking. The scale used in organoleptic (hedonic) tests ranges from 1-9,
107 | namely: 1 (very dislike), 3 (dislike), 5 (neutral), 7 (like), 9 (very like). The acceptance limit for
108 | panelists' preference level is ≥ 5 , i.e. if the test product has a value equal to 5 or more than 5
109 | then the test product is liked by the panelists and if the product being tested receives a value
110 | of ≤ 5 then the product is declared not accepted by the panelists [18].

111

112 | 2.6 Data Analysis

113

114 | Analysis for organoleptic testing used a two-way analysis of the Friedman test variance with
115 | the Chi-square test. If the price of $H_c < x2\alpha$ (K-1), then accept H_0 and reject H_1 , and if the
116 | price of $H_c > x2\alpha$ (K-1), then H_0 is rejected and H_1 is accepted. If H_1 is accepted, then the
117 | treatment gives a real difference and the test is continued to find out the median values that
118 | are not the same and to find out the differences between treatments with multiple
119 | comparison tests [12].

120 | The test method used to determine the selected product is-was the Bayes method. The
121 | Bayes Method is one technique that can be used to analyze in the best decision-making of
122 | many alternatives to producing gains that take into account various criteria [12]. The results
123 | obtained are then discussed descriptively.

124

125 | 2.6.1 Hedonic Test

126 | Hedonic test is a test that aims to determine the level of consumer preferences for a product.
127 | There were 20 panelists in the hedonic test. Tests on the level of preference include
128 | appearance, aroma, taste and texture. Consumer favorite values, namely: 9 (really like); 7
129 | (likes); 5 (neutral / ordinary); 3 (don't like it); and 1 (very dislike) [18].

130

131 | 2.6.2 Chemical Test

132 | Chemical tests are-were carried out for the most preferred products. Chemical tests on ~~n~~Nori
133 | include the following:

134

135 | 2.6.2.1 Moisture Content (AOAC 1995)

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

138 | 2.6.2.2 Crude Fiber Levels (AOAC 1995)

139 | A total of 1 gram of sample was dissolved with 100 ml of H₂SO₄ 1.25%, heated to boiling
140 | and then continued with destruction for 30 minutes then filtered with filter paper and with the
141 | Buchner curving deadlock- 3 times-. The residue was redistributed with 1.25% NaOH for 30

Formatted: Font: Italic

Formatted: Font: Italic

Comment [U2]: include the formula

142 minutes. Then filter with the above method and rinse successively with 25 ml of boiling
 143 1.25% H₂SO₄, 25 ml of water three times and 25 ml of residual alcohol and filter paper
 144 transferred to a porcelain cup and dried in a 130°C oven for 2 hours after cold residue along
 145 with the porcelain cup are weighed (A), then put in a 600°C furnace for 30 minutes, cooled
 146 and re-weighed (B).

149 Information:

150 W = weight of residue before burning in the furnace
 151 = A - (weight of cup filter paper): A: residual weight + filter paper + cup
 152 W₀ = residual weight after burning in the furnace
 153 = B - (cup weight): B: residual weight + cup

155 3. Results and Discussion

156 3.1 Hedonic Test

157 3.1.1 Appearance

158 Organoleptic tests included appearance, aroma, texture and taste. Preference test ~~is was~~
 159 conducted to determine the level of panelists ~~on preference of~~ the products produced.
 160 Visibility is the first parameter that is pleasant to ~~see from appreciate in~~ a product.
 161 Observation of ~~an~~Nori appearance from seaweed Gelidium sp and Eucheuma cottonii
 162 presented in table 1.

164 **Table 1. Average Nori Appearance Based on Seaweed mix of**
 165 **Gelidium sp and Eucheuma cottonii**

Condition Mix <u>Gelidium sp.</u> (%) dan and <u>Eucheuma cottonii</u> (%)	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

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

170 The highest average value of panelists' preference level for the appearance of nori from a
 171 mixture of Gelidium sp. and Eucheuma cottonii, in Gelidium sp. and Eucheuma cottonii 70%:
 172 30% with a dark brownish brown appearance and a flatter surface or not many holes, while
 173 the lowest average in the treatment of ~~an~~Nori mixture containing Gelidium sp. and Eucheuma
 174 cottonii at 90%: 10% with dark green appearance and uneven surface with many holes. Nori
 175 treatment of Gelidium sp. and Eucheuma cottonii 80%: 20% with a green appearance and
 176 uneven surface and many holes on the nori sheets. Nori treatment of Gelidium sp. and
 177 Eucheuma cottonii 60%: 40% with a rather light green appearance and uneven surface and
 178 many holes on the nori sheets. Nori treatment of Gelidium sp. and Eucheuma cottonii 50%:
 179 50% with light green appearance and a flat surface on nori sheets.

