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Effect of Substitution of *Kaopi* and Anchovy Flour Based on The Nutritional Values, Organoleptic, and Total Microbe of 'Kasuami/kasoami'

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***Abstract*—** These low contents demand necessary to conduct substitution using anchovy flour (*Stolephorus comesonii*) since it has a quite complete nutritional content, such as fat, protein, and carbohydrates. This research was carried out aiming to discover the effect of substitution between *kaopi* flour and anchovy flour on the nutritional content of *kasuami/kasoami* and the appropriate ratio of *kaopi* flour and anchovy flour proportions for a good *kasuami/kasoami* products in terms of color, aroma, and taste based on organoleptic tests and microbial growth. This study employed a completely randomized design with 6 treatment levels and 3 replications. The treatment levels were done on the proportion of *kaopi* flour and anchovy flour (*S. comersonii*), in which the ratio iwasT0 (100%:0%). T1 (98%:2%). T2 (96%:4%). T3 (94%:6%). T4 (92%:8%). and T5 (90%:10%). The best *kasuami/kasoami* was obtained from the substitution of *kaopi* flour using anchovy flour by 90% *kaopi*: 10% anchovy flour (T5). The results of *kasuami/kasoami* chemical test based on the best treatment provided indicated that the substitution of *kaopi* flour using anchovy flour significantly affected the variables of moisture content (47.57%), protein content (16.40%), fat content (3.48%), carbohydrate content (28.86), and total microbes (202.33 x 10^{-2} cfu). Meanwhile, based on the organoleptic test, the average preference values for color was 4.47 (preferred), the aroma was 5.40 (preferred), and the taste was 6.13 (preferred). This research data indicate that anchovy flour as a substitute for *kaopi* flour in producing *kasuami/kasoami* significantly affected the chemical composition variables.

***Keywords*—** Kasuami, Anchovy flour, Nutritional value

I. INTRODUCTION

Most Indonesian people depend on rice as their staple food. This will make it more difficult for Indonesian people, whether in terms of food production and procurement as well as rationalizing the optimal use of natural resources. In order to overcome such issues, non-rice food sources are needed to meet community consumption. A source that is quite abundant and easy to cultivate is Cassava root. Statistics Indonesia (*Badan Pusat Statistik*) issued data that cassava root production in Southeast Sulawesi Province was 201 quintals/hectare in 2013 and 208 quintals/hectare in 2014. This proves the high production of cassava in Southeast Sulawesi that will significantly help in overcoming food insecurity.

Cassava root commonly grows in tropical areas, such as Africa, Asia, and Latin America [1]. Cassava root, particularly in Indonesia, is used as a basic ingredient for making traditional foods. *Kasuami/kasoami* is fairly popular among local people in Southeast Sulawesi. *Kasuami/kasoami* is a traditional food of the people of Southeast Sulawesi, especially the past Buton Sultanate area (Wakatobi Regency, Baubau City, Muna Regency, and Bombana Regency) and the Buton people who are scattered in the country today. *Kasuami/kasoami* is produced using fermented cassava flour [2]. Several stages were carried out in producing *Kasuami/kasoami*, including the stages of peeling, grating, and pressing. The pressing results are called *kaopi*. Furthermore, *kaopi* that is ripened using hot steam in the steaming process is called *kasuami/kasoami*. Based on its raw materials, *kasuami/kasoami* contains high carbohydrates, low sugar, and low protein. *Kasuami/kasoami* which contains low sugar can be used as a functional food for diabetics to fulfill their carbohydrate needs.

Kasuami/kasoami contains 68.08% carbohydrates, 0.35% fat, and 1.15% protein [3]. Therefore, it needs substitution using other ingredients such as anchovy flour because anchovy (*Stolephorus comesonii*) has a quite complete nutritional content, including fat, protein, and carbohydrates. In addition, anchovy also contains glutamic acid which affects the taste. It also has great benefits for the body organs because it contains high calcium needed to prevent bone loss, dental health, intelligence, and support nutrition for pregnant women. The current research tried to produce *kasuami/kasoami* with high nutritional value and are preferred by consumer. Therefore, the use of anchovy flour as a substitute for *kaopi* in producing *kasuami/kasoami* is a promising alternative, especially in terms of nutritional quality, organoleptic testing, and total microbes.

II. RELATED WORK

Indonesian people, particularly those who live in Southeast Sulawesi, commonly processes cassava into *kaopi*. *Kaopi* is a product made from cassava that has been grated and further extracted (wet form). Meanwhile, the dry form of *kaopi* is made into flour utilized in food diversification effort in order to support the national food security and reduce the use of wheat flour [4]. For this matter, the nutrient of *kasuami/kasoami* as the traditional food of Southeast Sulawesi people needs to be improved. Such intention can be accomplished by adding both *kaopi* flour and anchovy flour. In this case, several previous studies have reported the increase of food nutrition after the adding of anchovy flour.

