

# Acidity Degree (pH), Cooking Loss and Tenderness: Study of Marinated Chicken *Afkir* with Pineapple (*Ananas Comosus L. Merr*) Peel Extract

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## ABSTRACT

Laying afkir has a weakness: the meat is hard. The tenderness of the meat is influenced by connective tissue protein; the older the connective tissue, the more it increases the toughness of the meat. The bromelain enzyme is an enzyme found in pineapples that can hydrolyze protein so that it can soften the meat. This study aims to determine egg-laying chicken meat's physical and organoleptic properties by giving concentrations of pineapple peel extract (*Ananas comosus L. Merr*) 0%, 20%, 30%, and 40%. The experimental design used was a completely randomized design (CRD) with four treatments and four replications. The results showed that administration of pineapple peel extract with concentrations of 0%, 20%, 30%, and 40% on Afkir layer chicken meat had a significant effect ( $P < 0.05$ ) on cooking loss, pH, tenderness, and juiciness of Afkir chicken meat, but did not show a significant effect on the color, aroma, and taste of the organoleptic properties of discarded chicken meat, where P4 (40%) was the best treatment.

**Keywords:** chicken *afkir*; pineapple skin extract; pH; cooking loss; tenderness

## INTRODUCTION

From year to year, people's animal protein needs continue to increase in line with the increasing population and awareness of the importance of nutritional needs [1], [2]. The need for animal protein can be met by consuming livestock products such as meat, eggs, and milk [3]. Meat is one of the livestock products that cannot be separated from human life and can cause satisfaction and enjoyment for those who eat it because it has a high and complete nutritional content such as protein, sodium, fat, and vitamins so that the nutritional balance for the body can be fulfilled [4][5]. *Afkir* layer chicken contains 25.4% protein, 56% water, and 3-7% fat. [6], [7].

One alternative to meet the need for meat availability and consumption can be done by utilizing the potential of *Afkir* chicken meat. *Afkir* laying hens have the potential to be processed meat products because they have good nutritional content [8], [9].

The weakness of *Afkir* chicken meat is mainly tenderness [10], [11]. The older the livestock, the more connective tissue, thus increasing the toughness of the meat. Meat tenderness is influenced by connective tissue protein; the older the animal, the more connective tissue, thereby increasing the toughness of the meat [12][13][14].

Thus, a method is needed to improve the quality of *Afkir* chicken meat by utilizing the bromelain enzyme, a class of protease enzymes widely found in pineapples. [15][16]. Pineapple fruit is widely used at the industrial and household levels [17]. Pineapple is rich in vitamins A and C and contains various important substances the body needs, such as glucose, protein, iron, phosphorus, and fiber [18]-[20].

Currently, the use of pineapple is limited to the flesh, while the skin and tubers are removed. Pineapple skin and hump have not been used optimally. One of the uses of pineapple skin is as a meat tenderizer and is thought to increase the nutritional content of the meat.

Pineapple skin as waste can be extracted and used in tenderization by soaking old laying hens. Pineapple skin contains the enzyme bromelain with optimum activity at a temperature of 65°C and a pH of 6.5 [21], [22]. Some other literature states that the optimal temperature of the bromelain enzyme is 40°C-60°C [23]-[25]. In addition, soaking *Afkir* chicken meat with pineapple skin extract (*Ananas comosus L. Merr*) at a concentration of 27.5% can increase tenderness and reduce water holding capacity and pH but does not cause an increase in water content, color, and aroma [26], [27]

Soaking *Afkir* laying hens with pineapple skin extract (*Ananas comosus L. Merr*) at a concentration of 27.5% can increase tenderness and reduce water holding capacity and pH [28] but does not cause an increase in water content, color, and aroma [29]. The research results of Dhiah et al. [30] stated that adding 15% pineapple extract and a cooking time of 60 minutes resulted in the best quality of duck meat.

Thus, this study aims to determine discarded laying hens' physical and organoleptic properties with concentrations of pineapple peel extract (*Ananas comosus L. Merr*) 0%, 20%, 30%, and 40%. This study is expected to provide information regarding the concentration level of pineapple (*Ananas comosus l. merr*) on the quality of discarded chicken meat.

