LOCAL ALGINATE AS A FOOD ADDITIVE AND NUTRITIONAL IMPROVEMENT FOR WHITE BREAD

Nonok Supartini[1], Wahyu Mushollaeni[2]*

[1]Study Program of Animal Husbandry, University of Tribhuwana Tunggadewi, Indonesia,
E-mail: nonik_76@yahoo.com, +6281334271939
[2]Study Program of Agroindustrial Technology, University of Tribhuwana Tunggadewi, Indonesia
e-mail: wahyu.mushollaeni@gmail.com, +628123365348, *corresponding author

ABSTRACT

Alginate extracted from brown seaweed derived from rocky coastal area of Yogyakarta Indonesia has been proven non-toxic and has a hypocholesterolemic effect. This research aims to get the type and concentration of alginate extracted from *Sargassum* sp. and *Turbinaria* sp. derived from rocky coastal area of Yogyakarta to produce white bread with the best quality in nutrition. The results showed that the use of 1.5% alginate extracted from *Turbinaria* sp., has ability to produce white bread with the best nutritional and physical quality. The protein content, fat, water, ash, carbohydrates, total fiber, total salt and total sugars of bread with the best formulations respectively 9%; 5.93%; 27.84%; 1.42%; 55.81%; 2.91%; 0.64%; and 8.92%. That bread is contains soluble dietary fiber (32.52%), which is very good to be consumed daily.

Keywords: alginate, white bread, health effects, dietary fiber, food additive

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INTRODUCTION

White bread is sold in the market are generally only made from flour, water, salt and yeast. Along with requirement to improve the physical and nutritional quality of bread, manufacturers tend to add food additives with an excessive amount, for example bread improver. Bread improver is a synthetic food additive which serves to increase the volume of bread, as well as soften the texture and stabilize the bread dough. Bread often contain food additives such as emulsifiers and enzymes, for example sodium stearoyl lactylate and maltogenic amylase which acts as an anti-staling so that it can extend the shelf life (Gomes-Ruffi *et al*., 2012). Food additives are included in synthetic materials, which if used excessively will cause toxicity to the health. White bread sold in the market although it has had a good physical quality, but the composition of dietary fiber and protein is very low. White (2012) states that consumption of white bread in high quantities continuously, it is not recommended because of the nutrients and fiber are very low. This is caused by the use of wheat that does not come from whole grains. The color of the flour is also bleached so that the fiber content is very low and nearly 25% protein has been lost (Steinhilber, 2015). Another disadvantage of white bread is possible to contain residues of bleach is used during the process of bleaching flour, including potassium bromate (Kim, 2013). These chemicals can not be contained in a food product in excess amount. Therefore, it needs food additive that is more natural, safe and not toxic if consumed, such as alginate.

Alginate is the main constituent of the cell walls of brown seaweeds (Moe et al. 1996) and generally in the form of sodium alginate which has a water-soluble properties. Brown seaweed *Sargassum* sp. and *Turbinaria* sp. can grow on rocky coasts in Indonesia in abundance and are available throughout the year in waters off the rocky area of Yogyakarta. To date this has never been demonstrated its potential as a producer of alginate and used in food products. The function of alginate in the food industry such as a thickener (Gujral et al.

2001; Mancini et al. 2002; Brownlee et al., 2005), and as a stabilizer of food such as to stabilize the ice cream, softens the texture of the cake, as well as stabilizing mixtures, dispersions and emulsions. This relates to the nature of the alginate as a gelling agents and viscosity (Toft et al. 1986; Gomez-Diaz and Navaza, 2004; Yunizal, 2004; Ferreira et al. 2005; Paraskevopoulou et al. 2006). In bakery products, the addition of alginate can prevent the occurrence of staling and soften the crumb texture.

The addition of 0.75% alginate extracted from S. *duplicatum* into the cake batter, can soften the texture of the cake even without the addition of cake improver. The addition of alginate is also able to prevent hardening of the cake (Mushollaeni and Sriwaningsih, 2012). The ability of alginate is also in accordance with the research of Wang et al. (2007) that the alginate is suitable as a coating material for food products. Alginate gel can build material permeability to water and oxygen, so that the food product is not easy to dry and protect against possible damage to the nutritional components that are sensitive to oxygen. Alginate has the ability to bind water (water holding capacity) so the bread does not dry quickly due to low air humidity (Yunizal, 2004). To the present, no studies have argued about the use of alginate extracted from brown seaweeds (BS) from the waters of the rocky area of Yogyakarta in food products, particularly in the white bread. Therefore in this study will apply the alginate to improve the quality of white bread, so if consumed would provide nutritional value better and healthier for the body.

