



## The Effect of Storage on The Nutritional Quality of Pindang Broiler Chicken Meat Packed with a Plastic Vacuum Bag (Vacuum Pack)

### AUTHORS INFO

**Anita Mustika Ibrahim**  
Universitas Muslim Buton  
[anitamustikaibrahim92@yahoo.com](mailto:anitamustikaibrahim92@yahoo.com)  
+6285299828861

**Asis Surajat**  
Universitas Muslim Buton  
[asissurajatrafaizan@gmail.com](mailto:asissurajatrafaizan@gmail.com)  
+6285341308679

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### Abstract

The body needs animal protein needs in this new normal. This research aimed to determine the storage time for Pindang seasoned broiler chicken, which was packaged using a plastic vacuum bag (vacuum pack). The problem with this research was that the exact length of storage for Pindang Spice broiler chicken's nutritional quality wasn't known by using a vacuum pack. This research will be conducted for one year (12 months). This research will be conducted in Bau-Bau City, Betoambari road, Bones village. Analysis of the nutritional content of Pindang Spiced broiler chickens meat will be carried out at the UHO Faculty of Animal Husbandry Technology Laboratory. The research that will be conducted is experimental. The research used a Completely Randomized Design with four treatments and four replications, each consisting of 500 grams of pindang seasoned broiler chickens. The research data were analyzed using analysis of variance (ANOVA) based on a completely randomized design using the SPSS standard. Further testing was carried out with the Duncan Multiple Range Test if the treatment had a significant effect. Based on the results of this research, it can be concluded that the protein content and fat content significantly ( $P < 0.05$ ) on the nutritional quality of Pindang Spiced Broiler chicken meat packaged in a vacuum pack. At the same time, the best treatment was obtained on the length of use of the vacuum pack on the nutritional quality of the results of this research, namely in the P2 treatment (10 days of storage), where the protein content, fat content, and water content of the meat were of higher quality.

**Keywords:** broiler chicken, meat, nutrition, vacuum pack

### A. Introduction

The world was hit by an Extraordinary Event (KLB) in the form of the COVID-19 pandemic caused by the SARS-CoV-2 virus that infected its first individual in Wuhan, one of the cities in the People's Republic of China, and then spread to all corners of the world without exception

Indonesia. Until now, Indonesia has implemented a new normal (New Normal). In the new normal era, people were still limited to attending public places, such as shopping places. So people were encouraged to provide their basic needs in large quantities and can be stored for a long time.

The body needed animal protein needs in this new normal. Broiler chickens meat was one of the largest animal protein contributors from livestock and were a leading commodity. The broiler chicken industry is growing rapidly because chicken meat is the main source of consumer menus. Processing and storage were usually done in chicken carcasses or half-cooked (pindang), which requires proper processing.

The cooking method by way of pindang is one of the techniques or ways of processing in maintaining the quality of a food ingredient using a combination of boiling/steaming or cooking for a certain period in a container. This technique was also widely used by fishers in several areas in Indonesia, generally applied to processed fish (Handayani *et al.*, 2017).

Carcasses that have been processed for long-term storage and to meet the demands of remote areas will be well packaged. Improper packaging of carcass or meat was recommended for a long time because it can deteriorate meat quality. The development of post-harvest technology that develops in the community was very rapid. However, several things need to be considered in storing and packaging a product. Several things need to be considered in the product packaging process, including processing, cleanliness, packaging methods, and temperature. So many product packaging technologies have been developed; one of these technologies was applying packaging technology using vacuum plastic bags (vacuum packs).

Packaging using a plastic vacuum bag (vacuum pack) has an effort to extend the shelf life. Product packaging in vacuum plastic bags was a method that served to control the growth of bacteria. Bacterial growth plays an important role in decreasing the quality of a product. However, many people still don't know the shelf life of the resulting product if packaging technology was carried out using vacuum plastic bags (vacuum packs). Therefore, researchers researched the shelf life of broiler chicken packaged using vacuum plastic bags (vacuum packs). The use of vacuum plastic technology such as polyester extended the shelf life. The thicker the packaging used for the product will prevent the release of water and gas, resulting in a lack of fat oxidation or nutritional content in the meat.