Herni *et al*. [4] revealed their research on the organoleptic and proximate tests of fermented *kaopi* and coconut pulp-based biscuit that resulted in high fibre content. In addition, Faroj [5] also reported his research result that aiming to know the effect of anchovy flour and red bean flour and to determine the right composition of mini pie product so it can be well-received, feasible, and has quality based on the organoleptic test and nutrition.

Ratnasari & Rahmawati [6] further also reported that the proportion between anchovy flour and soybean protein has affected the colour, flavour, aroma, and texture of the product studied. This research tried to make a biscuit formula made from anchovy flour and soybean protein so that it can be well-received. In addition, the researchers conducted the research to know the receptivity and nutrition of biscuit substituted by anchovy flour and soybean protein isolate as well. Furthermore, Akonor *et al*. [7] also carried out a study on the optimization of brown rice-based cereal enriched by anchovy flour content. The objective of this research was particularly to diversify the anchovy flour used to enrich the instant breakfast meal to that the nutrient intake increased.

Those previous studies are certainly related to the current study. Yet, current study has its own innovative point, where it is a new study that combined both anchovy and *kaopi* flour that were expected to improve the nutrient intake and support the growth of microorganism useful for contributing the nutrition profile of the traditional food. In addition, another objective of the current research was to provide new information related to the utilization of anchovy flour combined with *kaopi* flour which further diversified into food product.

III. METHODOLOGY

Preparation of Anchovy Flour

The basic ingredient of making this flour is fresh anchovy. This was done by first removing the fish head and all the stomach contents and washing it using clean water with a ratio of 5 liters water for every 1 kg anchovy. The fish was further steamed for 30 minutes (100°C), cooled before processing, then dried at 80°C for 14 hours, and cooled again at room temperature. Furthermore, anchovy flour was produced by crushing the fish using blender and sieved using an 80 mesh sieve.

Preparation of Kaopi Flour

First stage done in preparing *Kaopi* flour is peeling fresh cassava, followed by washing it using clean running water to remove the dirt and mucus on the cassava surface. It was further drained and grated. The next stage was pressing the cassava using a hydraulic press, so that the water content can be separated and the HCN level contained can be reduced. Such pressing resulted in *kaopi* which is the raw material for making *kasuami/kasoami*. Drying was carried out using an electric oven for 6 hours (60°C).

Preparation of Kasuami/kasoami with Substitution of Kaopi using Anchovy Flour

Kasuami/kasoami production was carried out by preparing 300 g of ingredients for each treatment. Various rations were provided in each treatment including 100%:0% (Treatment 0: T0), 98%:2% (Treatment 1: T1), 96%:4% (Treatment 2: T2), 94 %:6% (Treatment 3: T3), 92%:8% (Treatment 4: T4), and 90%:10% (Treatment 5: T5). The next stage was steaming the ingredients using a coconut leaf mold formed into a cone shape using a clay pot steamer. Time needed for the steaming was ±10 minutes. In order that *kasuami/kasoami* is cooked, it needs to be steamed for about 10-15 minutes. *Kasuami/kasoami* was then cooled in a tray covered by banana leaves. The last stage was organoleptic test and proximate analysis.

Observation Variables

The observed variables involved in this research were (1) moisture content using the oven method and (2) protein content using the spectrophotometer method; where all of these methods are in accordance with AOAC Official Method (2000). Furthermore, the other variables studied are also (3) fat content using the acid hydrolysis method based on the Soxhlet Official Method AOAC [16], (4) carbohydrate content using carbohydrate by different, as well as (5) total microbes and organoleptic tests which include: (1) color, (2) aroma, and (3) taste. The criteria for assessing the taste and aroma of *kasuami/kasoami* used an organoleptic test as a hedonic test instrument or tool.

Research Design and Data Analysis

The current research applied a randomized complete design with 6 treatment levels and 3 replications so that there were 18 experimental units. The treatment applied in this research of *kasuami/kasoami* production is by substituting the *kaopi* using anchovy flour. The treatment levels were in the form of *kaopi* and anchovy proportion, which are 100%:0% (T0), 98%:2% (T1), 96%:4% (T2), 94%:6% (T3), 92 %:8% (T4), and 90%:10% (T5). The research data were further analyzed using variance analysis. In case there were differences, Duncan's Multiple Range Test (DMRT) was further carried out.

IV. RESULTS AND DISCUSSION

Results

Nutritional Values

Moisture content

The average moisture content (%) of *kasuami/kasoami* and results of Duncan's Multiple Range Test ($DMRT_{0.05}$) are presented in the following Table 1.

Table 1: Average Moisture content (%)

Treatments	Average Moisture content (%)	$DMRT_{0.05}$
T0	52.03^{a}	
T1	51.42^{a}	2 = 0.670
T2	50.53^{b}	3 = 0.702
T3	50.38^{b}	4 = 0.721
T4	49.60^{c}	5 = 0.733
T5	47.57^{d}	6 = 0.742

Notes: The numbers followed by the same letter notation indicate that they are not significantly different based on the DMRT 0.05 test at 95% confidence level.