MATERIALS AND METHODS

Alginate extractions

Sargassum echinocarpum and Turbinaria decurrens obtained from the rocky coast of Yogyakarta, cleaned, cut ±1 cm, washed and dried in the sun for 2-3 days until the water level is ±13.5%. Leaching was conducted in two stages, the immersion in a solution of CaCl2 and

HCl. The next stage are soaking with KOH solution to remove impurities dissolved in alkali. Extraction was conducted with Na2CO3 2.5% for one hour at 50 ° C. Bleaching treatment is done by immersion in NaOCl solution that serves as bleaching agents, which can oxidize the dye from darker colors become more vibrant colors. Precipitation of alginic acid aims to obtain alginic acid by adding a solution of HCl. The deposition was conducted at pH 2.8 to 3.2. The precipitate formed alginic acid, washed and separated from the solution. Stage to neutralize the mixture is done by using a solution of Na2CO3 until pH 5-10. Alginate in the form of sodium alginate, can be separated from the solution by the addition of 95% isopropyl alcohol (Mushollaeni and Sriwaningsih, 2011).

Enriched bread making

Making enriched white bread with alginates (EWBA) is based on the method of Rauf and Sarbini (2015) which has been modified. The proportion of ingredients used in the making enriched white bread flour is 53.39%; 1.25% fermented bean flour; 5.46% sugar; 4.37% egg yolk; 3.28% full cream milk powder; 1.09% yeast; 0.44% salt; 21.86% UHT milk; 4.37% 3.83% water and butter. Dry ingredients and wet ingredients are mixed separately, then both types of material are mixed after each homogeneous. Fermentation is performed three times. Fermentation is performed for 30 minutes, 15 minutes and 15 minutes. Conditioning process conducted for 15 minutes. Baking bread dough conducted for 30 minutes at a temperature of 150^{o}C.

Water content analysis with oven method

Sample container dried in oven for 15 minutes and cooled in a desiccator, and then weighed. A total of 2 g sample is inserted in the sample container which has been weighed and then dried in the oven at 100-105oC for 6 hours. Sample container and sample therein, is inserted into the desiccator, cooled, and weighed. Drying is performed again until a constant weight. The water content was calculated based on the weight loss is the difference between the initial weight with the final weight (AOAC International, 1995).

Analysis of protein content by Kjeldahl method

A sample of 0.2 grams is weighed and transferred to the flask kjeldahl, then added 1.9 grams of K_2SO_4, 40 mg HgO and 2 ml of concentrated H_2SO_4. Destruction of the mixture is carried out in the hood for ± 1.5 hours until the liquid becomes clear and cooled. In cold conditions, distilled water is added to the mixture slowly through the outskirts of the flask. The mixture was transferred into a distillation apparatus and rinsed several times with distilled water. Erlenmeyer as a container vessel containing a solution of 5 ml of H_3BO_3 3%, and 3 drops of indicator methyl red and methylene blue is installed below the condenser. The tip of the condenser tube submerged in H_3BO_3. NaOH-$Na_2S_2O_3$ as much as 8-10 ml was added into the distillation equipment. Distillation is done until accommodated ± 50 ml distillate in the Erlenmeyer. Distillate titrated with HCl 0,02N until it changes color. The same procedure was conducted on a blank sample (AOAC International, 1995).

$$\% \text{ N} = \frac{(ml\ HCl - ml\ blanksample) \times N\ HCl \times 14{,}007 \times 100}{mg\ sample}$$

$$\% \text{ protein} = \% \text{ N} \times 6{,}25$$

Analysis of ash content

Crucible porcelain dried in an oven at 100oC for 15 minutes, cooled in a desiccator for 10 minutes and then weighed. A total of 3-5 g sample is weighed in a porcelain crucible. The crucible containing the sample was burned in a furnace for 6 hours to form an ash and cooled in a desiccator for 15 minutes, then weighed (AOAC International, 1995).

Analysis of fat content

A total of 2 g of sample weighed in the Erlenmeyer, add 30 ml of HCl 25% and 20 ml of water and then boiled for 15 minutes. The sample solution is then filtered with filter paper in a hot and washed with hot water until the acid does not react anymore. Paper filters are used to filter the sample solution is dried and its contents at a temperature of 100-105oC. Filter paper containing the sample was added to a special wrapping paper that has been fitted with cotton at the edges, and then formed into a tube shape. The tube is extracted by hexane for 2-3 hours at a temperature of ± 80 ° C. Fat result of the extraction process is heated in an oven at a temperature of 100-105 ° C, cooled in a desiccator, and weighed (AOAC International, 1995).