This research aimed to determine the storage time for Pindang seasoned broiler chicken, which was packaged using a plastic vacuum bag (vacuum pack). The problem with this research was that the exact storage time for the nutritional quality of Pindang Spiced Broiler chicken is unknown, which is packaged using a plastic vacuum bag (vacuum pack).

## **B. Methodology**

### *1. Research Design*

The research used a Completely Randomized Design with four treatments and four replications, each consisting of 500 grams of pindang seasoned broiler chicken.

The arrangement of the experiments that have been carried out was as follows:

P0 = Pindang broiler chicken meat without temperature and time treatment

P1 = Pindang broiler chicken meat was stored at 0°C for five days.

P2 = Pindang broiler chicken meat was stored at 0°C for ten days.

P3 = Pindang broiler chicken meat was stored at 0°C for 15 days.

### *2. Procedure of Research*

The broiler meat that will be sampled is broiler chicken breast. The sample used in this study was broiler chicken that has been mixed with spices and cooked with pindang. Before being used as pindang, broiler chicken meat is first cleaned by adhering dirt with clear water. After cleaning, broiler chicken meat was cut into several pieces of medium size with a weight range of 500 grams. After being cut, the broiler chicken meat was covered with the provided spices. After the spices and broiler chicken meat had been mixed, it was stored for 15 minutes. Storage for 15 minutes aims so that the spices used in the meat can be absorbed properly. After being stored for 15 minutes, the meat will be steamed to become seasoned broiler chicken meat for 15 minutes. After steaming, broiler meat will be aerated for 15 minutes. The meat will be packaged in a vacuum pack if the spiced pindang broiler chicken has cooled down. After that, it will continue the research procedures formulated in the experimental arrangement. After the treatment with long storage, the pindang spiced broiler chicken meat will be analyzed for its nutritional content.

### 3. Parameters of research

The parameters studied in this research were the content of protein, fat, ash, water, pH, and crude fiber.

### 4. Data Analysis

The mathematical model was as follows:

$$Y_{ij} = \mu + \alpha_i + \epsilon_{ij}$$

Wherein:

$Y_{ij}$  = observational value of the i-th treatment and j repetition

$\mu$  = average value of observations

$\alpha_i$  = the effect of treatment i

$\epsilon_{ij}$  = th try error-i

The data obtained were processed using a completely randomized design. If the treatment has a significant effect, further tests were carried out with the Duncan Multiple Range Test (Steel & Torrie, 1991).

## C. Result and Discussion

### 1. Protein Level

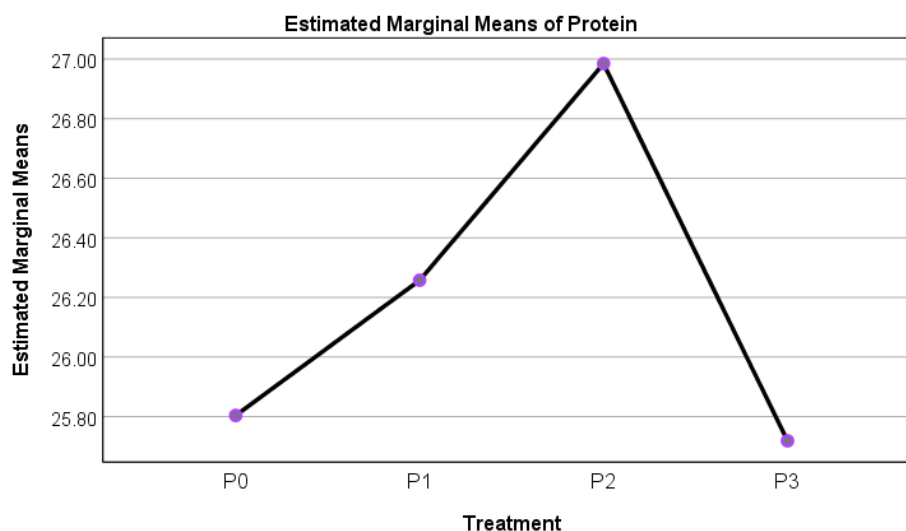
Protein content was the amount of protein contained in raw materials expressed as a percent (%). The average percentage of protein content obtained was presented in Table 1.