Table 1 presents that the substitution of *kaopi* using anchovy flour significantly affected the moisture content of *kasuami/kasoami*. The highest moisture content treatment was obtained at T0 treatment by 52.03%. This result was further revealed to be different from the result of T1 treatment. In addition, the result obtained from T1 treatment was different from the results of other treatments, along with the results obtained from T3, T4, and T5 treatments. Meanwhile, the results obtained from T2 treatment was not significantly different from T3 treatment. In this case, the reduction of *kaopi* and the addition of anchovy flour according to each treatment showed that there was a decrease in the moisture content of *kasuami/kasoami* as seen in Figure 1.

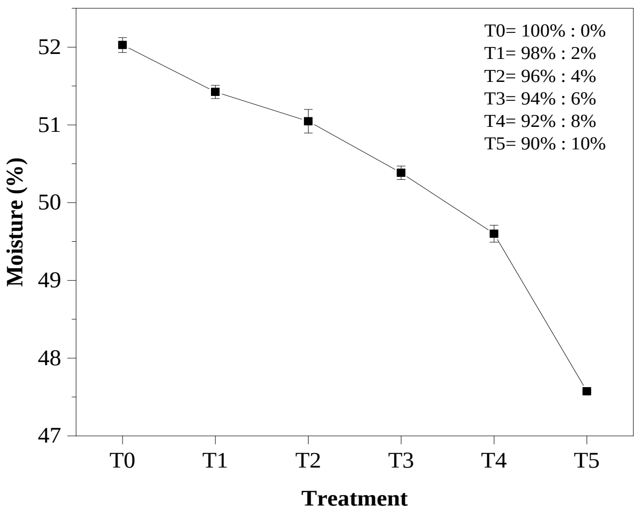

Figure 1: Average Moisture Content

Based on Figure 1 above, there was a decrease in the moisture content of *kasuami/kasoami*. Such decrease is significant, because the treatment of anchovy meal substitution was done through different additions. The greater the addition of anchovy flour, the more decrease the moisture content of *kasuami/kasoami*.

Protein Content

Average protein content (%) of *kasuami/kasoami* and Duncan's Multiple Range Test ($DMRT_{0.05}$) results were provided in the following Table 2.

Table 2: Average Protein Content (%)

Treatment	Average Protein Content	$DMRT_{0.05}$
T0	0.90^{f}	
T1	2.15^{e}	2 = 0.309
T2	4.29^{d}	3 = 0.324
T3	7.75^{c}	4 = 0.333
T4	11.44^{b}	5 = 0.339
T5	16.40^{a}	6 = 0.343

Notes: The numbers followed by the same letter notation indicate that they are not significantly different based on the DMRT 0.05 test at 95% confidence level.

Table 2 above indicated that the substitution of *kaopi* using anchovy flour significantly affected the protein content of *kasuami/kasoami*. The highest protein content was obtained in T5 treatment by 16.40%. This result was further revealed to be different from other treatments provided (T0, T1, T2, T3, and T4 treatments). The increase in protein content can be seen in Figure 2.

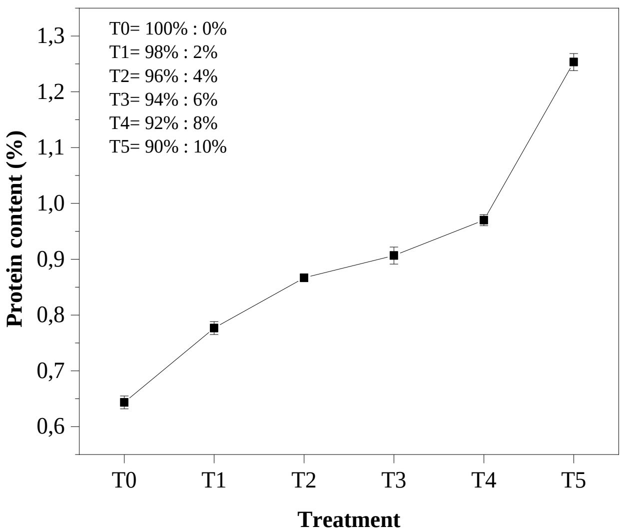

Figure 2: Average Protein Content

Figure 2 illustrates the increase of *kasuami/kasoami*'s protein content. The increase was significant because the anchovy flour substitution was done in different additions. In this case, the highest protein content was obtained in the T5 treatment. The greater the addition of anchovy flour, the more increase the protein content of *kasuami/kasoami*.

Fat Content

Average fat content (%) of *kasuami/kasoami* and the results of Duncan's Multiple Range Test ($DMRT_{0.05}$) is presented in the following Table 3.

Table 3: Average Fat Content (%)

Treatments	Average fat content (%)	$DMRT_{0.05}$
T0	1.02 [f]	
T1	1.14 [e]	2 = 0.107
T2	2.30 [d]	3 = 0.112
T3	2.68 [c]	4 = 0.115
T4	3.17 [b]	5 = 0.117
T5	3.48 [a]	6 = 0.119

Notes: The numbers followed by the same letter notation indicate that they are not significantly different based on the DMRT 0.05 test at 95% confidence level.

