Effect of tofu waste flour composition to hedonic test level and proximate test of Bread

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Abstract. The tofu solid waste (TSW), known as okara in Japan, is a solid waste of the tofu industry, usually disposed or sold at a low price. Its shelf life is short due to the high moisture. In hence the protein, carbohydrate and fiber content of TSW is high; it is potential to be used as food products such as flour. To expand the shelf life of the TSW, it was utilized into flour. In this research, the TSW is processed into flour as raw material of bread. The purpose of this study was to determine the effect of TSW flour composition as raw material for bread, such as organoleptic tests (aroma, texture, and taste) and proximate test (protein, carbohydrate, fat, and dietary fiber) of bread produced. The experimental design was conducted by the composition of TSW flour variable, i.e. 0% (R1), 5% (R2), 10% (R3), and 15% (R4). The results showed that the greater the TSW flour composition, the lower the sensory value of pane lists. The most favored sensory test was R2 sample, 5% tofu waste flour bread with the sensory score of favorite, texture, aroma, taste, and color of 2,71, 2,86, 3,14, 2,79 and 3. From the proximate test, the 5% TSW flour bread contains higher carbohydrate, protein, moisture content than 10% while the nutritional value was 44,39% carbohydrate, 6,45% fat, 9,16% protein, 39,3% moisture, 0,7% ash and 5,94% dietary fibre.

1. Introduction
Tofu is a popular food in Indonesia for thousands of years and it is produced in large quantities. Tofu consumption has been increased every year. The higher tofu production is corresponding to increasing the tofu solid waste. Tofu solid waste is also known as soybean curd residue or okara in Japan. Tofu industry is one of food industry which produced high solid waste, from 1 kg dried soy produced tofu will produce 1,2 kg wet solid waste [1]. It has become a problem for the environment while it is dumped into river or other environments. This problem should be solved due to its contamination such as smell and other organic materials. When it is dumped into a landfill, it will cause a potential environmental problem due to its easy putrefaction [2]. TSW has not been used optimally. TSW is usually disposed to environment without any treatment or sold as animal feed or processed again into food products such as oncom and tempe at very low price. TSW can be utilized as feed, fertilizer, and food in small quantities.

Although TSW is waste, it still has good nutrition as food, for example, the fiber and isoflavones [3]. TSW has several advantages as a food raw material, such as an industrial tofu waste containing 11.07% carbohydrate, 4.71% protein, 1.94% fat and 0.08% ash [4], which can be used as an
alternative source of protein, carbohydrate, and dietary fiber. In hence it is delicious and safe as food. TSW is also abundant. Tofu industry is one of the industries that is growing and is usually on the scale of IKM (Small and Medium Industries). According to Faizal et al. [3] there are 84 thousand tofu industry units with a total production capacity of 2.56 million tons per year quantities tofu waste produced around 25-35% of tofu products. The other advantages are TSW is low price as it is a waste. TSW can be processed into varied food such as brownies [5], “cat’s tongue or katte tong” cookie [6] and nuggets [7]. Although the TSW can be processed as varied food, it is long-lasting. To increase its lifetime, it should be processed into TSW flour. TSW flour has many benefits. It is easy to be processed into other food products and durable.

In this study, the TSW was processed into TSW flour and then made into fiber-rich bread. The purpose of adding tofu flour to the bread-making process is to increase protein content. The other advantage of TSW flour is that the fiber content (dietary fiber) is greater than wheat flour. So that the flour is expected to be in the form of fiber-rich bread which has many health benefits compared to commercial bread.

Bread is food made from wheat flour, water, and yeast through a process of kneading, development (fermentation by yeast) and roasting [8]. The main raw material for bread is wheat flour. There are two types of wheat flour, low protein, and high protein. The high protein flour is used to make bread. Although it is high protein, it is low-fiber flour. Now, bread is consumed by many people as a constituent of rice. Therefore, bread is should be enriched with fiber-rich raw materials.

The fiber content in food has an important role in the process of human digestion. The fiber in the ingredients provides a positive effect on the human digestive system which is a laxative and prevents chronic diseases such as coronary heart disease and colon cancer. So there needs to be an alternative raw material for making bread that is rich in fiber and protein. The ingredients that can be used are koro flour which has high protein content [9], keladi flour [10], cassava flour and soy flour [11]. Although this flour is classified as protein-rich flour (PRF) which is potential as a raw material for bread, the raw material is not easy to find. Another alternative is to use TSW flour as a substitute for bread making.

2. Method
The main raw material in this study is tofu solid waste (TSW). TSW was taken from the tofu industry in Cakung, East Jakarta. TSW was made into flour and then processed into plain bread. Raw bread was TSW flour, high protein flour, instant yeast, softener ingredients, sugar, salt, margarine, and water.

The experimental design conducted in this study was a Randomized Block Design (RBD) with factorial 4 x 1 with 2 repetitions to obtain 8 treatments. The factorial design model of 4 x 2 with Randomized Block Design (RBD) can be seen in table 1.

Table 1. Factorial 4 x 1 Experiment Design Model with Randomized Block Design (RCBD) with 2 replications.

| Composition | Repetition |
|-------------|------------|
|             | 1          | 2          |
| 0%          | R₁₁        | R₁₂        |
| 5%          | R₂₁        | R₂₂        |
| 10%         | R₃₁        | R₃₂        |
| 15%         | R₄₁        | R₄₂        |
2.1. Tofu Flour Making

The procedure for making TSW flour began with choosing good TSW, for example, good in terms of soybean aroma, texture, and color. Extortion was done so that TSW knows the water content decreases, then the steaming was carried out for 30 minutes so that the TSW can last longer and reduce the bad smell.