Carbohydrate content analysis

Content of carbohydrates are calculated by *total carbohydrate by difference method* (FAO, 2003; Lestari *et al.*, 2013).

Analysis of total fiber

4 g of sample added to lead, then inserted into soxhlet apparatus. Cooling behind on a soxhlet apparatus is installed and connected to the 250 ml flask already containing 100 ml of n-hexane, then poured water as a coolant. The extraction is done more or less for 4 hours, until the solvent went back down to the colored clear round bottom flask. Drying in the oven at 50°C to constant weight. Transferred into a 500 ml erlenmeyer, was added 200 ml of 0.2 N H2SO4 solution, associated with cooling behind, and boiled for 30 minutes. Subsequently, the residue was filtered and washed with distilled water filter paper 80-90oC temperature heat until the water discharged is not acidic again. The residue was transferred into the Erlenmeyer, then added 0.3 N NaOH solution of 200 ml and is associated with cooling behind, then boiled for 30 minutes. Filtering is done with a dry filter paper of known weight,

then the residue was washed with 25 ml of 10% K2SO4 solution, washed with 15 ml of hot distilled water at a temperature of 80-90oC, and then washed with 15 ml of 95% alcohol. Dried filter paper with contents in an oven at a temperature of 105oC, cooled in a desiccator and weighed to constant weight (FAO, 2003; Lestari *et al.*, 2013).

Analysis of total sugar

The total sugar content analysis using the Nelson-Somogyi method of AOAC (1995) with slight modifications. Samples of bread that has been mashed, then weighed as much as 3 g and dissolved in 25 ml of distilled water. The mixture was put in a flask of 200 ml and then diluted to 200 ml and filtered. The filtrate is collected in a 250 ml flask and diluted to the extent, then taken as many as 15 ml and put in a test tube. The mixture was added with 6 ml of HCl 25%, then heated at 70 ° C for 10 minutes, cooled and added to 250 ml flask. The solution dilution carried to the limit and take 15 ml as a trailer. Snippets included in the test tube and add 2 drops of indicator PP, then titrated with NaOH 1 N to pink and then recorded NaOH used. A total of 15 ml of the sample that has been titrated, pipette and placed in a 100 ml flask, diluted to the extent, and taken 1 ml to be included in the test tube. The sample in a test tube is then added 1 ml of reagent Nelson C and then heated for 20 minutes at a temperature of boiling water, cooled and then added 1 ml arsenomolibdat divortex. The sample is then added to 7 ml of distilled water and vortexed. The absorbance at 540 nm (expressed as A) (AOAC International, 1995).

$$\text{Total sugar} = \left[\frac{(A \times dilution\ factor)}{mg\ sample}\right] \times 100\%$$

Analysis of total salt

Analysis of total salt use Mohr method, 1 g of sample was weighed and put into a 100 mL volumetric flask, diluted to mark boundaries. The mixture is shaken until homogeneous, then filtered. The filtrate pipette of 25 mL and added K2CrO4 indicators as much as 2 mL of 5%, then titrated using 0.01 N AgNO3 solution until a brick-red color (AOAC International, 1995).

$$\% \text{ NaCl} = \left[\frac{\{(vol\ titration - N\ AgNO3) x dilution\ factor x BE\ NaCl\}}{weight\ of\ sample x 1000}\right] x\ 100\%$$

RESULTS AND DISCUSSION

EWBA process

Materials and manufacturing processes EWBA in this study was based on a method developed by Rauf and Sarbini (2015) which uses the basic ingredients are flour, butter, salt, sugar, yeast, and emulsifiers. Stages of the manufacturing process has undergone modifications and the addition of support material. These materials include alginate, milk and fermented bean flour. Referring to the definition of white bread in https://www.vocabulary.com (2016) is bread made from white flour with the help of yeast and baked until the top surface layer to form a crust of bread, then in this study also uses white wheat. The materials used in the manufacture of EWBA in this study, segregated between materials in the solid form (material A) with a liquid material (material B). Interest separation of the two kinds of material is to form a homogeneous mixture in each type of material. If both types of materials had homogenous, then the process of mixing the ingredients A and B will form a perfect hydration on carbohydrates and proteins, forming and soften glutein, as well as hold on glutein gas. Justicia et al. (2012) states that the viscoelastic dough mass will be formed both when mixture of flour and water is formed by the homogeneous, so that the roasting time will form a soft texture of the bread and the skin crispy bread. The addition of alginate concentration of each type of Turbinaria sp. and Sargassum sp. is as much as 1%; 1.5% and 2%. Addition of alginate concentration is calculated from the weight of the total.