**Table 1. Protein content on the nutritional quality of Pindang seasoned broiler chicken packaged in vacuum pack bags**

Test	Treatment			
	P0 (Control)	P1 (5 Days)	P2 (10 Days)	P3 (15 Days)
1	25.74	25.72	27.16	25.58
2	26.38	26.14	26.67	26.03
3	25.47	26.13	26.87	25.43
4	25.63	27.03	27.23	25.84
Average	25.81±0.40 <sup>b</sup>	26.26±0.55 <sup>b</sup>	26.98±0.26 <sup>a</sup>	25.72±0.27 <sup>b</sup>

**Description: Numbers followed by different letter superscripts in the same row and column show a significant effect**

Based on the analysis of variance that has been carried out, it shows that the nutritional quality of pindang seasoned broiler meat packaged in vacuum plastic bags has a significant effect ( $P < 0.05$ ) on the protein content of the broiler meat.



**Figure 1. Graph of The Protein Content**

Figure 1 shows that the treatment of pindang seasoned broiler chicken using a plastic vacuum bag (vacuum pack) increased and decreased again in the P3 treatment (25,72%). Based on the results of the average percentage of research in Table 1, the average value of protein content ranges from 25.81%-26.98%. Not only P2 but the results of P0, P1, and P3 are higher than the Ninu (2008) results, which was 19.65%-21.28%.

Protein content increased along with shelf life, namely in the treatment P1 (26.26%) and P2 (26.98%), the increase in protein content was caused by the addition of additional spices to broiler chicken meat, one of which was salt, where salt made the protein residue and didn't dissolve easily. Following Winarno's (2004) opinion, which says that the salting-out process can cause protein levels, protein solubility decreases. As a result, the protein separates as a precipitate in the chicken meat. While in the P3 treatment (25.72%), where the protein content decreased due to protein decomposition, it was suspected that in the P3 treatment, there was Drip formation. In addition, it can be caused by further processing (pindang) so that denaturation occurs. It was supported by the opinion of Kusuma *et al.* (2017), which states that a decrease in protein levels during storage can occur due to protein decomposition. Other soluble nutrients, including protein. It will form a drip during storage. The longer processed meat products were stored, the higher the amount of drip. Either in the pindang process, the heating treatment can result in protein denaturation.

In addition, the decreased protein was thought to be due to a relationship with the increased water and fat content. The absorption of water enters the muscle tissue of the meat at the time of rotation so that water can be absorbed. According to Indriastuti (2012), protein content allegedly decreased during the shelf life because there was a relationship between the value of water and fat content, which tended to increase even though it was very small. Heinz *et al.* (2007) said that the low protein content was caused by absorption into muscle tissue and resulted in the denaturation of protein in meat both into the extracellular and intracellular spaces. The protein content of meat was low (Prasetyo, 2009).

## 2. Fat Level

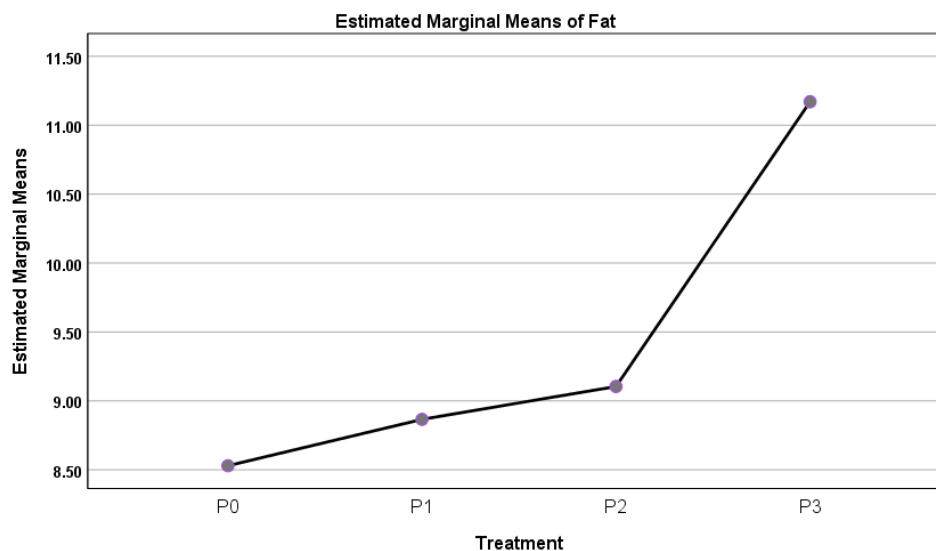
Fat content was the amount of fat in the raw material expressed as a percent (%). The average percentage of fat content that has been obtained is presented in Table 2.

