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Technology Improvement of Physical Properties of KUB Chicken Meat Include Papaya Leaves (*Carica papaya* L) in Feed

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Abstract— This study aims to determine the Technology improvement of physical properties of KUB chicken meat including Papaya Leaves (Carica papaya L) in feed. This study used 100 KUB chickens placed in 20 boxes of cages, each box containing 5 KUB chickens, using papaya leaf flour at the age of 3 weeks. The method used in this experimental study was a completely randomized design (CRD) with 5 treatments and 4 replications consisting of treatment A (feed with 0% papaya leaf flour), treatment B (feed with 2.5% papaya leaf flour), treatment with C (feed with 5% papaya leaf powder), treatment D (feed with 7.5% papaya leaf powder) and treatment E (feed with 10% papaya leaf powder). The parameters observed were meat pH, cooking loss, meat tenderness and water holding capacity. The results showed that giving papaya leaf flour up to 10% had no significant effect ($P>0.05$) on meat pH and cooking loss, but had a very significant effect on ($P<0.01$) KUB chicken meat tenderness. The conclusion of this study is that giving 2.5% papaya leaf flour has an effect on the tenderness of KUB meat.

Keywords : KUB chicken, papaya leaf flour, meat pH, cooking loss, meat tenderness and water holding capacity

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1. Introduction

The Kampung Unggul Balitbangtan (KUB-1) is one of the breeds of native chicken (*Gallus-gallus domesticus*) originating from West Java Province. produce eggs again. This trait is the advantage of KUB-1 chickens compared to ordinary free-range chickens, where egg production can reach 180 eggs / brood / year. In addition to advantages in laying properties, KUB-1 chickens also have good potential as chickens. butcher. At the age of 12 weeks of harvest, the weight of KUB-1 chickens can reach 0.8 - 1 kg [1]. Chicken meat is a food ingredient that contains high nutrition, has a distinctive taste and aroma, a chewy texture and a relatively cheap and affordable price so that consumers prefer it. Bintoro in ref [2] stated that meat contains high nutritional value and the protein content in chicken meat is higher than other meats, which can reach 23%, cooking and pH of the meat. These are indicators of the quality of the meat consumed. In order to get high carcass quality (low fat and cholesterol) and tender meat, it is necessary to add a supplement in the ration. One of the supplement ingredients that can be used to improve the quality of free-range chicken carcass is papaya leaves [3]. Prabowo in ref [4] stated that feed quality and in optimal quantities will have a good effect on meat quality. One of the ingredients that can be used as feed is papaya leaves. This study used papaya leaves (*Carica papaya* L) because papaya leaves contain a lot of papain enzymes which have the ability to form new proteins or protein compounds called plasteins, which are the result of protein hydrolysis [5].

The result of non-ruminant laboratory (2020) papaya leaves contain crude protein as much as 16.77%, crude fat 8.55%, crude fiber 16.28%. Papaya leaves contain proteolytic enzymes, papain, kimopapain and lysozyme as well as carpain alkaloids, pseudo carpaina, glycosides, carposides, saponins, sucrose, and decrose. The enzymes chymopapain, papain and lipase can help break down