Reason uses alginate concentrations are based on research and Sriwaningsih Mushollaeni (2014) have proved that there is no real toxic effect of the concentration of clinical use in the test mice. The increasing concentration of alginate is added, the dough will be stiff and vice versa when less (<1.5%) dough will be sticky. Butter as much as 3.38% is added to the mixture has been homogenized. Function as a softening butter dough and soften the texture. Koswara (2009) asserts that the fat in butter as a bread enhancer, so as to increase the nutritional value and flavor. In addition, fat can help hold moisture in the bread which results in excellent condition and texture of the bread still does not become hard during storage. EWBA fermentation process occurs due to the work of the yeast Saccharomyces cerevisiae. During the fermentation process, the CO_2 will be formed from the metabolism of the yeast. Yeast will use traditional carbon sources (sugar) to support life, so it will produce ethanol and CO_2 (Brown, 2013).

Protein content (%)

EWBA protein levels increased along with increased concentrations of alginate are added, both derived from Sargassum sp. or from Turbinaria sp. The protein content EWBA with the addition of each of the two types of alginate, showed almost the same value. This shows the effect of increased levels of protein EWBA made possible not so much affected by the protein content of the alginate, but comes from Addition of other materials that contain high in protein such as eggs and milk. According to Dumay and Morançais (2016), BS protein levels tend to be lower than other types of macroalgae that is 3% -15%. Reinforced also by Hou et al. (2015) that the protein content of around 10% BS. ANOVA test results showed no significant differences among the treatments.

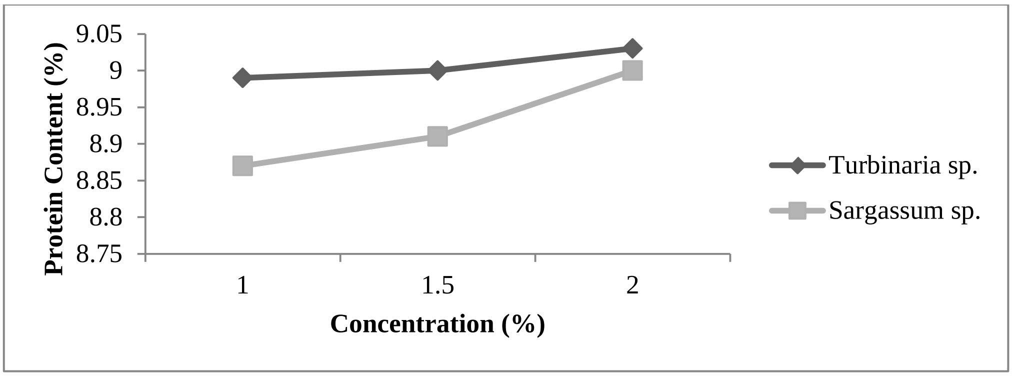

Figure 1. Correlation between the type of alginate and alginate concentration toward the protein content of EWBA

Fat content (%)

The average fat content between treatment types of alginate of Turbinaria sp. is 6.051% and of Sargassum sp. is 6.173%. EWBA highest levels of fat in the treatment of alginate types Turbinaria sp. and Sargassum sp. with the addition of 2% alginate. The highest content of the entire combination treatment is by addition of 2% alginate from Sargassum sp. The average fat content EWBA, can be seen in Fig. 2. Based on the test ANOVA, showed no significant differences among the treatments.

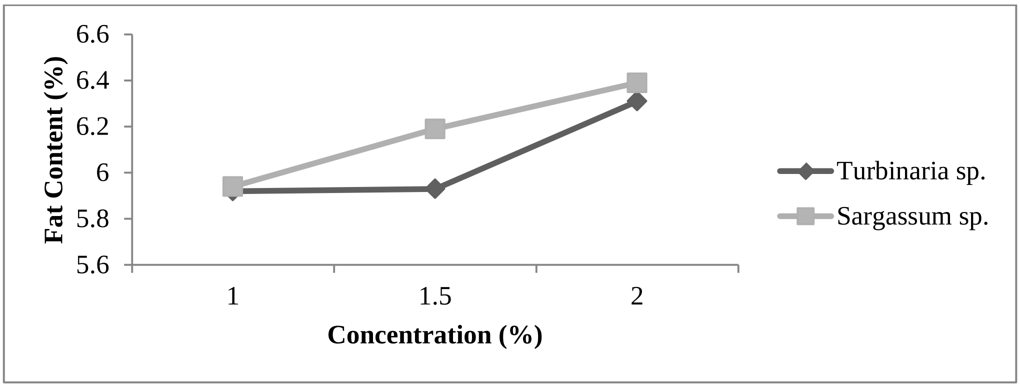

Figure 2. Correlation between the type of alginate and alginate concentration toward the fat content of EWBA

