INFLUENCE OF SOYBEAN (*Glycine Max (L.) Merrill*) FLOUR ADDITION TO THE LEVEL OF ELASTICITY, PROTEIN, AND ORGANOLEPTIC TEXTURE OF SEAWEED *Eucheuma cottonii* DODOL.

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ABSTRACT

Seaweed dodol is a traditional food that is semi-wet (Intermediate Moisture Food). This food has the basic ingredients derived from seaweed, glutinous rice, sugar, and coconut milk, as well as the elastic texture that is processed on a hearth, stirred until evenly until it reaches a certain level of maturity. It can also be added to soybeans which have a protein content of 35%, 18% fat, and 35% carbohydrates. The addition of soybean is an attempt to increase the nutritional value of dodol. The purpose of this study was to determine the effect of adding soybean flour (Glycine max (L.) Merrill) to the physical, chemical, and organoleptic properties of seaweed dodol Eucheuma cottonii. In this study used an experimental design that is a completely randomized design (CRD) with 4 treatments and 6 replications. Then the data obtained were analyzed using ANOVA followed by the Duncan Test and the Wallis Kruskall Test for organoleptic data analysis. Then the selection of the best concentration was determined in the study using the deGarmo method. The results of the study the level of elasticity of 10.11% ± 0.86 namely 34.75% moisture content, 4.95% protein content, 0.67% ash content, 56.45% carbohydrate content, 3.2% fat content, and crude fiber content of 0.36% and organoleptic characteristics of hedonic texture 3.2, hedonic aroma 3.18, taste hedonic 3.32, and hedonic appearance 3.28.

Keyword : Seaweed dodol, Soybean flour

Introduction

Seaweed is a very important marine commodity. This commodity is most widely cultivated in Indonesia, namely the genus Eucheuma which is spread almost in all regions of Indonesia. Besides having many uses it will also be of economic value after getting further handling. In general, post-harvest handling of seaweed by farmers is only until drying. Snacks, snacks or snacks can no longer be separated from the needs of the community. But often snacks that are consumed are not good, because they do not contribute to diverse nutrients and of course can also be accepted organoleptically. Therefore, we need an alternative snack product that has good nutritional content (Amoriyana, 2015).

Eucheuma is a seaweed from Rhodopyceae (red algae) which is able to produce carrageenan, grouped into several species, namely Eucheuma edule, Eucheuma spinosum, Eucheuma cottonii, Eucheuma cupressoideum and many others. Today, one type of Eucheuma that is widely cultivated is Eucheuma cottonii.

Dodol as a typical food is usually made from glutinous rice flour mixed with sugar and coconut milk. The three raw materials are then processed on a furnace until they reach a certain level of maturity. The material is then put into a large kettle above the furnace. For a few moments, the ingredients are stirred

evenly and then turn brown and thicker (Nusa et al., 2012).

Soybean (Glycine max L. Merril) is an annual crop cultivated in the dry season, because it does not require large amounts of water. Soybean is a source of protein, and fat, and as a source of vitamins A, E, K, and several types of B vitamins and minerals K, Fe, Zn, and P. Peanut protein levels range from 20-25%, whereas in soybeans it reaches 40% . Protein levels in soy products vary for example, 50% soybean flour, 70% soy protein concentrate and soy protein isolates 90% (Winarsi, 2010) .

Based on research Astawan (2004), which dodol control is without the addition of seaweed, while dodol seaweed selected is dodol with the addition of seaweed formulation 5: 2 produces the proximate analysis of proteins in dodol seaweed selected and dodol control, each is 3:06 and 2.15% (bk), while the Dodol Quality Requirements based on SNI No. 01-2986-1992, the minimum protein content is 3%. It can be seen that the protein content is very small even though it meets the requirements. Seeing this need to be pursued research on seaweed dodol with the addition of soybean flour which is expected to increase the protein content of seaweed dodol so that it can help meet human protein needs by consuming it. In addition, it is also important to note the importance of quality and consumer acceptability of seaweed dodol with the addition of soybean flour.