181 3.1.2 Aroma

182 Aroma is one of the factors that influence panelists on a product. Aroma assessment aims to
 183 determine the deliciousness of the product based on the sense of smell. The results of
 184 observations of ~~an~~Nori aroma from Mix of Gelidium and Eucheuma cottonii seaweed are
 185 presented in Table 2.

187 **Table 2. Average Aroma of Nori Based on a mixture of Seaweed Gelidium sp and**
 188 **Eucheuma cottoni**

Condition Mix <u>Gelidium sp.</u> (%) dan and <u>Eucheuma cottonii</u> (%)	Median	Average
---	--------	---------

Formatted: Font: Italic

Formatted: Font: Not Italic

Formatted: Font: Italic

Formatted: Font: Italic

Formatted: Font: Italic

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

189 Note: The treatment that has a real level with the same letter shows no significant difference
190 according to the F test at 95% confidence level
191

192 Panelist assessment of the average *Nori* aroma of *Gelidium* sp. and *Eucheuma cottonii* with
193 differences in addition have an average range of 5.4 to 6.1 the average value of the highest
194 aroma that is at the addition of 70%: 30% with a distinctive aroma of seaweed with a
195 flavoring aroma, while the lowest value is the treatment 90%: 10% with less fragrant aroma
196 but still specific seaweed odor. The aroma of seasoning in the manufacturing process is
197 slightly more dominant than the typical aroma of seaweed. The test results obtained from the
198 Friedman statistical test showed that the 90%: 10% treatment to 50%: 50% treatment were
199 not significantly different. It is suspected that in each treatment the scent that is less smelled
200 from the processing.
201

Formatted: Font: Italic

Formatted: Font: Italic

202 According to [15], seasonings are all additives that improve the flavor of the product and can
203 affect the aroma. However, according to [14] that the aroma that can be felt by the sense of
204 smell depends on the ingredients and ingredients added to the food. The aroma that can be
205 generated by volatile components, but the volatile component can be lost during the
206 processing process, especially heat
207

208 3.1.3 Texture

209 Texture is one of the parameters of consumer preference for food products. Evaluation of
210 this parameter aims to determine the level of panelist acceptance of the level of elasticity or
211 flexibility of a product that can be assessed by the sense of touch, namely from the
212 stimulation of touch. Hedonic test results on the average *Nori* texture of *Gelidium* sp. and
213 *Eucheuma cottonii* are presented in table 3.
214

Formatted: Font: Italic

Formatted: Font: Italic

215 **Table 3. Average Nori Surface Texture Based on Treatment of Seaweed Mix of**
216 ***Gelidium* sp. and *Eucheuma cottonii***

Condition Mix <i>Gelidium</i> sp. (%) dan <i>Eucheuma cottonii</i> (%)	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

Formatted: Font: Italic

Formatted: Font: Italic

217 Note: The treatment that has a real level with the same letter shows no significant difference
218 according to the F test at 95% confidence level
219
220

Formatted: Font: Italic

221 Panelist assessment of the nori texture of *Gelidium* sp. and *Eucheuma cottonii* averaged
222 between 4.0 and 8.3, meaning that the texture of some treatments on nori mixture *Gelidium*
223 sp. and *Eucheuma cottonii* can still be accepted by people who are judges. The average
224 value of nori texture of *Gelidium* sp. and *Eucheuma cottonii* with the addition treatment of
225 60%: 40% and 50%: 50% were not significantly different from the treatment of 80%: 20%,
226 while the treatment of *Gelidium* sp. and *Eucheuma cottonii* 70%: 30% received relatively
227 higher values and significantly different from *Gelidium* sp. and *Eucheuma cottonii* 60%: 40%
228 and 50%: 50% but not significantly different from the treatment of 80%: 20%. The highest
229 average value of mixed nori textures of 70%: 30% has a value of 8.3 with a median of 9
230 which has a flexible and elastic texture. Whereas *Nori* mixture *Gelidium* sp. and *Eucheuma*

231 | *cottonii* with 90%: 10% treatment had the lowest median value of 3 and an average of 4.0.
 232 | This means that the treatment of 90%: 10% is significantly different from the treatment of
 233 | 80%: 20%, 70%: 30%, 60%: 40%, and 50%: 50%.