EWBA fat content is quite high when compared to the levels of fat in white bread brands sariroti ie 4.05 g / 100 g (http://www.sariroti.com). Seaweed contains very little fat. Seaweeds are generally storing food reserves in the form of carbohydrates, especially polysaccharides. Fat content in brown seaweed Sargassum sp. based on the research of Handy et al. (2004) is 1.63% with the composition of fatty acids include lauric acid (12: 0) 1.45%; myristic acid (14: 0) 3.53%; palmitic acid (16: 0) 29.49%; palmitoleic acid (16: 1) 4.10%; oleic acid (18: 1) 13.78%; linoleic acid (18: 2) 33.58% and linolenic acid (18: 3) 5.94%. Confirmed by Manns et al. (2014), the fat content in BS is very low compared to the levels of other components at less than 2%. Based on this, a high enough fat content of EWBA made possible by the additional fat derived from eggs, butter and full cream milk is also used as an additive.

Water content (%)

EWBA water content for the entire treatment is between 27.423% -28.940%. Based on the results of chemical analysis, treatment with the addition of alginate types Turbinaria sp. contributes to the increased water content EWBA higher than Sargassum sp. Based on the ANOVA test results showed that there was no significant difference between the treatment of the water content. Alginate is a hydrophilic colloid. Its colloidal lead alginate can be gelled and the nature of hydrophylic side can bind water. This condition is reinforced by research Yunizal (2004), the water content is higher in sodium alginate caused by the influence of salt is hygroscopic in alginate, so it is possible binding of water better. The water content of the alginate type Turbinaria sp. higher (13.4%) than Sargassum sp. (12.75%). It also resulted in the increasing concentration of alginate types Turbinaria sp. is added, it will increase the moisture content and water content EWBA EWBA will be higher than with Addition of alginate Sargassum sp. The amount of water content and the incidence of water migration into the bread, can be the cause of staling. Noer (2011) states that the alginate can lower crumb staling during storage, so that the bread is not prone to hardening of the texture during storage. Based on SNI 01-3840-1995, the water content of the resulting EWBA still meet the standard bread that is a maximum of 40%.

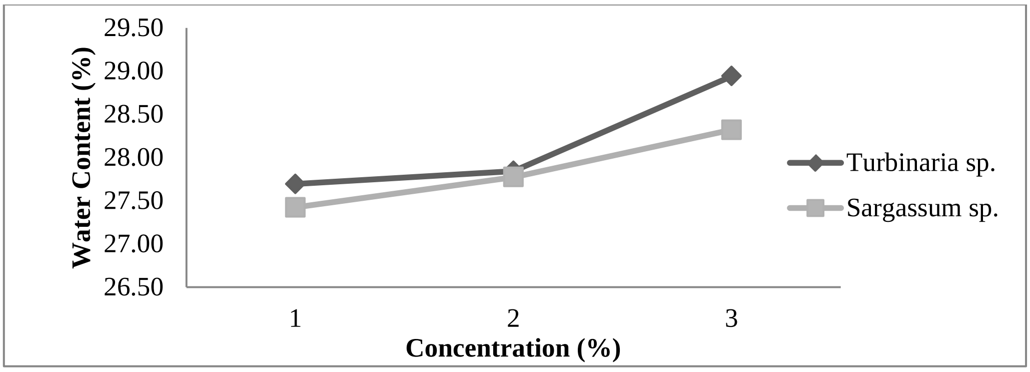

Figure 3. Correlation between the type of alginate and alginate concentration toward the water content of EWBA

Ash content (%)

Ash is a component in food products that are important to determine the levels of minerals in the product. The ash content in a product is affected by the ash content of a substance that is added to the product. The ash content in EWBA also influenced by the alginate was added. The increasing concentration of both kinds BS alginate is added to the dough EWBA, showed elevated levels of ash EWBA. This shows that the ash content is the content of minerals in the alginate has influenced and increased the ash content in EWBA. The ash content in BS reflect the mineral content in it with varying amounts of 15% -39% (Manns et al., 2014) or 7% -38% (Zailanie and Kartikaningsih, 2016). The ash content of the alginate is different in each type and shows the differences in the amount of mineral salts that attach to the surface of the seaweed and contains. The highest mineral components BS in general that halogen compounds (Br and I), as well as sodium and chlorine compounds in varying amounts (Salasa, 2002; Truss et al, 2001). Mineralization in BS Sargassum sp. among which potassium