Steamed TSW then dried in a dryer with a temperature variation of 120 °C and 120 minutes. The dried TSW was grinding using a dry blender. The flour produced is then sieved with a 40 mesh sieve. If there is still a rough one, it can be refined again. Tofu flour that has been finished is then stored.

2.2. Bread Making

Bread making process based on Skrbic et al process [13] with modification. The Bread was made from TSW flour, high protein wheat flour, instant yeast, bread improver, baking powder, sugar, and they were stirred using a mixer with low speed until well blended. The water was then put into the mixture, stirred at low speed until well blended. Speed was increased to medium speed, stirred again until smooth for 15 minutes. Salt and margarine were added, stirred with a mixer followed by a low speed mixed well for 10 minutes until the dough becomes smooth.

The dough has become big and initial fermentation was done by placing the mixture on the baking plate and then closed using a wet cloth for 45-60 minutes until it expands. The dough that has undergone initial fermentation was deflated and then kneaded again for 15 minutes. The oven was heated until 180 °C, the dough was put into oven and bake until 30 minutes.

2.3. Chemical Analyzes

The responsibility design in the research that will be carried out includes the response of the organoleptic test and response to quality/chemical testing. The control was used an original bread without TSW flour. The TSW bread was evaluated for chemical composition and organoleptic response.

The chemical composition was carried out in TSW bread making is to do a proximate test, water content, ash content, protein content, carbohydrate content, and fat content, and food fiber content. The organoleptic response is carried out to analyze the specific quality characteristics and acceptance of panelists on tofu bread products based on color, aroma, taste, and texture. This organoleptic test uses a hedonic scale, a determination criterion based on panelist's assessment of organoleptic properties by analyzing the level hedonic scale.

2.4. Hedonic Test

The hedonic test was conducted to 25 random panelists. The hedonic test includes color, flavor, aroma, and texture. It was also asked for the favorite bread. They were given four sample R₁, R₂, R₃, R₄.

3. Result and Discussion

3.1. Hedonic Test Result

The result of the hedonic test to 25 random panelists can be seen in table 2. It can be seen that the bread without tofu flour is the most favorite of 25 panelists with score 2.92 but in the composition of 5% tofu flour on second favorite bread, its color, taste, aroma, texture can still be accepted by the panelists. Even on color sensory tests get a higher value than plain bread without tofu flour. So that on average the composition of adding TSW knows 5% is in the second position, it can be seen in Figure 1.
Tabel 2. The hedonic test result of tofu waste flour bread

| Sensory test                                      | R1 | R2 | R3  | R4 |
|--------------------------------------------------|----|----|-----|----|
| Waste tofu bread composition (% w)               | 0 %| 5 %| 15 %| 15 %|
| Color                                            | 2.93| 3.00| 2.93| 2.93|
| Flavor                                           | 2.93| 2.79| 2.43| 2.43|
| Aroma                                            | 3.28| 3.14| 2.86| 2.86|
| Texture                                          | 3.28| 2.86| 2.86| 2.86|
| Favorite                                         | 2.92| 2.71| 2.5 | 2.5 |
| Average                                          | 3.068| 2.9 | 2.716| 2.716|
| The panelist                                     | 10 | 9  | 5  | 5  |

Information: Assessment score for color, taste, aroma, and preference criteria are 1 = very dislike; 2 = dislike; 3 = rather like; 4 = like; 5 = really like it. Assessment score for texture criteria is 1 = very hard; 2 = hard; 3 = rather hard; 4 = soft; 5 = very soft.

Figure 1 shows that there are still many panelists who like white bread without dreg flour know as much as 40%. Following the second-order is 5% composition variation with 20% panelist.

3.2. The Influence of Tofu Flour Composition on Proximate Tests and Food Fibre of TSW.

Of the two best compositions, besides without tofu flour, 5% and 10% are tested for proximate and dietary fiber, the results can be seen in Figure 1. The Proximate Test is carried out using the SNI 01-2891-1992 method, while the dietary fiber uses the testing method based on AOAC 985.29 19th e. 2012 (enzymatic).

Figure 2. Proximate Test Results and bread fiber for composition of 5% and 10%
From Figure 2, it can be seen that the carbohydrate content of bread is still quite large, but the composition of 10% is lower than 5%; this is because the amount of tofu waste flour knows more. This is confirmed by the higher fiber content at 10% composition compared to 5%. Protein content in the composition is 5% higher because of the higher protein content of high-protein flour. The fat content of 10% is higher than 5% TSW flour than 10%.

4. Conclusion
The results showed that the greater the TSW flour composition, the lower the sensory value of panelists. The most favored sensory test was R2 sample, 5% tofu waste flour bread with the sensory score of favorite, texture, aroma, taste, and color of 2.71, 2.86, 3.14, 2.79, and 3. From the proximate test, the 5% TSW flour bread contains higher carbohydrate, protein, moisture content than 10% while the nutritional value was 44.39% carbohydrate, 6.45% fat, 9.16% protein, 39.3% moisture, 0.7% ash and 5.94% dietary fibre.

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