234 |
 235 | According to [7] the largest component of food is water 55-85%, so that the component can
 236 | affect the structure and texture of the processed foodstuff. *Eucheuma cottonii* ripening which
 237 | aims to remove carrageenan from the cell wall until the extraction process is modified to form
 238 | a film-like texture.

239 |
 240 | **3.1.4 Taste**

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

245 |
 246 | According to [18] the acceptance of each panelist to a type of product is generally strongly
 247 | influenced by the characteristics of taste, although the other parameters are good, if it has a
 248 | disliked taste then the product will be rejected. The average hedonic test on the *Nori* flavor
 249 | of *Gelidium* sp. and *Eucheuma cottonii* are presented in table 4.

250 | **Table 4. Average Nori Surface Sense Based on Treatment**
 251 | ***Gelidium* sp. And *Eucheuma cottonii***

Condition Mix <i>Gelidium</i> sp. (%) dan and <i>Eucheuma cottonii</i> (%)	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

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

254 |
 255 | Based on panelists' assessments of *Nori* flavors ranging from 5.0 to 7.2 it means that the
 256 | product is neutral or ordinary and preferred. The lowest average value occurred in the
 257 | treatment of adding 90%: 10% and the average is preferred in the treatment of 80%: 20%,
 258 | 70%: 30%, 60%: 40% and 50%: 50%. *Nori* treatment of *Gelidium* sp. and *Eucheuma cottonii*
 259 | 90%: 10% were not significantly different from the treatment 60%: 40% and 50%: 50% and
 260 | the treatment was not significantly different from the 80%: 20% treatment. However, this
 261 | treatment was not significantly different from 70%: 30% treatment. The 70%: 30% treatment
 262 | was significantly different from the 90%: 10% treatment 80%: 20%, 50%: 50% and the 70%:
 263 | 30% treatment got the highest average of 7.2 score.

264 |
 265 | In general, *Gelidium* sp. has a protein content of 16.1 - 12.5 gr [21], *Eucheuma cottonii* has a
 266 | protein content of 2.69% [23] that can cause the formation of a good taste in the mixture's
 267 | *Nori*. During the heating process, the protein will be denatured into free amino acids and
 268 | one amino acid, glutamic acid so that it can cause a delicious taste [22].

269 |
 270 | Most seaweeds contain quite a lot of aspartic acid and glutamic acid in the total composition
 271 | of amino acids [8]. Types of seaweed tested in vitro from soluble base proteins and water
 272 | including green seaweed (Chlorophyta), red (Rhodophyta) and brown (Phaeophyta)

273 |
 274 | **3.2 Bayes Method**

275 | The data of the pair comparison test results on the criteria of appearance, aroma, texture
 276 | and taste of the mixture of *Gelidium* sp. and *Eucheuma cottonii* from 20 panelists.
 277 | Completion of the results of the pairwise comparison was done by manipulating the

Formatted: Font: Italic

280 weighting matrix of the appearance, aroma, texture, and flavor characteristics of Gelidium
 281 sp. and Eucheuma cottonii.

283 **Table 5. Weighted Criteria for Nori *Gelidium* sp. and Eucheuma cottonii**

Criteria	Weighted criteriascore
Appearance	0,228
Aroma	0,097
Texture	0,140
Flavor	0,534

Formatted: Font: Italic

285
 286 Based on the table above, the calculation of criteria weights ranging from appearance to
 287 taste from nori mixture *Gelidium* sp. and *Eucheuma cottonii* produce the value that taste is
 288 the most important criterion for determining the final decision of a panelist in Nori Gelidium
 289 sp. and *Eucheuma cottonii* with a baseline weight criteria value of 0.534, while panelists
 290 assessed the appearance and texture with criteria weights of 0.228 and 0.140 followed by
 291 aroma criteria weight values of 0.097. This shows that other assessments are good but if the
 292 taste of the mixture is *Gelidium* sp. and *Eucheuma cottonii* is not favored by panelists, the
 293 product will be rejected by panelists.