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nutrient rations so as to increase the digestibility and efficiency of nutrient ration utilization [6]. Eleazu *et al* reported that papaya leaves contain 0.80% saponins, 6% alkaloids, 0.43 mg/100g tannins, 6.7% flavonoids, and 0.62 mg/g HCN [7]. Papaya is a plant that has a Latin name (*Carica papaya* L), which is very easy to find in the Asian region. Papaya leaves are one of the agricultural wastes that contain high levels of nutrients. Papaya leaves are good enough to be used as animal feed because they contain 13.5% crude protein, 14.68% crude fiber, 12.80% crude fat, and 14.4% ash. Papaya leaves also contain papain enzymes, carpain alkaloids, *glycosides*, carposides and saponins, sucrose and dextrose [8]. Research conducted in [9] state that in 100 grams of papaya leaves contains 8.00 g of protein, fat 2.00 g, carbohydrates 11.90 g, calcium 353.00 mg, phosphorus 63.00 mg, iron 1.00 mg and energy 79.00 kcal. Nwofia *et a*l. in [10] stated that papaya leaves contain -carotene as much as 644.10-666.67 IU/100 g, niacin 0.35-0.43 mg/100 g, thiamine 0.43-0.46 mg/100 g and riboflavin 0.12-015 mg/100 g. -carotene and vitamin C are known apart from being antioxidants, they are also antilipid. Papaya leaves are also rich in alkaloids and proteolytic enzymes such as papain, flavonoids, chymopapain and lysozyme, which play a role in the digestive process [11]. Papain enzymes in papaya leaves have been widely used to increase the tenderness of meat, especially for old-aged livestock meat, such as: native chicken, buffalo, goat, duck, and horse. Crude papain enzymes have an effect on tenderness, cooking loss, water binding capacity, and organoleptic tests on texture, juiciness, tenderness and taste in rejected old horse meat [12], rejected laying ducks [13] and free-range chicken [14]. Research conducted by Siti *et al*., in [15] state that regarding the administration of fermented papaya leaf extract on the physical quality of free-range chicken meat obtained meat pH 5.8-6.04, cooking loss 2.36-2.75 and water holding capacity 0.43-0.50%. The nature of the work of the papain enzyme, which is a proteolytic enzyme in increasing protein degradation in meat, so that the increasing concentration of the papain enzyme given, the higher the level of damage to the cellular membrane of peptide bonds and the more water comes out of the meat (Miller, 1958). According to Shanks et al., the amount of cooking loss is influenced by the amount of damage to cellular membranes, the amount of water that comes out of the meat, the shelf life of the meat, protein degradation and the ability of the meat to bind water.

The results of research by Sitiet *et a*l., stated that the use of fermented papaya leaf extract from levels of 8-16% in free-range chicken rations could increase the water content and cooking loss of meat, but reduce the water holding capacity [15]. The research results of Sitiet al., in [14] are supported by the results of the research of Utami *et al.* in [12] which stated that soaking rejected horse meat with the enzyme crude papain at a dose of 50-100 ml can affect the water content of the physical quality of the meat. However, both research results showed that there was no significant effect of treatment with or without papain enzyme on meat pH.

2. Experimental Section and Methods

This research was conducted using an experimental method, Completely Randomized Design (CRD) consisting of 5 treatments and 4 replications, each replication consisting of 5 KUB chickens. Placement of treatment in the study cage was carried out randomly in a completely randomized design (CRD).Treatment of giving papaya leaf flour in the ration: P0 Feed with 0% papaya leaf flour P1 Feed with 2.5% papaya leaf flour P2 Feed with 5% papaya leaf flour P3 Feed with 7.5% papaya leaf flour and P4 Feed with 10% flour papaya leaf

The data obtained were analyzed using the analysis of variance with the CRD method. The mathematical model is as follows:

$$Yij = \mu + \tau i + \varepsilon ij$$

Data analysis, the data for each treatment was analyzed by means of the ANOVA test in accordance with a completely randomized design. If the treatment shows a significant effect (F count > F Table 0.05) or very significant (F count > F table 0.01), a further test is carried out using Duncans Multiple Range Test (DMRT) based on Steel and Toriie [16].

Research Parameters.1.pH Meat. Measurement of carcass pH was carried out using a pH meter standardized at pH 4.0 and pH 7.0. The sample used is breast meat. The tip of the electrode is pressed

against the surface of the meat in several places. The tip of the pH meter electrode is removed from the surface of the meat when the reading of the pH value has been constant. Measurement of pH was taken 3 times on broiler meat at random [18]. 2. Cooking Loss. The meat sample used in the cooking loss test was the breast meat. The meat sample was weighed ±20 g in the form of a beam with a cross-sectional size of approximately 2x3 cm with the direction of the muscle fibers parallel to the tip of the sample, then inserted into a plastic clip then labeled and tightly closed so that when boiling the water could not enter the plastic bag, then The sample was boiled in a water bath at 80oC for one hour. After boiling, the meat sample is removed from the water bath and then cooled by placing it in a beaker containing cold water at a temperature of 10oC for 15 minutes, then the sample is removed from the plastic clip and dried with tissue paper, and then weighed again on the analytical balance [18]. 3. Tenderness of Meat. This test uses a sample of the measurement results in the cooking shrinkage test, the sample is formed according to the hole (cylinder) model on the meat fiber breaker (CD-Shear Force). The meat sample was inserted in the hole parallel to the meat fiber. Then the tool lever is pulled down to cut perpendicular to the grain of the meat. The results of the tensile load will be read on a scale with units of Kilograms (Kg) .4. Water Binding Power. Measurement of Water Holding Capacity [17], the water holding capacity (WHC) above was measured using the FPPM (the filter Paper Press Method) method, to find the above formula, the following measurements were needed: Measurement of Free Water Content. The breast meat sample weighing 0.3 grams was placed on a Watman 41 filter paper and pressed between two glass plates and weighed with a weight of 35 kg for 5 minutes. After 5 minutes the filter paper and samples were taken. The wet area was measured using millimeter block paper, and the free water content was calculated using the formula [17].