The purpose of this study was to determine the effect of the addition of soybean flour (*Glycine max (L.) Merrill*) to the physical, chemical, and organoleptic properties of Eucheuma cottonii seaweed.

This research was conducted in June 2018 to January 2019 at the Fish Nutrition Laboratory, Faculty of Fisheries and Marine Sciences, Brawijaya University, Malang and the Laboratory of Food Technology and Agricultural Products, Faculty of Agricultural Technology, Gajah Mada University, Yogyakarta.

Materials and Methods

Tools and materials

The tools used in the manufacturing process are basins, pans, ovens, pans, blenders, and 80 mesh sieves, filters, knives, cutting boards, spoons, and pans, stoves, analytical scales, knives, pans, wood stirrers, spoons, and cutting board. The tools used in chemical analysis include funnel, spatula, measuring cup, enlenmeyer, vortex, centrifuge, cuvet, test tube, UV-Vis spectrophotometry, porcelain cup, oven, goldfisch, volume pipette, beaker glass, crushhable pliers, desiccator, muffles, goblets.

The ingredients used in making soybean flour are soybeans, Eucheuma cottonii seaweed, glutinous rice flour, white sugar, brown sugar, coconut milk, and water. Materials for the test include aquadest, filter paper, paper, mattress hammer, tissue, ammonium sulfate crystal, buffer solution, biuret reagent, label paper, H2SO4 solution, HCl solution, ammonium oxalate solution, Naoh solution, ptrolium ether (PE), methyl orange , sodium acetate, H2O2, HNO3, KMNO4 solution, boric acid, ammonium sulfate, and hexane.

Method

The study consisted of two stages: a preliminary study and the main study. Preliminary research aims to determine the best concentration and the best results obtained at a concentration of 30%. So that in the main study used concentrations of 25%, 30%, and 35%. The main research includes elasticity test, proximate analysis, and organoleptic test.

Making Process

Soybean Flour Making Process

The process of making soybean flour begins with the process of washing soybean seeds to be free of impurities. After cleaning, the soybean seeds are soaked in water for 12 hours. After that the soybean seeds boiled with boiling water for 20 minutes and drained. After being drained, the soybean seeds are heated in an oven at 65˚C for 3-5 hours while stirring occasionally so that the heat is evenly distributed. After that the soybean seeds are removed from the oven and cleaned from the charred seeds. Furthermore, the soybean seeds are blended until smooth and sieved using 80 mesh sieves with two repetitions to get maximum results.

Process of Making Seaweed Porridge

The process of making seaweed porridge begins with the process of washing dried seaweed to separate from the dirt that is still attached. Then seaweed soaked with clean water for 3 days with water replacement every 24 hours. Furthermore, seaweed is drained and cut into pieces to facilitate the process of destruction. Then the seaweed that has been cut into pieces is put into the blender and crushed until smooth like mush.

Seaweed Dodol Making Process

Table 1. Seaweed Dodol Formulation
Seaweed Dodol Making Process

Ingredients	**Amount (g)**
Glutinous rice flour	65
Brown sugar	75
White sugar	38
Seaweed porridge	28
Coconut milk	394
Amount	**600**

The manufacturing process begins with cooking coconut milk over low heat until it thickens and removes oil then is added glutinous rice flour and soy flour which has been mixed with water put into cooked coconut milk until the dough looks smooth and shiny, when dropped it looks broken and when tasted it doesn't taste raw. then do the addition of white sugar and brown sugar. Stirring is done until the texture is chewy and not sticky in the frying pan. Then added seaweed porridge. The dough is declared cooked if dropped unbroken. As soon as the dough is cooked, the dough is transferred into a baking dish and cooled.

Results and Discussion

level of eligibility

Table 2. The level of elasticity dodol seaweed

Treatment	**Level of elasticity**
0%	15,72%±0,85
25%	10,11%±0,86
30%	8,29%±1,78
35%	4,68%±0,12

From the above table it can be concluded that the increasing concentration of soybean flour, the elasticity of Seaweed Dodol decreases. The level of elasticity of seaweed dodol is influenced by the addition of soybean

flour, where the soybean flour contains amylose content in the amount of 11.8-16.2% (Stevenson et al., 2006). The lower the concentration of the addition of soy bean flour, the lower the starch content present in the dodol, so that the resulting texture becomes rubbery dodol.