(4170 mg / 100 g), sodium (3250 mg / 100 g), phosphorus (120 mg / 100 g) of calcium (66.98 mg / 100 g) mentioned by Peng et al. (2013), and 12.01% -15.53% in the form of macro minerals (Na, K, Ca and Mg) and 7.53% -71.53 mg / 100 g in the form of trace minerals (Fe, Zn, Cu, Se and I (Matanjun et al., 2009). Moreover, according to Dharmananda (2002) that the calcium content of seaweed is generally around 4-7% of the dry weight, or about 4000-7000 mg / 100 g dry weight. the ash content of alginate of the type Turbinaria sp. by 20.10% higher than the ash content of the alginate Sargassum sp. which amounted to 19% (Mushollaeni and Sriwaningsih, 2011). the addition of sodium alginate on bread give real effect to the increase in the ash content of white bread. Based on the results EWBA ash content analysis, showed an average of less than 3%. average EWBA ash content ranging from 1.2% -1.55%, so that the resulting ash content EWBA SNI 01-3840-1995 meet the standard that is less than 3%.

Table 1. The average of ash content

Treatment	Average of ash content
	Turbinaria (a)
1	1.400 a
2	1.420 a
3	1.550 b
	Sargassum (b)
1	1.167 a
2	1.203 a
3	1.473 b

Carbohydrate content (%)

The average levels of carbohydrate in the alginate is 17% -45% (Mushollaeni and Sriwaningsih, 2011). Differences in the carbohydrate concentration and alginate BS is influenced by differences in the location of the site, the extraction method, the season and the type of BS (Manns et al., 2014). Trivedi et al. (2015) states that the carbohydrate content in BS is high at 21% -33%, but still lower than the green sea grass (33% -58%) and red seaweed

(31% -61%). ANOVA results showed no significant differences between the treatment of carbohydrate content. The highest levels of carbohydrates obtained from EWBA added alginate from Sargassum sp. Based on analysis of the purity of alginate, BS Sargassum sp. (17% -28%) had higher levels of a type of Turbinaria sp. (20% -22%), so that the levels of carbohydrates EWBA added alginate from Sargassum sp. have a higher carbohydrate levels (Mushollaeni and Sriwaningsih, 2011). Besides alginates, BS also contain other components including fiber and fucoidan varying amounts. Along with increased concentrations of alginate Addition of of each of the two types of alginate, decreased carbohydrate levels EWBA generated. This is related to the increasing carbohydrates are degraded into simpler sugars that are used by yeast in the process of metabolism.

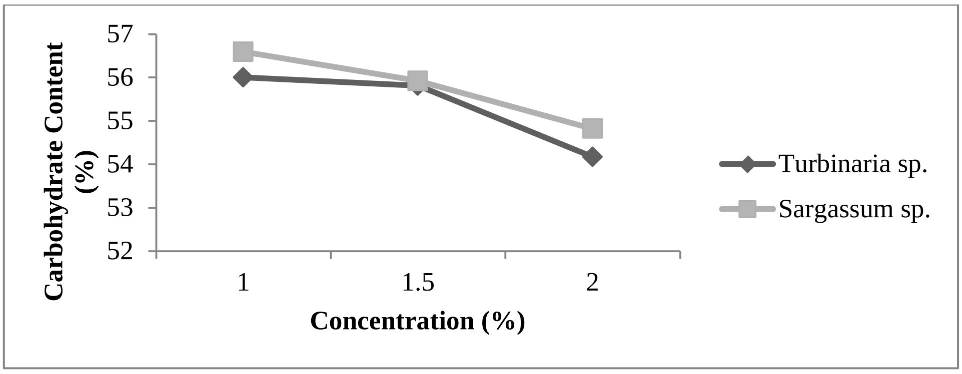

Figure 4. Correlation between the type of alginate and alginate concentration toward the carbohydrate content of EWBA.

Total of Crude Fiber (%)

The test of the total fiber in this study is testing the total levels of crude fiber (crude fiber). Crude fiber in the food product is a residue of the solvent extraction process in the food product in a solution of acetic, nitric acid and trichloroacetic acid (https://www.icc.or.at).