Table 3 presents that the substitution of *kaopi* using anchovy flour significantly affected the fat content of *kasuami/kasoami*. The highest fat content was obtained during T5 treatment by 3.48%. In this case, the result obtained from T5 treatment was different from other treatments provided (T0, T1, T2, T3, and T4 treatments). The increase in fat content can be seen in Figure 3.

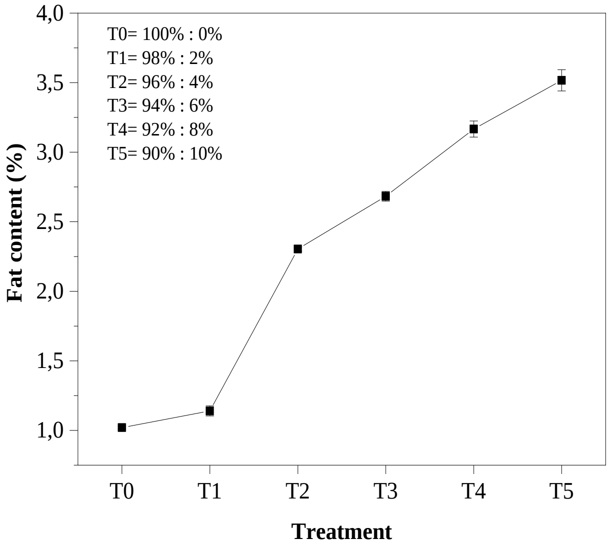

Figure 3: Average Fat Content

Based on Figure 3, there was an increase in the fat content of *kasuami/kasoami*. Such a significant increase was due to the addition of anchovy meal substitution in different proportions. The highest fat content was obtained in T5 treatment. The greater the addition of anchovy flour, the more increase the fat content. The increase in fat content is caused by the substitution treatment using anchovy flour which has been heated and evaporated in the material.

Carbohydrate Content

Average carbohydrate content (%) of *kasuami/kasoami* and results of Duncan's Multiple Range Test ($DMRT_{0.05}$) is presented in Table 4.

Table 4: Average Carbohydrate Content (%)

Treatments	Average carbohydrate content (%)	$DMRT_{0.05}$
T0	45.02[a]	
T1	40.93[ab]	2 = 5.706
T2	40.71[ab]	3 = 5.972
T3	36.36[b]	4 = 6.134
T4	29.68[c]	5 = 6.241
T5	28.86 [c]	6 = 6.315

Notes: The numbers followed by the same letter notation indicate that they are not significantly different based on the DMRT 0.05 test at 95% confidence level.

Table 4 showed that the substitution of *kaopi* using anchovy flour significantly affected the carbohydrate content of *kasuami/kasoami*. The highest carbohydrate content was obtained in T0 treatment by 45.02%. The results from the other treatments discovered that results obtained from T1 treatment was not significantly different from T3, yet significantly different from the remaining treatments. However, no different results obtained between T4 and T5 treatments. In addition, results obtained from T4 was significantly different from other treatments. The decrease in carbohydrate content can be seen in the following Figure 4.

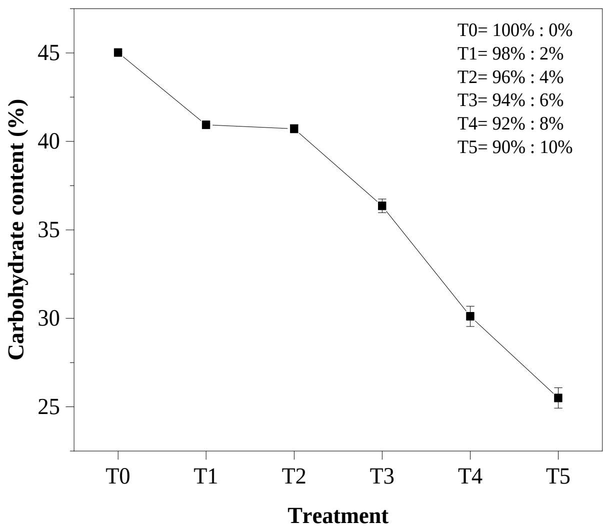

Figure 4: Average Carbohydrate Content

Figure 4 indicates a decrease in the carbohydrate content of *kasuami/kasoami*. This significant decrease occurred because the anchovy meal substitution was done in different additions. The highest carbohydrate content was obtained in T0 treatment. The greater the addition of anchovy flour, the more decrease the carbohydrate content of *kasuami/kasoami*. The decrease in carbohydrate content is caused by reduced water absorbed by the *kaopi* flour because starch is soluble in water and evaporates during heating. The existence of anchovy flour substitution treatment causes carbohydrate levels to decrease.

Organoleptic Test

Color

Average *kasuami/kasoami* color based on organoleptic test and results of Duncan's Multiple Range Test ($DMRT_{0.05}$) are presented in Table 5.