**Table 2. Fat Content on Nutritional Quality of Pindang Seasoned Broiler Chicken Packaged In Vacuum Plastic Bags (Vacuum Pack).**

Test	Treatment			
	P0 (Control)	P1 (5 Days)	P2 (10 Days)	P3 (15 Days)
1	7.95	9.09	9.11	11.09
2	8.65	8.88	9.31	11.17
3	7.85	8.68	9.03	10.96
4	9.67	8.87	8.97	11.45
Average	8.53±0,84 <sup>b</sup>	8.88±0,17 <sup>b</sup>	9.10±0,15 <sup>b</sup>	11.17±0,21 <sup>a</sup>

**Description: Numbers followed by different letter superscripts in the same row and column show a significant effect (P<0.05)**

Based on the results of the analysis of variance, it showed that the nutritional quality of Pindang seasoned broiler meat packaged in a plastic vacuum bag (vacuum pack) had a significant effect (P<0.05) on the fat content of the broiler meat.



**Figure 2. Fat Content**

Figure 2 shows a graph of the treatment that continues to increase the fat content of broiler chicken with pindang spices using a plastic vacuum bag (vacuum pack). The average percentage in Table 2 showed an increase in the P3 treatment (11.17%). Allegedly because the protein content in this study decreased, it impacted fat content. In addition to these factors, the increase in fat content can occur due to adding spices that absorb into the chicken meat for a longer time. The amount of fat content that had already existed under the skin increased the fat content of the meat. Following Indriastuti's (2012) opinion, the decreased protein content during the shelf life would increase the value of water and fat content. According to Soeparno (2009), the fat content varies widely, ranging from 1.5-to 13%. So, it was better than the fat content in chicken meat wasn't recommended to be lower and not less than in the P2 treatment in this study because the fat content can affect the taste and aroma of chicken meat. Stimulates increased cholesterol levels to result in heart and blood vessel disorders (Kulkarni & Dalai, 2006). Aroma and taste are determined by precursors soluble in water and fat and the release of essential oil substances in meat (Hehanussa *et al.*, 2010).

Rupsankar (2010) stated that fat is mostly spread under the skin in poultry. The varying chemical compositions of fat and protein reflect each other, inversely, where if the fat content was high, the protein content was low (Fenita *et al.*, 2009) according to this study, which can be seen in Table 1. Purnomo (2000) said that the chemical content at the time of meat processing would be influenced by additives and processed the food processing either before or after processing to gradually reduce or even damage the nutrients in the food. The increase in fat content was caused by a decrease in the water content in the former (Bahalwan, 2011). One of the ingredients used as a spice mixture for the pindang chicken was candlenut, which contains oil. The increase in fat content in foodstuffs can occur due to the absorption of one of the mixed ingredients used in making spices, candlenut.