Olvera-Novoa et al. (1994) also stresses the definition of crude fiber is the residue in a material that has been extracted and dissolved in sulfuric acid and NaOH. Crude fiber-containing components that are insoluble in a food product that is cellulose, pentose, lignin and other components that have the same solubility properties (http://www.foodscience-avenue.com). Zailanie and Kartikaningsih (2016) states that the total level of fiber in BS 3%. The results of chemical analyzes show the results EWBA fiber content is added alginate of the type Turbinaria sp. having an average fiber content higher than EWBA with alginate Sargassum sp. Based on the results of the study, the levels of soluble and insoluble fiber contained in alginate types Turbinaria sp. showed higher values than those contained in alginate Sargassum sp. Soluble fiber content (% bk) of alginate types Turbinaria sp. and Sargassum sp. are 32.52 and 27.54. Insoluble fiber content of the alginate are respectively 36.68 and 31.06. Total dietary fiber content of the alginate type Turbinaria sp. higher than Sargassum sp. (Mushollaeni dan Sriwaningsih, 2015). Data in soluble fiber and insoluble from both types of alginate can be useful to supplement data on the potential of the fiber content of food on EWBA. Testing the effect of type (Turbinaria sp. and Sargassum sp.) With concentrations (1%, 1.5% and 2%) were lodged on the type, the fiber content is done using a nested ANOVA. Based on the ANOVA test results, obtained at the source of a variety of factors Fhitung kind with a value greater than the value 6.860 Ftabel, and the significant value in kind factor of 0.022 is smaller than the value α of 5%, so that otherwise there is a real difference between the treatment of the fiber content. The real difference between the treatment also occurs on the concentration factor that is nested on the types of factors Fhitung 105.091 value greater than F table, and the significance value α is smaller than 5%. Further tests to determine differences in average levels of fiber on a factor in the type and concentration factors also are nesting on factors kind, performed using LSD 5%.

Table 3. The average of the total fiber content

Treatment	Average of the total fiber content
	Turbinaria (a)
1	2.673 a
2	2.907 b
3	3.177 c
	Sargassum (b)
1	2.580 a
2	2.897 b
3	3.117 c

Total of salt content (%)

EWBA salt content ranges from 0.587% to 0.667%. Salinity is in compliance with the provisions of SNI 01-3840-1995 due to lower than the maximum limit of 2.5%. The main function of the presence of salt in bread dough which is to strengthen the gluten and helps control the fermentation activity of the yeast. Proper salt concentration will result in an optimal fermentation rate, due to the activity of the yeast goes well. When the fermentation activity goes well, then the pores will be formed and texture of the bread becomes finer. Salt also serves to form the texture of dough, so that the dough does not mushy (Koswara, 2009). The salt also has astringent effect that is able to minimize pores bread. Salt added to bread dough EWBA is 0.44% of the total weight of the material. This amount is lower than the amount of salt is usually added to the bread, so that with the addition of alginate which also contains the building blocks of salt can play a multiple role not only as a flavoring but also to simultaneously play a role in the function of forming the texture. The use of both types of alginate in the batter, resulting EWBA with chemical quality is almost the same, but differ in physical condition. The pattern of pores and volume EWBA development is different in each concentration. The concentration of alginate Addition of as much as 1% and 2% gave a pore EWBA pattern sizes are not uniform. The size of pores in the alginate Addition of as much as

2% greater than 1%. The size and shape of the pores EWBA with the addition of alginate, 1.5% more uniform than the concentration of other additions. Addition of alginate concentrations lower and higher than 1.5% does not provide volume EWBA better development. EWBA containing alginate concentration of 1% tend to be more dense and soft, while EWBA with 2% alginate concentrations tend to be more rigid and has a rougher texture. Consistency, texture, shape and taste well formed on the addition of alginate to a concentration of 1.5%. This is consistent with the use of salt in normal circumstances to make bread ranges from 1.5% to 2%.

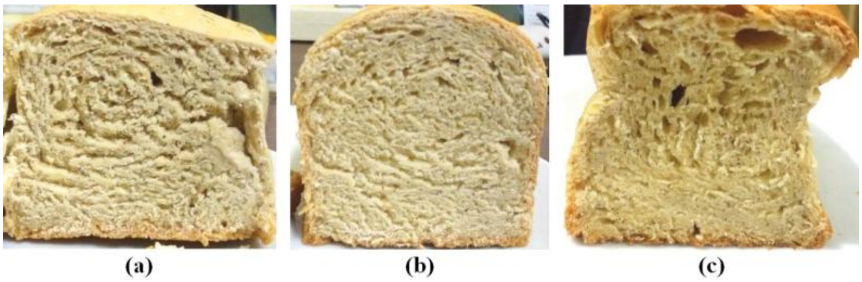

Figure 5. Pores pattern and volume of EWBA, (a) 1%, (b) 1.5%, (c) 2% of alginate.