Table 5: Average *Kasuami/kasoami* Color Based On Organoleptic Test

Treatments	Average color (%)	$DMRT_{0.05}$
T0	6.60^{a}	
T1	5.67^{b}	2 = 0.535
T2	5.00^{c}	3 = 0.560
T3	4.53^{cd}	4 = 0.575
T4	4.27^{d}	5 = 0.585
T5	4.47^{d}	6 = 0.592

Notes: The numbers followed by the same letter notation indicate that they are not significantly different based on the DMRT 0.05 test at 95% confidence level.

Based on Table 5, it indicates that the substitution of *kaopi* using anchovy flour significantly affected the organoleptic test for *kasuami/kasoami* color. The most preferred *kasuami/kasoami* color was obtained during T0 treatment, which is 6.60 (preferred). In this case, this result was significantly different from other treatments. This is the same as the color obtained from T1, T2 and T3 treatments which also significantly different from other treatments. However, the results obtained from T4 and T5 treatment was not significantly different from each other, yet the latter was significantly different from the remaining treatments. The decrease in the panelist's preference for *kasuami/kasoami* color substituted with each treatment based on the organoleptic test results can be seen in Figure 5.

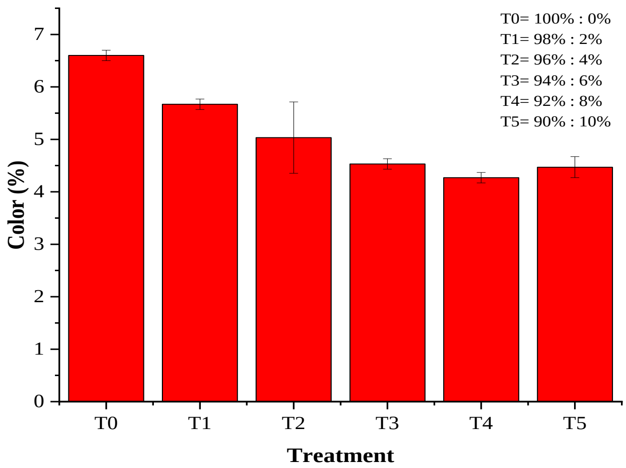

Figure 5: Average Color Based On Organoleptic Test

Figure 5 indicates that there was a decrease in the panelist preference regarding the *kasuami/kasoami* color substituted with anchovy flour. This significant decrease occurred due to the various addition of anchovy flour as substitutes. The most preferred *kasuami/kasoami* color was obtained during T0 treatment. The higher the addition of anchovy flour, the more brownish the *kasuami/kasoami* color so that it reduces the panelists' preference towards *kasuami/kasoami* color. Meanwhile, the average aroma of *kasuami/kasoami* based on organoleptic test and the results of Duncan's Multiple Range Test ($DMRT_{0.05}$) are presented in Table 6.

Table 6: Average Aroma of *Kasuami/kasoami* Based On Organoleptic Test

Treatments	Average aroma (%)	$DMRT_{0.05}$
T0	5.47^{a}	
T1	5.00^{b}	2 = 0.359
T2	4.87^{bc}	3 = 0.376
T3	4.62^{c}	4 = 0.386
T4	5.13^{a}	5 =0.393
T5	5.40^{ab}	6 =0.398

Notes: The numbers followed by the same letter notation indicate that they are not significantly different based on the DMRT 0.05 test at 95% confidence level.

Table 6 revealed that the substitution of *kaopi* using anchovy flour has a very significant effect on the organoleptic test for *kasuami/kasoami* color. The most preferred *kasuami/kasoami* aroma was obtained at T0 treatment by 5.47 (preferred). In this case, the aroma obtained from T0 treatment, along with the aroma obtained from T1 and T2 was significantly different from other treatments. Furthermore, the aroma obtained from T3, T4, and T5 treatments were also different from other treatments carried out. The decrease in the panelists' preference for the aroma of *kasuami/kasoami* substituted with anchovy flour in each treatment based on the results of the organoleptic test can be seen in Figure 6.

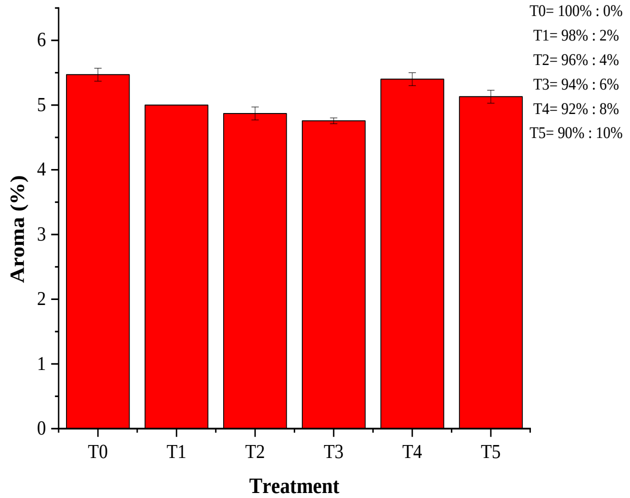

Figure 6: Average Aroma Based On Organoleptic Test

Figure 6 illustrated the decrease in the level of panelists' preference for the aroma of *kasuami/kasoami* substituted with anchovy flour. This significant decrease occurred due to the addition of anchovy flour substitution in different treatments. Based on the results of the organoleptic test, the most preferred cassava aroma was obtained in T0 treatment. The greater the addition of anchovy flour, the less favored the aroma of *kasuami/kasoami* by the panelists. This is because the panelists were not used to the smell of *kasuami/kasoami* substituted with anchovy flour.