**MATERIALS AND METHODS**

The equipment used in this study were knives, blenders, scissors, pens, digital scales, filters, funnels, measuring cups, pans, stoves, filter paper, pH meters, containers, cutting boards. The materials used in this study were *Afkir* chicken, pineapple skin, and equates.

The manufacture of pineapple peel extract begins with washing the pineapple skin clean, then cut into small pieces and put into a blender. Then blend the pineapple skin without adding water. After that, filter the pineapple skin using cheesecloth and filter it again using filter paper to obtain a pineapple skin extract solution.

One hundred grams of chicken breast *Afkir*, put in a container. After that, soak each meat with pineapple peel extract at a predetermined rate (0%, 20%, 30%, 40%) for 15 minutes. After that, reweigh the sample that has been soaked with pineapple peel extract, then put the sample into a plastic press and then boil the sample at a temperature of ±80°C. Then after 15 minutes, the meat is removed from the plastic press and then dried and weighed again to get the cooking loss from the meat.

The pH test is done by calibrating the pH meter first with a pH buffer of 7.0. The meat that has been soaked is weighed 10 grams and mashed by chopping it, putting it in a small plastic tube, and adding 10 ml of distilled water. Furthermore, the pH meter is dipped into the meat sample, and the results are read on the pH meter digital screen.

The test was carried out three times, and the results were averaged. Cooking loss testing was carried out by weighing 100 grams using a digital scale (initial weight). Then the sample was put in a water bath at 80°C for 60 minutes. Samples were then taken and reweighed, and used as (final weight) [5][14]. Meat cooking loss can be measured by calculating the results. Cooking loss can be calculated using equation (1).

$$Susut Masak (\%) = \frac{B_0 - B_1}{B_0} \quad (1)$$

With  $B_0$  = weight of the initial sample;  $B_1$  = weight of the final sample

The tenderness test used semi-trained panelists from alumni and students interested in studying livestock products technology in the final semester of 20 people according to the rating scale presented in Table 1.

**TABLE 1:** Scoring scale

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Very soft	Soft	Medium soft	Tough	Very Tough

Source :[31][32][33]

This study used a completely randomized design (CRD) 4 x 4 with 4 replications, with treatment (1)  $P_0$  = Without soaking pineapple peel extract;  $P_1$  = pineapple peel extract 20%;  $P_2$  = 30% pineapple peel extract soaking;  $P_3$  = Soaking 40% pineapple peel extract. The mathematical model used for the research design is written in the form of an equation (2).

$$Y_{ij} = \mu + \alpha_i + \epsilon_{ij} \quad (2)$$

With,  $Y_{ij}$  = Treatment response to- $i$  ( $i = 1,2,3$ ), on the repeat to- $j$  ( $j = 1,2,3$ );  $\mu$  = General average;  $\alpha_i$  = The effect of treatment to- $i$ ;  $\epsilon_{ij}$  = Error on treatment to- $i$  and repeat to- $j$

**RESULTS AND DISCUSSION**

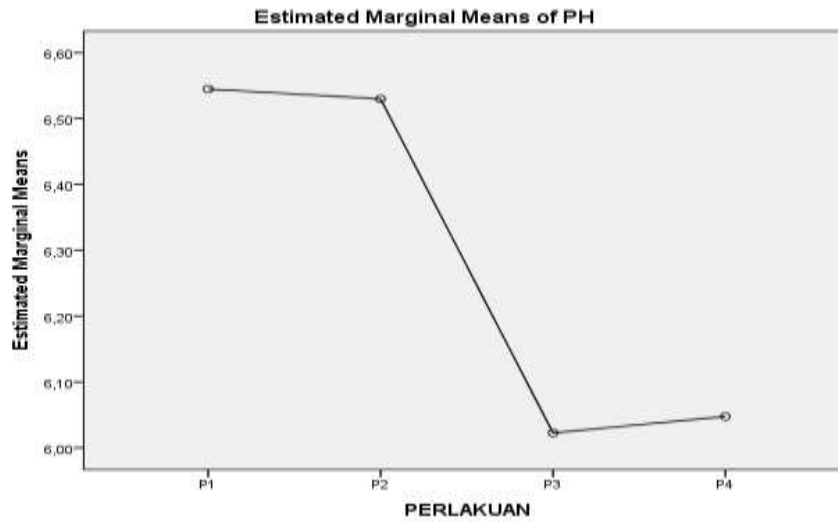
**Meat pH Value**

**TABLE 2:** Average pH Value, Cooking Loss, and Tenderness of *Afkir* Chicken Meat Given Pineapple Skin Extract with Different Concentrations