Table 3. Chemical Characteristics of Seaweed Dodol Addition to Soy Bean Flour

	Parameter					
Treatment	Water (%)	Protein (%)	Fat (%)	Ash (%)	carbohydrate (%)	crude fiber (%)
0%	33,86 ±0,31	2,73 ±0,09	3,7 ±0,11	0,55 ±0,01	60,11 ±0,14	0,3 ±0,01
25%	34,75 ±0,59	4,95 ±0,01	3,2 ±0,21	0,67 ±0,44	56,45 ±0,18	0,36 ±0,3
30%	38,31 ±0,89	5,13 ±0,05	2,82 ±0,19	0,69 ±0,01	52,92 ±0,02	0,46 ±0,02
35%	38,4 ±0,88	5,52 ±0,04	1,84 ±0,02	0,72 ±0,02	52,06 ±0,25	1,27 ±0,04

Proximate test

Water content

The highest value of Seaweed Dodol Moisture Content Addition of Soybean Flour was found at 0% treatment with a value of 33.86% ± 0.31 and the lowest at 35% treatment with a value of 38.4% ± 0.88. Snyder and Kwon (1987) explain that soybean flour has crude fiber content of 4.3%. All components of total food fiber provide functional characteristics which include the binding capacity of water, the capacity to expand to form gels with different viscosities, cation exchange and give color (Toharisman, 1995).

Protein content

The highest levels of seaweed dodol protein were the highest addition of soybean flour at 35% treatment with a value of 5.52% ± 0.04 and the lowest at 0% treatment with a value of 2.73% 0.09. the increasing concentration of soybean flour, the Seaweed Dodol Protein Levels are increasingly rising this is due to the addition of soybean flour so that it increases the value of protein content.

Fat content

The highest value of seaweed dodol fat content in the addition of soybean flour was found in the 0% treatment with a value of 3.75% ± 0.11 and the lowest in the treatment of 35% with a value of 1.84% ± 0.02. So it can be concluded that the increasing concentration of soybean flour, the value of Seaweed Dodol Fat Level decreases. Fat content in seaweed dodol is influenced by the addition of soybean flour because soybean flour has a high fat content that is equal to 20% (Affandi, 2001). but in this study fat levels have decreased, this is thought to be caused by heat from the cooking process.

Ash content

The highest ash value of seaweed dodol was the highest addition of soybean flour at 35% treatment with a value of 0.72% ± 0.02 and the lowest at 0% treatment with a value of 0.55% ± 0.01. So it can be concluded that the increasing concentration of soybean flour, the ash content of Seaweed Dodol is rising. This can occur due to the addition of more soy flour. Soybean flour based on research by

Hariadi et al., (2017), has an ash content of 3.37%, so the more soybean flour additions, the increasing the ash content of seaweed dodol, the addition of soybean flour.

Carbohydrate content

Value Levels of carbohydrates Dodol Seaweed Soybean Meal Addition highest in the treatment of 0% with a value of 60.11% ± 0.11 and the lowest in the treatment of 35% with a value of 52.06% ± 0.25. So it can be concluded that the increasing concentration of soybean flour, the carbohydrate level of seaweed dodol decreases. This is because the calculation of carbohydrate content uses the by different method, so that it is influenced by other nutritional components, as stated by Irmayanti et al. (2017), that carbohydrate levels calculated by different are influenced by other nutritional components, the lower the other nutritional components, the higher the carbohydrate content. Vice versa, the higher the other nutritional components, the lower the carbohydrate content

Crude fiber content

The highest value of crude fiber content of seaweed dodol, the highest addition of soybean flour was in the treatment of 35% with a value of 1.27% ± 0.04 and the lowest in the treatment of 0% with a value of 0.3% ± 0.01. So it can be concluded that the increasing concentration of soybean flour, the Rough Level of Seaweed Dodol Crude Increases. This can happen soy bean flour has a high fiber content so the more the addition of soy bean flour then crude fiber content will also be higher. According to Snyder and Kwon (1987) soybean flour has crude fiber content of 4.3%, protein 40.5%, fat 20.5%, carbohydrate 22.2%, ash 4.5%, and water 6.6% .