Taste

The most preferred *kasuami/kasoami* taste was obtained from the results of T5 treatment by 6.13% (preferred) which was not significantly different from other treatments. The increase in the panelists' preference for the taste of *kasuami/kasoami* substituted with anchovy taste in each treatment based on the results of the organoleptic test can be seen in figure 7.

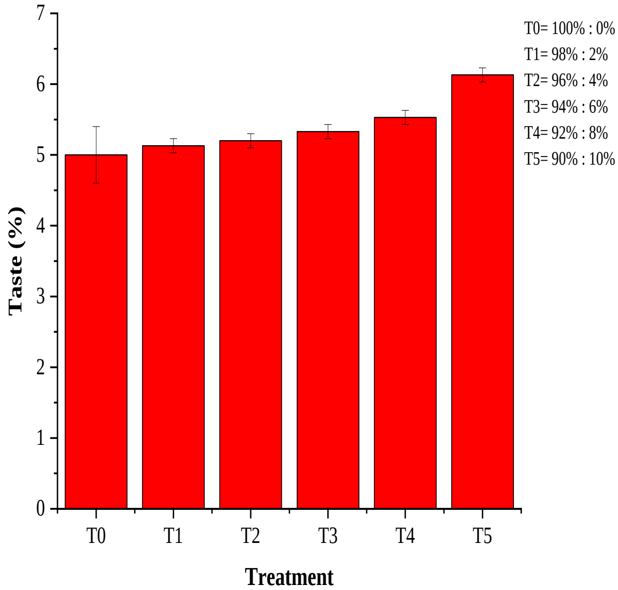

Figure 7: Average Taste Based On Organoleptic Test

Based on Figure 7, there was an increase in the level of panelists' preference towards the taste of *kasuami/kasoami* substituted with anchovy flour. This significant decrease occurred due to the addition of anchovy flour substitution in different treatments. Based on the results of the organoleptic test, the most preferred *kasuami/kasoami* taste was obtained during T5 treatment. The greater the addition of anchovy flour, the more preferred the taste of *kasuami/kasoami* by the panelists. This is presumably due to the chemical composition contained in anchovy flour which is substituted with *kaopi* so that *kasuami/kasoami* produced is preferred by the panelists.

Total Microbe

The highest total microbe was obtained in T5 treatment by 202.33 cfu. In this case, the results obtained from T5 treatment was different from other treatments. Furthermore, significant difference was found between T0 and the remaining treatments as well as between T3 and the remaining treatments. However, no significant difference was obtained between T1 and T2, but it was found between T1 and the other treatments except T2 treatment. Furthermore, T4 treatment also gave a significant difference from T0, T1, T2, T3, and T5 treatments. The increase in total microbes can be seen in figure 8.

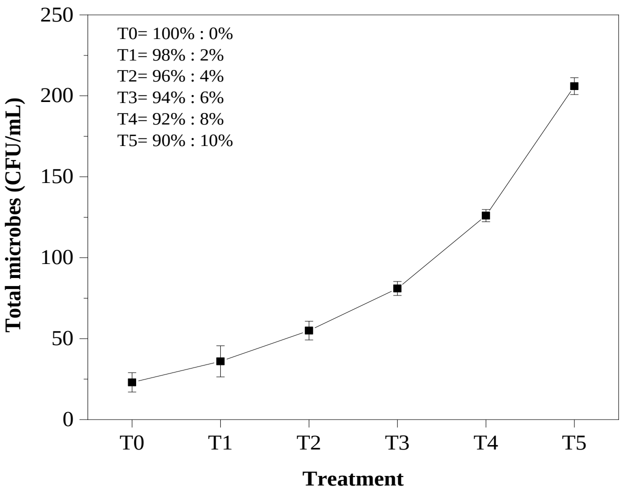

Figure 8: Average Total Microbe

Based on Figure 8, there was an increase in total microbes of *kasuami/kasoami*. This significant increase occurred due to the anchovy meal substitution in different treatments. The highest total microbes was obtained in T5 treatment. The greater the addition of anchovy flour, the more total microbe in *kasuami/kasoami*.