3. Result and Discussion

The Effect of the Level of Use of Papaya Leaves (*Carica papaya* L) in Feed on the pH Meat Cooking Loss, Meat Tenderness, Water Holding Capacity of KUB Kampung Unggul Balitnak

Based on the results of this study, the average pH Meat Cooking Loss, Meat Tenderness, Water Holding Capacity of KUB chicken meat in each treatment is listed in Table 1.

Table 1. The average pH Meat, Cooking Loss, Meat Tenderness, Water Holding Capacity of KUB chicken

Treatment	Average PH	Cooking Loss	Meat Tenderness	Water Holding Capacity
P0 Feed (0% papaya leaves flour)	6,8	25,61	2,55[a]	29,5
P1 Feed (2,5% papaya leaves flour)	6,8	24,83	1,47[b]	28,9
P2 Feed 5% (papaya leaves flour)	6,7	19,22	1,96[b]	30,7
P3 Feed (7,5% papaya leaves flour)	6,75	23,81	2,30[ab]	28,0
P4 Feed (10% papaya leaves flour)	6,8	23,44	2,46[a]	31,1
Average	6,8	23,38	2,15	23,38

The results of this study indicate that the provision of papaya leaf flour in the ration at the level of 0-10% does not have a significant effect on the pH of KUB chicken meat, this is also in line with research in [14][15] that the administration of fermented papaya leaf extract in commercial rations at the level of 8-16% did not have a significant effect (P>0.05) on the pH of 12-week-old native chicken. The pH value of the meat in this study was slightly higher than the normal ultimate pH of post mortem meat, which was 5.5 [18]. The ultimate pH of meat is the pH reached after muscle glycogen is depleted. This may be due to the lack of energy content in the given ration, because the muscles in livestock that consume energy feed will have a higher pH [18].

The energy content of the feed in the five treatments was almost the same. This causes the pH of KUB chicken meat is not significantly different. The energy content in the feed is related to the glycogen content in meat, the higher the glycogen content, the faster the glycolysis process and the higher the ultimate pH, and vice versa if the glycogen content is low, the glycolysis process will be slower and the

ultimate pH will be high.The pH value also affects the tenderness of the meat. Meat with a high pH has a higher tenderness than meat with a low pH. Toughness or tenderness of muscle fibers in the pH range of 5.4 to 6.1. Meat pH is related to water holding capacity, tenderness and cooking loss, it can also be related to meat color and mechanical properties (breakability and tensile strength) [19]

Based on the results of the analysis of diversity, the treatment gave no significant effect (P>0.05) Table 1 on the cooking loss of KUB chicken meat. Cooking loss in KUB chicken is related to the water holding capacity of the meat, this causes no significant difference to cooking loss. Cooking loss is the weight lost due to cooking or heating. Cooking loss is an indicator of the nutritional value of meat related to meat juice, namely the amount of water bound in and between the muscle fibers of the meat. With a lower cooking loss, the quality is better because it loses less nutrients during cooking than meat with a higher cooking loss [20] Meat cooking loss in this study ranged from 19.22-25.61% with the highest value in the P0 treatment. Meat cooking loss in general is in the range of 15-40%. So, it still revolves around the mass loss of meat in general. Soeparno added that meat with low cooking loss has a relatively better quality because the loss of nutrients during cooking is less [18]. Papaya leaf flour supplementation in treatments P3 (7.5%) and P4 (10%) could increase the cooking loss of meat by 23.81% and 23.44%, while in treatments P1 (2.5%) and P2 (5%) there is a decrease in cooking loss. The increase in cooking loss was associated with a decrease in the water holding capacity of the meat. This is in accordance with the opinion of Soeparno in [18] state that in addition to temperature and cooking time, cooking loss is also influenced by meat pH, length of sarcomeres, muscle fibers, length of fiber cut, myofibril contraction status of meat, sample size and weight, cross section, fat content in the meat. meat and water holding capacity of meat.