Formatted: Font: Italic

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

Formatted: Font: Italic

Formatted: Font: Italic

300 **Table 6. Calculation of the Bayes Method**

The Conditions	Criteria				Alternative Value	Priority Value
	Appearance	Aroma	Texture	Flavor		
A	3	5	3	5	4.26	5
B	5	5	7	7	6.35	3
C	9	7	9	7	7.74	1
D	5	6	6	6	5.77	4
E	6	5	6	7	6.44	2
Weighted Criteria	0.228	0.097	0.140	0.534		

Formatted: Font: Italic

302
 303 The calculation table using Bayes method shows that the mixture of *Gelidium* sp. and
 304 *Eucheuma cottonii* at 70%: 30% obtained the highest alternative value of 7.74 followed by
 305 *Gelidium* sp. and *Eucheuma cottonii* at 50%: 50% have an alternative value of 6.44, followed
 306 by *Gelidium* sp. and *Eucheuma cottonii* at 80%: 20% have an alternative value of 6.35,
 307 followed by *Gelidium* sp. and *Eucheuma cottonii* 60%: 40% have an alternative value of
 308 5.77, and the lowest value of 4.26 by *Gelidium* sp. and *Eucheuma cottonii* at 90%: 10%.
 309 based on the observed preference test parameters, differences in the mixture of *Nori*
 310 *Gelidium* sp. and *Eucheuma cottonii* with a ratio of 70%: 30% is the best treatment and is
 311 was most preferred by panelists.

312
 313 **3.3 Chemical Testing**

314
 315 **3.3.1 Moisture Content**

316 Moisture test was carried out on Nori from *Gelidium* sp. by mixed withing *Eucheuma cottonii*
 317 at 70%: 30%. The results of the analysis of the water content obtained in the mixture of
 318 *Gelidium* sp. and *Eucheuma cottonii* which is was 15.35%. Drying *Nori* using oven results in
 319 some free water coming out and evaporating, resulting in a decrease in water content. The

Formatted: Font: Italic

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.

Formatted: Font: Italic

Formatted: Font: Italic

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 *Porphyr* sp. *Nori* is 7.5%. The difference in fiber content between *Nori* mixture *Gelidium* sp. and *Eucheuma cottonii* with *Nori* from *Porphyr* sp. caused by the fiber content in the product's raw material. Even this agrees with result of other research [16] that the mixture of *Eucheuma cottonii* and *Ulva lactuca* contains different ingredients from commercial *Nori* in general.

Formatted: Font: Italic

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 below.

Formatted: Font: Italic

Formatted: Font: Italic

Formatted: Font: Italic

Table 7: Overall Observations per treatments

Observations	90% :10%	80%:20%	70%:30%	60%:40%	50%:50%
Hedonic					
Appearance	3	5	9	5	6
Aroma	5	5	7	6	5
Textsture	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

Formatted: Font: Italic

Formatted: Font: Italic

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 *Eucheuma cottonii* is the most preferred panelist and has the highest value. But in the treatment of mixture *Nori* *Gelidium* sp. and *Eucheuma cottonii* 90%: 10% appearance and texture of this treatment were rejected by the panelists, but the aroma and taste are still neutral.

Formatted: Font: Italic

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*.

Formatted: Font: Italic

Formatted: Font: Italic

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% is was the most preferred *Nori* of compared to various other treatments.

Formatted: Font: Italic

Formatted: Font: Italic

358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415

4. Conclusions

Based on these research results, the treatment of adding a mixture of *Gelidium* sp. and *Eucheuma cottonii* at 70%: 30% was the most preferred by panelists. Nori mixture of *Gelidium* sp. and *Eucheuma cottonii* at 70%: 30% had a value of appearance value 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.

Referensi :