### 3. Ash Content

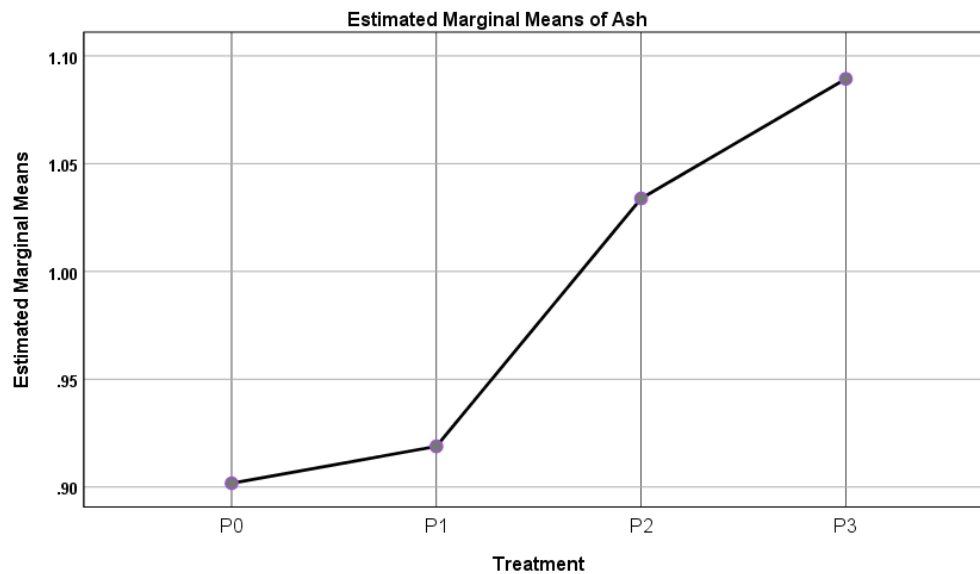
Ash content was the amount of ash contained in raw materials expressed as a percent (%). The average percentage of ash content obtained was presented in Table 3.

**Table 3. Ash Content on Nutritional Quality of Pindang Seasoned Broiler Chicken Which was Packaged In Vacuum Plastic Bags (Vacuum Pack)**

Test	Treatment			
	P0 (Control)	P1 (5 Days)	P2 (10 Days)	P3 (15 Days)
1	0.86	0.92	1.13	1.19
2	0.80	0.90	0.94	0.93
3	1.03	0.98	0.94	0.96
4	0.91	0.87	1.13	1.28
Average	0.90±10	0.92±0.05	1.03±0.11	1.09±0.18

**Description: Numbers followed by different letter superscripts in the same row and column show no significant effect (P>0.05)**

Based on the analysis of variance, it was shown that the nutritional quality of Pindang seasoned broiler meat packaged in a plastic vacuum bag had no significant effect (P>0.05) on the ash content of the broiler meat.



**Figure 3. Ash Content**

Figure 3 shows that the graph of the ash content in the research results has increased on the treatment of broiler chicken with pindang seasoning using a plastic vacuum bag (vacuum pack). The average percentage results in the research showed that the average in Table 3 has increased in the range of 0.90%-1.09%. It was caused by an increase in the water content in the meat to increase the ash content. According to Winarno (2004), an increase in water content cause a decrease in the concentration of ash content. In addition to these factors, it was suspected that the ashing process caused the increase in ash content; organic materials will undergo evaporation and leave combustion residues in the form of minerals that do not evaporate when heating the research sample.

#### 4. Moisture Content

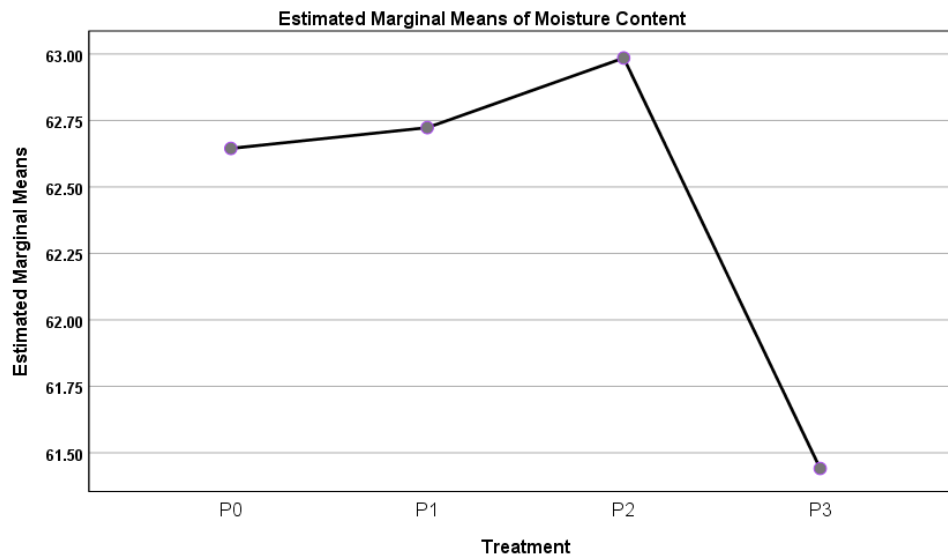
Moisture content was the amount of water in the raw material expressed as a percent (%). The average percentage of ash content obtained was presented in Table 4.