Variable	Treatment			
	P <sub>1</sub> (control)	P <sub>2</sub>	P <sub>3</sub>	P <sub>4</sub>
pH	6,55±0,32 <sup>c</sup>	6,53±0,27 <sup>bc</sup>	6,02±0,16 <sup>a</sup>	6,05±0,11 <sup>ab</sup>
<i>Susut Masak</i>	47,48±0,17 <sup>a</sup>	48,33±0,18 <sup>b</sup>	48,71±0,37 <sup>b</sup>	48,85±0,34 <sup>b</sup>
tenderness	4,07±0,26 <sup>a</sup>	3,20±0,86 <sup>a</sup>	1,40±0,51 <sup>bc</sup>	1,07±0,26 <sup>bc</sup>

Based on the results of the analysis in Table 2, the variance shows that the addition of pineapple peel extract has a significant effect ( $P < 0,05$ ). The results of the Tukey test showed the average percentage of pH obtained that treatment  $P_3$  with an average of 6.02 was significantly different from  $P_1$  with an average of 6.55 and  $P_2$  with an average of 6.53, but did not differ from  $P_4$  with an average of 6.05. It is caused by giving pineapple fruit extract to a discarded layer of chicken meat after soaking.

Using pineapple peel extract with different concentrations can break the bonds of the flesh and soften the meat fibers because the pineapple peel extract cells contain bromelain enzymes which can lower the pH value. It is following the statement [26], [34], The decrease in the pH of *Afkir* laying hens with increasing levels of concentration of pineapple peel extract given is due to hydrolysis of meat proteins, pineapple peel extract reaches the cytoplasmic membrane and increases  $H^+$  ions in the meat [35].



**FIGURE 1:** Graph of pH Percentage of Laying Chickens with Provision of Pineapple Peel Extract.

Based on Figure 1, the soaking of *Afkir* layer chicken meat in pineapple peel extract had a significant effect ( $P < 0.05$ ) on the pH value. Increasing the concentration of pineapple peel extract on *Afkir* laying hens causes the pH value to decrease. Further test results showed that the pH value in the 30% treatment was significantly lower than the 0%, 20%, and 40% treatments.

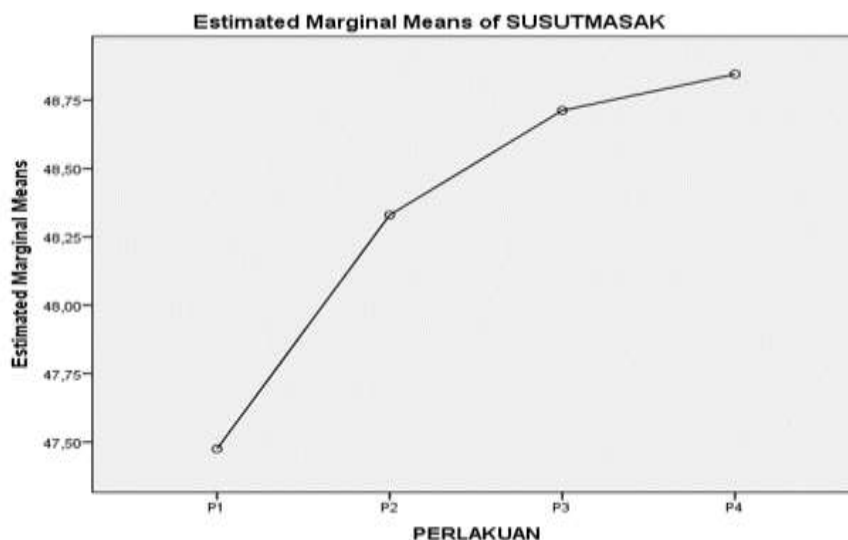
The decreased pH of *Afkir* layer chicken meat with an increasing concentration level of pineapple peel extract was due to the protein hydrolysis of *Afkir* layer chicken meat. Pineapple peel extract penetrates the cytoplasmic membrane of the flesh and dissociates into  $CH_3COOH$  (acetic acid) and  $H^+$  [29], [36]. The higher the concentration of the pineapple peel extract used, the higher the  $H^+$  formed, which will lower the pH of the chicken meat because  $H^+$  ions affect the degree of acidity. Many factors affect the pH, including the water holding capacity of meat, the formation of actomyosin (rigor mortise) [37], [38], temperature and humidity, carcass wilting, meat type and muscle location, muscle function, age, feed, and intramuscular fat [39]. Suradi [39] wrote that the difference in the value of the water-binding power of meat is influenced by the protein and carbohydrate content of the meat, a high protein content of meat is followed by a higher water-binding capacity. [40], [41].