Organoleptic Test

Appearance

The average value of hedonic appearance at a concentration of 0% with a value of 3.3 (likes) then for the treatment of 25% gets a value of 3.28 (likes) while the lowest hedonic appearance is obtained at a concentration of 30% with a value of 2.98 (dislike), and 35% treatment get a value of 3.28 (likes). So it can be concluded that the average panelists preferred the taste of dodol seaweed treatment with the addition of soybean flour 0%. According to Sukmawati et al., (2014), the color of seaweed dodol is influenced by the brown color formed from caramelization of sugar. Browning reaction is also influenced by the value of aw. In foodstuffs, non-enzymatic browning reactions will increase if aw is increased and will reach a maximum at the aw limit of semi-wet food.

Taste

The average value of hedonic taste of treatment 0% get a value of 3.3 (likes), then at a concentration of 25% and 30% with a value of 3.32 (likes) while hedonics at a concentration of 35% with a value of 3.14 (likes), then to. So it can be concluded that the average panelists preferred the taste of seaweed dodol treatment with the addition of soybean flour 25% and 30%. According to Marpaung (2001), that the taste of seaweed dodol that arises is dominated by caramel flavor due to the presence of granulated sugar and brown sugar and the presence of heating that exceeds its melting point.

Aroma

The highest average hedonic aroma value was obtained at a concentration of 30% with a value of 3.26 (likes) while the lowest hedonic appearance was obtained at a concentration of 0% with a value of 3.16 (likes), then for 25% treatment and 35% treatment got a value of 3 , 18 (likes). So it can be concluded that the average panelists preferred the taste of seaweed dodol treatment with the addition of 30% soybean flour. One of the causes of aromas on dodol is the heating process during dodol processing. The protein content in soybean flour is one of the causes of the formation of a good aroma in dodol. This is in accordance with the opinion of Winarno (2004), which states that the use of materials that have a lot of protein content will cause a characteristic aroma.

Texture

The highest average hedonic texture value was obtained at a concentration of 30% with a value of 3.26 (likes) while the lowest hedonic appearance was obtained at a concentration of 35% with a value of 2.84 (dislike), then for 0% treatment a value of 3.06 (likes) and 25% treatment gets a value of 3.2 (likes). So it can be concluded that the average panelists preferred the taste of seaweed dodol treatment with the addition of 30% soybean flour. According Sukmawati et al., (2014), consumers generally like foods that have a high aw. The reason is because consumers like food that is rather wet and easy to chew. So it is wet, soft, and easy to chew is the desired texture.

Determining Best Treatment

Based on the calculation of determining the best treatment of De Garmo, it can be concluded that the best treatment on physical, chemical, and organoleptic parameters is dodol seaweed with the treatment of adding soybean flour concentration 25% with proximate analysis namely 34.75% water content, 4.95 protein content %, ash content 0,67%, carbohydrate content 56,45%, fat content 3,2%, and crude fiber content 0,36% and hedonic organoleptic test 3,2 (like), hedonic aroma 3,18 (like), hedonic flavor 3,32 (likes), and hedonic taste 3,28 (likes).

Conclusions and suggestions

Conclusions

The results showed that the addition of soybean flour significantly affected the characteristics of seaweed dodol at the level of elasticity, protein content, water content, fat content, ash content, carbohydrate content, crude fiber content and hedonic characteristics of appearance, taste, and aroma but did not affect real effect on organoleptic characteristics of the texture.

Suggestions

Suggestions that can be given are the need for further research in the manufacturing process in order to get maximum results in accordance with SNI.

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