**Table 4. Moisture Content on Nutritional Quality of Pindang Seasoned Broiler Chicken Packaged In A Vacuum Pack**

Test	Treatment			
	P0 (Control)	P1 (5 Days)	P2 (10 Days)	P3 (15 Days)
1	62.34	62.85	62.75	61.42
2	63.70	61.96	63.07	62.03
3	61.90	62.79	63.26	61.35
4	62.63	63.29	62.85	60.97
Average	62.64±0.77 <sup>a</sup>	62.72±0.55 <sup>a</sup>	62.98±0.23 <sup>a</sup>	61.44±0.44 <sup>b</sup>

**Description: Numbers followed by different letter superscripts in the same row and column show no significant effect ( $P>0.05$ )**

Based on the results of the analysis of variance, it showed that the nutritional quality of Pindang Spice broiler meat packaged in a plastic vacuum bag (vacuum pack) had no significant effect ( $P>0.05$ ) on the moisture content of the broiler meat.



**Figure 4. Moisture Content**

Figure 4 in the results of this study shows a graph of the decreased water content of the treatment of broiler chicken with pindang seasoning using a plastic vacuum bag (vacuum pack). Based on the results of the average percentage in Table 4, the research that has been done shows that the average in Table 4 has the lowest decrease, namely in the P3 treatment (61.44%). Thought to be caused by an increase in fat content in the meat, as shown in Table 2 treatment P3 (11.17%). According to Ranken (2000), the decrease in water content in food was caused by the heating process, causing an increase in the amount of fat, protein, and carbohydrates in these foodstuffs. Decrease in water content due to osmotic pressure.

Where osmotic pressure was the exchange of water between cells and the environment due to differences in concentration (Kuntoro *et al.*, 2007), Ranken (2000) adds that if the water content decreases in food during the heating process, the fat content will increase. The decrease in the average water content in the table in this research could be due to a vacuum pack with many functions, one of which can stabilize the chemical speed in food ingredients. In addition, Yahiya *et al.* (2012) also stated that vacuum packaging was waterproof, which acts as a barrier against moisture content.

### 5. pH

pH was the amount of pH in the raw material expressed as a percent (%). The average percentage of pH obtained was presented in Table 5.

**Table 5. pH Levels on Nutritional Quality of Pindang Seasoned Broiler Chicken Packaged in Vacuum Plastic Bags (Vacuum Pack)**

Test	Treatment			
	P0 (Control)	P1 (5 Days)	P2 (10 Days)	P3 (15 Days)
1	5.81	5.61	5.74	5.24
2	5.57	5.74	5.82	5.64
3	6.02	5.42	5.21	4.93
4	5.61	5.67	5.52	5.59
Average	5.75±0.21 <sup>a</sup>	5.61±0.114 <sup>ab</sup>	5.57±0.27 <sup>ab</sup>	5.35±0.33 <sup>b</sup>

**Description: Numbers re 5. pH**

Figure 5 shows a decreasing pH for broiler chicken treatment with pindang spices using a plastic vacuum bag (vacuum pack). It was suspected that decreasing pH was caused by the release and capture of H<sup>+</sup> ions due to the meat's acidic nature. According to Candra (2006), the gradual decrease in pH, which was relatively constant in meat, was caused by buffering substances in broiler chicken meat and the release and capture of H<sup>+</sup> ions in the meat due to acidic conditions. In addition, he said that the lactic acid of meat greatly affects the pH value, whereas meat with high lactic acid will have a low pH of meat.

Based on the average percentage of this study, the lowest pH decreased in the P3 treatment (5.35%). The decrease in pH occurs due to other factors that have been described above, and factors from storage can also cause pH. According to Surajadi (2004), the longer the storage of meat, the lower the pH of the chicken meat. It was different from the results of



research Prayitno *et al.* (2010) said that the pH of broiler chicken meat was between 6.11-6.25. The meat's decreased pH was thought to be due to the influence of the content in broiler meat in this study where one of the chemical contents. Such as increased protein content, besides the decrease in the meat's pH level, was also thought to be due to the low acid content of the meat. According to Montolalu *et al.* (2013), the structure of the restructured meat in its function as a meat protein can affect the pH of processed meat. Wulf *et al.* (2002) said that meat that was said to be non-acidic was meat with a pH above 5.0.