This is also in line with the study of Widhowati et al. [42] wrote that the water content of meat is a factor of low or high pH of meat; the quality of meat that is slaughtered depends on the level of pH value in the meat

**Susut Masak**

The results of the calculation of cooking loss of *Afkir* laying hens given pineapple peel extract are presented in Table 2. The analysis of variance showed that the addition of pineapple peel extract was significantly different ( $P < 0.05$ ). The Tukey test results showed that the average cooking loss percentage showed that treatment P<sub>1</sub>, with an average of 47.48, was significantly different from treatment P<sub>2</sub> with an average of 48.83 and P<sub>3</sub> with an average of 48.71 P<sub>4</sub> with an average of 48.85. The results in Table 2 indicate that the administration of pineapple peel extract increased the cooking loss value of the meat. This is because, at the time of cooking, the meat cannot maintain the water content contained in the meat, causing much water to come out during the cooking process.

If the water holding capacity decreases, more water will come out of the meat so that the cooking loss of the meat will be high. Windyasmara & Sahiri [13]; Soeparno [14] explains that the size of the cooking loss of meat is strongly influenced by the binding capacity of the water produced; if the water holding capacity of meat increases, the cooking loss of meat will increase.



**FIGURE 2:** Graph of Cooking Loss of Laying Chicken Meat Dismissed with Pineapple Peel Extract

Based on Figure 2, the addition of concentrate affects the cooking loss of meat. It can be seen from the addition of cooking loss at each percentage addition of concentrate. This result is in line with the study conducted by Biyatmoko et al. [28] and Falahuddin et al. [45], which wrote that adding a solution of pineapple extract can increase the cooking loss value of chicken meat. In Bromelain, pineapple extract hydrolyzes protein connective tissue to meat, including meat collagen, so that it can open the microstructure of meat by breaking myofibrils. [28], [30]. Novita et al. [35] wrote that the high value of the cooking loss was related to muscle fibers and collagen tissue shrinkage.

### Tenderness

The results of the calculation of the tenderness of *Afkir* laying hens given pineapple peel extract are presented in Table 2. Tenderness is the most important thing in determining meat quality. The quality of the meat is influenced by several factors, such as post before slaughter (Antemortem) and post after slaughter (post mortem) [46][47]. Kruskal Wallis analysis showed that soaking meat with pineapple peel extract with different concentrations showed a significant difference ( $P < 0.05$ ) in the tenderness value of *afkir* laying hens. The results of the panelists' assessment showed that the tenderness score of beef ranged from 4.07 (tricky) to 1.07 (very tender). It indicates that the immersion of meat in pineapple peel extract affects the panelists' assessment of the tenderness of *Afkir* layer chicken meat from very tough to very tender. The results of this study are by the research [48]. Triyono [10], in his study, reported that the higher the number obtained from measurements using a texture analyzer, the lower the softness value. It shows that the meat not marinated with young papaya juice provides a low tenderness of the meat. It is presumably due to the absence of osmosis between young papaya juice and flesh water. Menurut Kuntoro et al. [49] Osmosis is the exchange of water between cells and the environment due to differences in concentration

### CONCLUSION AND RECOMMENDATION/POLICY IMPLICATION

Berdasarkan Based on the results of this study, it can be concluded that the soaking of *Afkir* layer chicken meat with pineapple peel extract with different concentrations had a significant effect ( $P < 0.05$ ) on cooking loss, pH, tenderness, and juiciness. Nevertheless, it did not give a significant effect ( $P > 0.05$ ) on color, aroma, and taste with the best treatment in category P4. In addition, for further studies, it is necessary to pay attention to the ingredients and the marinade process to create good quality meat in terms of pH or tenderness of the meat.

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