Discussion

The quality and shelf life of food is affected by the amount of water contained in the food itself [17], because certain amount of water can damage the food due to microbiological, chemical, and enzymatic processes occurred caused by the water content. Therefore, one of the factors which can cause food having long shelf life is the low water level contained in the food. The variance analysis carried out in the current research discovered that the substitution of *kaopi* using anchovy flour in each treatment (T0, T1, T2, T3, T4, and T5) significantly affected the moisture content of *kasuami/kasoami*. In addition, the DMRT test results as presented in Table 1 indicates that the lowest water content in *kasuami/kasoami* was obtained during T5 treatment by 47.57%. The reduction of *kaopi* and the addition of anchovy flour in each treatment showed that there was a decrease in the moisture content of *kasuami/kasoami* as shown in Figure 1.

The results showed that the moisture content of *kasuami/kasoami* decreased as the decrease of *kaopi* and the addition of anchovy flour. This is because anchovy flour has a lower moisture content than *kaopi* flour so that the more anchovy flour added, the more it absorbs the moisture content. This is supported by Habsy [10] that the water content of instant noodles tends to decrease along with the increase of anchovy flour added.

Protein was also observed as a post-treatment nutritional evaluation. Based on the variance analysis done, it was discovered that the substitution of *kaopi* using anchovy flour in each treatment (T0, T1, T2, T3, T4, and T5) significantly affected the protein content of *kasuami/kasoami*. The results of DMRT test as shown in Table 2 show that the substitution of *kaopi* using anchovy flour significantly affected the protein content of *kasuami/kasoami*. In this case, T5 treatment produced the highest protein content of 49.21%. Therefore, it indicated that the higher the use of anchovy flour, the higher the amount of protein contained in *kasuami/kasoami*. Such increased levels of cassava protein can be seen in Figure 2.

The increase of protein contained in *kasuami/kasoami* was argued due to the high protein content in anchovy flour, where anchovy product contains 44.43% of protein [15]. Furthermore, Swastawati *et al*. [16] stated that fresh anchovy contains 10.3 gram/100 gram of the ingredient. Therefore, the more anchovy flour was added, the more protein content obtained in *kasuami/kasoami*. Theoretically, *kaopi* and anchovy flour will increase the protein content of *kasuami/kasoami*. This is in accordance with the previous research [17] that suggests that the more anchovy flour substitutions added, the higher the protein content of biscuits. Anchovy (*Stolephorus* sp.) as food has high nutritional value with 504 mg calcium, 6.04 g fat, 5.73 g carbohydrate, and the highest nutritional value of protein which is 82.97 g [18].

Fat is an essential food substance for the health of human body. Fat is also found in almost all food ingredients with different contents [15]. Variance analysis revealed that the substitution of *kaopi* using anchovy flour in each treatment (T0, T1, T2, T3, T4, and T5) significantly affected the fat content of *kasuami/kasoami*. Furthermore, table 3 shows the results of the DMRT test, where T5 treatment obtained the highest fat content among other treatments by 3.48%. In this case, this result was significantly different from other treatments. The results further indicated that the more anchovy flour used, the higher the amount of fat contained in *kasuami/kasoami*. The increase in fat content in kasuami can be seen in Figure 3.

The increase of fat contained in *kasuami/kasoami* is assumed to be caused by the high fat content in anchovy, so that the more anchovy flour is added, the more fat contained in *kasuami/kasoami*. This is in accordance with the previous research carried out by Habsy [6], claiming that the addition of anchovy flour significantly affected the fat content of instant noodles. The fat content value ranged from 0.99 – 1.80 g per 100 g of anchovy instant noodles.

This indicates that the more anchovy flour used, the higher the *kasuami/kasoami* contains fat. This is resulted from the higher fat contained in anchovies compared to the fat contained in *kaopi*. Furthermore, another previous research project [17] also discovered that the more anchovy flour substitutions are added, the higher the fat content.

Carbohydrates have an essential role in determining the characteristics of food, this includes color, taste, texture, and others. In addition, carbohydrates are also useful in preventing ketosis, breaking excessive protein, loss of minerals, and fat and protein metabolism [15]. Based on the variance analysis conducted, it was found that the substitution of *kaopi* using anchovy flour in each treatment (T0, T1, T2, T3, T4, and T5) significantly affected on the carbohydrate content of *kasuami/kasoami*. The results of DMRT test as shown in Table 4 obtained that the highest carbohydrate content in *kasuami/kasoami* was obtained in T0 treatment by 45.02%, which was significantly different from the remaining treatments. The results showed that the higher the use of anchovy flour, the lower the carbohydrates contained in treatment. The decrease in carbohydrate content in *kasuami/kasoami* can be seen in Figure 4. The low carbohydrate contained in *kasuami/kasoami* substituted with anchovy flour, was due to a decrease in the addition of *kaopi* to *kasuami/kasoami*'s protein content and greater fat per unit g of ingredients based on carbohydrate calculations by difference [15].

Furthermore, organoleptic tests were carried out on three parameters, those are color, aroma, and taste because these parameters will affect the consumers to like the product or not. The appearance of a color is strongly affected by the physical state of the product, because the first thing that consumers pay attention to when choosing a product is generally the physical condition or appearance of the product. Factors that determine food ingredients include the taste and the nutritional value which become the visual consideration for the customers. A food which is considered to be well-nourished and tastes good, will not be eaten if the color is bad and gives a deviant impression from how the color should be.