- [1] Andarwulan, N., Kusnandar, F., Herawati, D. 2011. *Analisis Pangan*. Dian Rakyat. Jakarta.
- [2] AOAC. 1995. Official Methods of Analysis the Association of Official analytical And Chemis. 16 th editor. virginia. AOAC Inc Arlington.
- [3] Aslan, L. M. 1991. *Budidaya Rumput Laut*. Kanisius. Yogyakarta.
- [4] Atmadja, W.S., A. Kadi, Sulistijo, dan Radiamanias. 1996. *Pengenalan Jenis-Jenis Rumput Laut Laut di Indonesia*. Puslitbang Oseanografi. LIPI. Jakarta.
- [5] Atmadja, W.S. 2012. *Pengendalian Helopeltis secara Terpadu pada Tanaman Perkebunan*. Balai Penelitian Tanaman Rempah dan Obat. Bogor. 25 hlm.
- [6] Doty, M.S. 1985. *Taxonomy of Economic Seaweeds: Eucheuma alvarezii sp.nov (Gigartinales, Rhodophyta) from Malaysia*. California Sea Grant College Program. 37 – 45.
- [7] Edwards, M. 1995. *Change in Cell Structure. In Physico-Chemical Aspects of Food Processing. New York*. edited by S.T. Beckett. Blackie Academic and Professional.
- [8] Fleurence, J. 1999. Seaweed Protein: Biochemistry, Nutritional Aspects and Potential Uses. *Review of Trends in Food Chemistry*, 10 : 25-28
- [9] Handayani, T. 2006. Protein Pada Rumput Laut. *Jurnal Oseana*.ISSN 0216-1877 Volume XXXI, No 4, tahun 2006 : 23-30
- [10] Istini, S., Jana T., Anggadiretdja., Achmad Zatznika., Heri Purwoto. 2006. *Rumput Laut Pembudidayaan, Pengolahan dan Pemasaran komoditas perikanan potensial*. Penebar Swadaya. Depok.
- [11] Kadi, A dan Atmadja W.S. 1988. *Rumput Laut (Algae). Jenis-jenis Reproduksi Budidaya dan Paca Panen*. Pusat Penelitian dan Pengembangan Oseanografi-LIPI. Jakarta.
- [12] Marimin, M.Sc., Prof., Dr., Ir. 2004. *Teknik dan Aplikasi Pengambil Keputusan Kriteria Majemuk*. PT.Gramedia Widiasarana Indonesia. Jakarta.
- [13] McHugh, Dennys J. 2003. *A Guide to the Seaweed Industry*. FAO FISHER. Canberra.
- [14] Rahmawati, A. 2016. Pengaruh Perbandingan Penambahan Daun Katuk dan Lama Pengeringan Terhadap karakteristik Fruit Nori Pisang. *Skripsi*. Universitas Pasundan. Bandung.
- [15] Rezekiana, M. 2015. *Pengaruh Penambahan Karagenan pada Pembuatan Nori Fungsional Lidah Buaya (Aloe barbadensis)*. Skripsi. Fakultas Teknologi Pertanian, Universitas Brawijaya, Malang.

Formatted: Font: Italic

Formatted: Font: Italic

Formatted: Font: Italic

Formatted: Font: Italic

- 416
417 [16] Sajida. 2016. Karakteristik Produk Nori Dari Rumput Laut Campuran *Ulva lactuca* dan
418 *Eucheuma cottoni*. *Skripsi*. Departemen Ilmu dan Teknologi Pangan. Fakultas
419 Teknologi Pertanian. Institut Pertanian Bogor. Bogor.
420
- 421 [17] Soegiarto A., W.S. Atmadja, Sulistijo dan H. Mubarak, 1978. *Rumput Laut (Algae);*
422 *Manfaat, Potensi dan Usaha Budidayanya*. Lembaga Oseanologi Nasional LIPI.
423 Jakarta. 61 hal.
424
- 425 [18] Soekarto, S.T. 1985. *Penilaian Organoleptik (untuk Industri Pangan dan Hasil*
426 *Pertanian)*. Penerbit Bharata Karya Aksara, Jakarta.
427
- 428 [19] Santoso, D. 2007. Pemanfaatan Rumput Laut Gelidium sp Dalam Pembuatan Permen
429 Jelly. *Skripsi*. Program Studi Teknologi Hasil Perikanan. Fakultas Perikanan dan
430 Ilmu Kelautan. Institut Pertanian Bogor. Bogor.
431
- 432 [20] Teddy M,S. 2009. Pembuatan Nori Secara Tradisional Dari Rumput Laut Jenis
433 *Glacilaria sp*. *Skripsi*. Program Studi Teknologi Hasil Perairan. Fakultas Perikanan
434 dan Ilmu Kelautan. Institut Pertanian Bogor. Bogor.
435
- 436 [21] Trono, G.C dan Reine, W.F. 2002. *Plant Resources of South-East Asia. Prosea*
437 *Foundation*. Bogor.
438
- 439 [22] Winarno F.G. 1997. *Kimia Pangan dan Gizi*. Gramedia Pustaka Utama. Jakarta.
440
- 441 [23] Yani, H. I. 2006. Karakteristik Fisik Kimia Permen Jelly dari Rumput Laut *Eucheuma*
442 *spinosum* dan *Eucheuma cottonii*. *Skripsi*. Program Studi Teknologi Hasil Perikanan,
443 Institut Pertanian Bogor, Bogor.
444
445
446