The use of alginate of BS types of *Turbinaria* sp. provide EWBA softer texture than with Sargassum sp. EWBA added with alginate type Turbinaria sp. or Sargassum sp., both showed the same physical conditions in the texture and consistency is best obtained by the addition of 1.5% alginate. The taste of EWBA with Addition of alginate concentrations lower than 1.5% will give a bland taste. This is consistent with the statement of Koswara (2009) that the salt content of less than 1.5% will give a bland flavor and more than 2% will inhibit the fermentation rate.

Figure 6. The texture of EWBA with the addition of alginate (a) *Turbinaria* sp. dan (b) *Sargassum* sp.

Table 4. The average of the salt content

Treatment	The average of the salt content
	Turbinaria (a)
1	0.620 a
2	0.637 a
3	0.667 a
	Sargassum (b)
1	0.587 a
2	0.610 a
3	0.637 a

Total of sugar content (%)

EWBA total sugar levels between 8.82% -9.47%. Application seaweed alginates with different types and concentrations of alginate Addition of, effect on total sugar EWBA. Average total sugars EWBA resulting from the addition of alginate Sargassum sp. higher than any Turbinaria sp. According Sundari and Saati (2009), the presence of sucrose and polysaccharides such as sodium alginate can improve the taste and total sugars. The content of total sugars contained in EWBA prove that the complexity of reducing sugars (glikon) and not a reducing sugar (aglycone). This is due to their ability to bind alginate in water and other compounds such as sucrose, sucrose containing 1.24% reduced sugar so that the total amount of sugar from EWBA increased. The addition of Na-alginate can help improve the taste of the product. Products added alginate will have quite sweet flavor, but only contain very few calories. It is caused by a low-calorie alginate is about 1.44 kcal / gram (Sundari and Saati, 2009). Alginate can form a gel when dissolved in water, so that the alginate is also known as gelling agent. Alginate or a gelling agent is added to a material calculated as total sugar, so the higher the concentration of alginate is added, the total sugar measured also higher. Increasing concentrations of alginate followed by an increase in the surface of the skin texture and color EWBA top EWBA. The increasing concentration of alginate is added, the upper skin becomes harder and become more brown color EWBA. This is associated with sugar in EWBA were higher due to the increasing concentration of alginate was added. Brown (2013) stated that the sugar in bread dough will form the outer portion of EWBA time of roasting result of caramelization and Maillard reaction. In addition, sugar is able to become a provider of food for the yeast, so the yeast will grow well and will also increase bread volume well. Best consistency based on physical observations EWBA is up 1.5% alginate the addition of the two types of alginate.

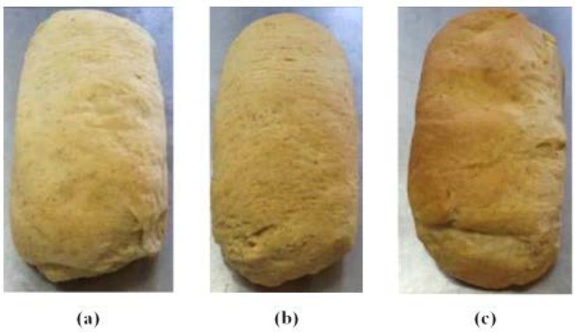

Figure 7. The color and texture of EWBA with the addition of alginate (a) 1%; (b) 1,5%; (c) 2%.

The real difference was found in the treatment factor in the type of alginate and the concentration factor that is nested on the type of factors on levels of total sugars. Factors types showed significant differences with different notation for this type of alginate is a Turbinaria sp. and b for Sargassum sp. on levels of total sugars. The real difference in the concentration of 1% to 2% and 1.5% to 2% on the type of alginate Turbinaria sp and also on alginate Sargassum sp. Addition of alginate at a concentration of 1% to 1.5% did not show significant differences.

Table 5. The average of the total levels of sugar

Treatment	Average of the total levels of sugar
	Turbinaria (a)
1	8.820 a
2	8.920 a
3	9.390 b
	Sargassum (b)
1	8.980 a
2	9.027 a
3	9.470 b

CONCLUSION

Based on the results of the study, showed that the addition of as much as 1.5% alginates from brown seaweed types Turbinaria sp. is the best treatment that provides results bread enriched with chemical and nutritional highest quality. This treatment resulted in levels of protein, fat, water, ash, carbohydrates, total fiber, total salt and total sugars in a row which is 9%; 5.93%; 27.84%; 1.42%; 55.81%; 2.91%; 0.64%; and 8.92%.

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