#### 6. Crude Fiber

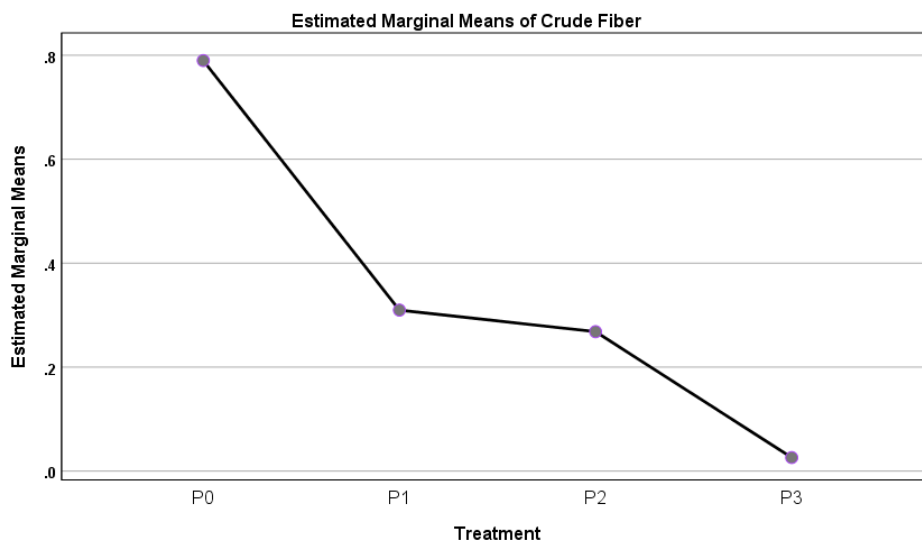
The crude fiber was the crude fiber contained in raw materials expressed as a percent (%). The average percentage of crude fiber obtained was presented in Table 6.

**Table 6. Protein Content on Nutritional Quality of Pindang Seasoned Broiler Chicken Packaged in Vacuum Plastic Bags (Vacuum Pack)**

Test	Treatment			
	P0 (Control)	P1 (5 Days)	P2 (10 Days)	P3 (15 Days)
1	0.78	0.30	0.27	0.03
2	0.69	0.32	0.26	0.02
3	0.88	0.32	0.35	0.03
4	0.81	0.30	0.19	0.02
Average	0.79±0.08 <sup>a</sup>	0.31±0.01 <sup>b</sup>	0.27±0.06 <sup>b</sup>	0.03±0.03 <sup>c</sup>

**Description: Numbers followed by different letter superscripts in the same row and column show a significant effect (P<0.05)**

Based on the results of the analysis of variance, it showed that the nutritional quality of Pindang seasoned broiler meat packaged in a plastic vacuum bag (vacuum pack) had a significant effect (P<0.05) on the crude fiber of the broiler meat.



**Figure 6. Crude Fiber**

Figure 6 in the graph shows a decrease in crude fiber against the treatment of broiler chicken with pindang spices using a plastic vacuum bag (vacuum pack). Based on the results of the average percentage, this study resulted in a decrease in crude fiber. The lowest crude fiber is P3 (0.03%), presumably due to the low glycolysis process in chicken meat to affect the pH and crude fiber. According to Dharmawati *et al.* (2014), high crude fiber content can cause the enzymes involved in the glycolysis process to increase, affecting the pH of broiler meat.

#### D. Conclusion

Based on the results of the research that has been carried out, it can be concluded that the protein content and fat content significantly (P<0.05) on the nutritional quality of Pindang Spiced Broiler chicken meat packaged in a plastic vacuum bag (vacuum pack). Meanwhile, the storage time for pindang spice broiler meat which was packaged using a plastic vacuum bag (vacuum pack) in the results of this study, was in the P2 treatment (10 days of storage).



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