Furthermore, analysis of variance discovered that the substitution of *kaopi* using anchovy flour in each treatment (T0, T1, T2, T3, T4, and T5) significantly affected the organoleptic test of *kasuami/kasoami* color. The results of the DMRT test for the organoleptic cassava color test is presented in table 5, showing that the most preferred *kasuami/kasoami* color based on the organoleptic test, were obtained at T0 treatment by 6.60% (preferred) which had significant difference from the remaining treatments. The results showed that the more the use of anchovy flour, the lower the panelists' preference for the color of *kasuami/kasoami*. The color of the substituted *kasuami/kasoami* product tends to turn brown with the addition of anchovy flour. Such darker color lowers the panelists' preference towards *kasuami/kasoami*. A previous research performed by Habsy [6] supported these results, proving that the addition of anchovies tends to reduce the panelists' preference of the color of substituted instant noodles. The color of substituted instant noodle products tends to turn brownish with the addition of anchovy flour. The resulting color difference can be caused by different proportions of anchovy flour and heating during steaming.

Testing on the aroma is considered important because the aroma of food determines the delicacy of food ingredients and can provide research results on products regarding th e acceptance or rejection of a food ingredient. Analysis of variance found that there is a very significant effect provided by the substitution of *kaopi* using anchovy flour in each treatment (T0, T1, T2, T3, T4, and T5) on the organoleptic test of *kasuami/kasoami* color. The results of the DMRT of organoleptic test on aroma is presented in Table 5 showing that the substitution of *kaopi* using anchovy flour has a very significant effect on preferred *kasuami/kasoami* color based on the organoleptic test. Furthermore, the most preferred *kasuami/kasoami* aroma was obtained in T0 treatment by 5.47% (preferred) which had significant difference from the remaining treatments.

The results revealed that the more anchovy flour used, the less preferred the aroma of *kasuami/kasoami* by the panelists. The aroma of *kasuami/kasoami* is dominated by the addition of anchovy flour substitution in each treatment, in which the less addition of anchovy flour to *kasuami/kasoami*, the more preferred it is by the panelists. This is presumably because the panelists are not familiar with the aroma produced. de Man [16] explained that starch contains a large number of carbonyl compounds which are believed to have important aroma and taste. Browning during heating is the main cause in the formation of *kasuami/kasoami* aroma.

Furthermore, taste is defined as the result of chemical stimuli received by the sense of taste or tongue. Taste is a factor that allows the customers to accept the food products or not. If the components of aroma, and color are good but the consumer does not like the taste, the consumer will not accept the food product. The relationship between the chemical structure of a compound is easier to determine by its taste.

The results of the DMRT test for the most preferred *kasuami/kasoami* taste based on the organoleptic test were obtained in T5 treatment by 6.13% (preferred), while the least preferred was obtained in T0 treatment. The results showed that the higher the use of anchovy flour, the higher the panelists' preference for the *kasuami/kasoami* taste. This is presumably because chemical components such as glutamic acid contained in anchovy flour affect the taste so that the resulting *kasuami/kasoami* are preferred by panelists with anchovy flour substitution.

A food products' microbiological quality is defined by the amount and types of microorganisms the food has. In addition, such quality also determine how long the product can be stored without any damage from microorganisms. Meanwhile, the safety of the product from microorganisms is determined by the number of pathogenic species present. Fish is a very easily-damaged food which commonly contains microbiota of around 2 to 7 log cfu/g. This is affected by several factors including local fish species or packaging technique [17]. The DMRT test results in Figure 8 show the highest total *kasuami/kasoami* microbes which were obtained in T5 treatment, which was 202.33 cfu/mL. This was significantly different from other treatments. The results showed that the higher the use of anchovy flour, the higher the amount of carbohydrates contained in *kasuami/kasoami*.

The high content of total plate count (TPC) values in *kasuami/kasoami* is considered to be affected by the high nutrient content and the presence of contamination from molds through the air during cooling. This is supported by the previous research carried out by Zaki [18], which states that the high TPC value in biscuits can be affected by several factors including biscuits containing rich nutrients which are good growth and development media for microorganisms. In addition, there is contamination from molds through the incoming air.

V. Conclusion

The substitution of *kaopi* using anchovy flour affects the nutritional value. In addition, the best *kasuami/kasoami* based on the organoleptic test were obtained in T5 treatment. The determination of the best treatment was done based on Duncan test and organoleptic test. Meanwhile, the results of the chemical components analysis of *kasuami/kasoami* are carried out through the weighting method. Treatment 5 (T5) (90%: 10%) obtained the highest protein content by 16.40%, highest fat content by 3.48%, and the lowest moisture content by 47.57%. The best comparison of *kaopi* and anchovy flour which is able to provide maximum nutritional and organoleptic value was obtained in T5 (90%: 10%) with an average taste of 6.13% (preferred), color of 4.47% (preferred), and aroma of 5.40% (preferred).

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