Based on the results of the analysis of diversity, the treatment of giving papaya leaf flour had a very significant effect (P < 0.01) on the tenderness of KUB chicken meat (Table 1). Furthermore, the results of the DMRT test showed that treatment P0 was significantly different (P<0.05) with treatments P1 and P2 but not significantly different (P>0.05) with treatments P3 and P4. For treatment P1 was very significantly different (P<0.01) with treatment P0 and P4. Meanwhile, the P3 treatment was not significantly different (P>0.05) with the P0, P1, P2, and P4 treatments. The tenderness of the meat obtained in this study was 1.47-2.46 kg/cm. giving papaya leaf flour can increase the tenderness of the meat this is because in papaya leaf flour there is papain enzyme. Papain contained in papaya leaves acts as a proteolytic enzyme, is also amylolytic and lipolytic, soluble in water (colloidal) and insoluble in organic solvents including alcohol, ether and chloroform. Papain can soften meat in a short time (meat tenderizer), and can even soften meat from old animals that are hard and tough in texture. Papain obtained from the papaya plant can be used as a meat tenderizer. The tenderness of the meat is influenced by the age of the animal, the older the animal, the more connective tissue, thus increasing the toughness of the meat [22]. Consumers want meat that has good quality, especially in terms of tenderness [12]. The method of adding protease enzymes can function to degrade the collagen connective tissue of meat [23] so that tough free-range chicken meat becomes tender, juicy and has a distinctive taste and can be accepted by consumers.

The level of tenderness of meat is influenced by the amount of connective tissue protein in the tendons, the older the age of the animal, the tougher the meat due to the increase in connective tissue protein, especially collagen [26]. Connective tissue protein can be degraded by the use of the enzyme papain [24]. Enzymatic activity is influenced by the influence of enzyme concentration. The more enzymes, the more substrates will be converted into products [25]. The protein binding of the connective tissue will be hydrolyzed by the papain enzyme into simpler proteins and the degree of hydrolysis of the protein is affected by the concentration of the enzyme.

The main components of meat that have a major influence on tenderness and toughness are connective tissue, muscle fibers, and adipose tissue. Less connective tissue is softer than muscle which contains a larger amount of connective tissue [18] and the higher the marbling fat, the more tender the meat will be. Tender meat is the most sought after by consumers. The lower the breaking power value, the more tender the meat will be [21]. Meat with a high pH value tends to have a low breaking power value. In theory, the higher the energy level, the more fat will be produced so that the tenderness of the meat increases [18].

Based on the results of the analysis of diversity, the treatment gave no significant effect (P>0.05) on the water holding capacity of KUB chicken meat. The water holding capacity of KUB free-range

chicken which was given a commercial ration of papaya leaf flour was not statistically significantly different (P>0.05) (Table 1). The results of this study indicate that the provision of papaya leaf flour in the ration at the level of 0-10% does not have a significant effect on the water holding capacity of KUB chicken meat. The average water holding capacity of KUB chicken meat at the time of this study ranged from 28.0-31.1. The value of this binding capacity belongs to the normal category, this is supported by the opinion of Soeparno in [18], the normal number of water holding capacity in meat ranges from 20-60%. Water holding capacity is a parameter of meat quality related to water ability, water holding capacity shows how much meat is able to bind water. Water holding capacity is closely related to the pH of the meat, as in this study that the addition of papaya leaf flour with a level of 0-10% also did not show a significant effect on the pH of the meat. This is in accordance with the opinion of Soeparno in [18] state that the water holding capacity is also influenced by the pH of the meat. The water retained in the muscles increases in line with the increase in the pH of the meat. Water holding capacity has a positive relationship with the pH value of meat [27], Factors that affect water holding capacity include water content in muscle, fat content, stress, breed of livestock, actomyosin formation, temperature and humidity with carcass withering, muscle type and position, age, fodder and intramuscular fat.

4. Conclusion

The Giving papaya leaves (Carica papaya L) in KUB chicken feed had no effect on pH, cooking loss, and water holding capacity of meat, but it had a very significant effect on meat tenderness, the best tenderness occurred in the provision of 2.5% papaya leaf flour.

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