Effect of Ration Fortification from Tofu Waste, Crabs and Curcuma Longa on Feed Intake, Feed Conversion and Organoleptic Properties of Broiler Chicken Meat

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***Abstract*—The ration is an important factor in determining the success of a business in raising broilers. The provision of appropriate rations will have an impact on feed use and meat quality. This study aims to determine the effect of ration fortification on feed consumption, feed conversion and organoleptic properties of broiler chicken meat. The study was conducted for 28 days with five treatments and 8 replications with a sample size of 40 chickens. Chickens are kept in a litter-floored cage equipped with a feed and drinking area with continuous lighting. The variables observed were feed consumption, feed conversion and organoleptic properties of broiler chicken meat. Data analysis using ANOVA at a significant level of 5% and continued with the least significant difference test (LSD). The results showed that the provision of rations in all treatments resulted in a feed conversion value below 2. For feed consumption and organoleptic tests on broiler chicken meat there was also no significant difference. It was concluded that fortification of rations with crab shell chitosan provided better benefits than commercial rations.**

Keywords—broiler, rations fortification, organoleptic

I. INTRODUCTION

Currently, broiler chicken meat is the main contributor in meeting the needs of Indonesian people's animal protein consumption compared to meat originating from ruminants. Broiler chicken has a higher protein content with a lower fat content. A good broiler chicken is a chicken with fast growth, white plumage, no dark feathers on the carcass and uniform size [1]. To get results in accordance with these criteria, a good management is needed including maintenance management, lighting, and feeding. From the three things, feed management is one of the biggest and most important expense factors as a determinant of success in broiler production [2]. Good feed contains balanced nutrients such as carbohydrates, protein, fat, vitamins and minerals needed by livestock [3]. The main component is calculated into the ration protein content. protein plays a very important role in increasing chicken body weight. usually in the production of broiler breeders using commercial feed for the protein supply. Besides being costly, the protein content of crude fibre is not able to fully digested by the digestive tract due to digestive tract of poultry do not possess the enzyme-producing microorganisms that can break down cellulose enzyme β 1,4 glycosidic on cellulose [4]. Therefore, to reduce the cost of feed needed a new innovation through the abundant availability of feed fortification. Some materials that can be used are tofu waste as a source of protein and crab shell waste as an ingredient of chitosan and the addition of herbal ingredients in the form of turmeric as an ingredient to improve the performance of chickens and their organoleptic properties. Judging from the content, tofu pulp still contains protein and fat are quite high [5]. meanwhile the crab shells still contain 15.60% -23.90% protein, chitin 18.70% - 32.20% and calcium carbonate 53.70% -78.40% [6].

In addition, the crab shell also contains chitosan which is quite efficient in inhibiting microbial activity. In addition to these two ingredients, the curcumin content in turmeric can affect appetite, improve the work of the digestive organs of poultry, stimulate the gallbladder walls to release bile and stimulate the release of pancreatic juice which contains amylase, lipase, and protease enzymes which are useful for improving digestion of feed ingredients such as carbohydrates, fat, and protein [7]. Thus, this research is expected to be able to see the effect of fortification of crab shell chitosan, tofu waste and turmeric on feed consumption, FCR and organoleptic properties of broiler meat.

II. METHODS

The research was conducted in August-September 2020. The materials used in this study were broiler chickens strain CP 707 without separating the sexes of 40 chickens produced by PT. Charoen Phokphan Jaya Farm which was divided into 5 treatments and 8 replications which were maintained for 28 days. Chicken is placed inside the cage as much as five plots with a size of 2 x 2 m with a floor mat by sawdust and each plot cage equipped dining and drinking water as well as a 60-watt incandescent lamp as a lighting. The amount of feed is given according to the age of the chicken and water. drink is

given ad libithum. Observations were made on days 1, 7, 14, 21, and 28. This research was conducted experimentally using a completely randomized design consisting of 5 treatments. treatment (P1) = Control, (P2) = commercial feed + 1% chitosan + 20% tofu pulp + 5% turmeric, (P3) = commercial feed + 2% chitosan + 20% tofu pulp + 5% turmeric, (P4) = Commercial feed + 3% chitosan + 20% tofu pulp + 5% turmeric, (P5) = commercial feed + 4% chitosan + 20% tofu pulp + 5%. The basal feed used is commercial feed BR 511 PT. Charoen Phokphan Jaya Farm. observed variables that feed intake, feed conversion and organoleptic properties of broiler meat. Data analysis using ANOVA at a significant level of 5% and continued with the least significant difference test.

A. Making Fermented Tofu Flour with EM-4

The wet tofu dregs are mixed with 15% EM-4 until homogeneous. Then put in a plastic bag or closed container, tightly closed, and stored for 7 days at room temperature. When finished, the fermented tofu dregs are dried for 3 days. Then crushed using a grinding machine.

B. Isolation and Characterization of Chitosan from Crab Shells

Waste Shells of crabs washed, dried, and then pulverized. then weighed as much as 101.16 grams and put in a beaker 1 L. For deproteinize process, into the crab shell skin powder was added NaOH 5% of 750 mL and refluxing at a temperature of 75^0C for 1 hour. After that the powder is washed with water until the pH becomes neutral. Then the demineralization stage. Add 350 mL of 10% HCl for crab shell powder and reflux at 700C for 1 hour. Furthermore, the decolorization process by adding 400 mL of 0.4% NaCl was immersed for 1 hour. Furthermore, the deacetylation stage by adding 400 mL of 50% NaOH and refluxing at 120ºC for 2.5 hours. The results were tested by dissolving the product in 5% acetic acid. If it dissolves, chitosan has formed. The chitosan product is washed to a neutral pH and dried.

C. Organoleptic Test

Organoleptic test was conducted by scoring involving 20 untrained panellists. Organoleptic tests are carried out using sensory abilities in the form of senses such as eyes, skin (sense of touch), nose (sense of smell), and tongue (sense of taste). Organoleptic test in the form of hedonic associated with colour, aroma, texture. Assessment provisions in the organoleptic test of chicken meat based on the following criteria: Colour with a score of 1 (Pale), a score of 2 (Redness) a score of 3 (Yellowish white). For textures with a score of 1 (Very Coarse), a score of 2 (Coarse), a score of 3 (Fine). For the aroma with a score of 1 (stinking fishy), a score of 2 (fishy does not sting), a score of 3 (typical meat and not fishy). The results of the panellists' assessment were then filled in the scores into the questionnaire.

III. RESULTS AND DISCUSSION

A. Feed Intake

Feed intake is the amount of feed consumed by the chickens during the study period in grams. Feed consumption in chickens is influenced by several factors, including temperature, humidity, lighting, livestock density, where to eat and drink as well as the quality and quantity of feed given [8,9]. Feed consumption is obtained by calculating the difference between the feed given and the leftover feed after 28 days. The results of the average weekly feed consumption of broiler chickens in treatment P1, P2, P3, P4 and P5 can be seen in Table 1.

TABLE I. THE WEEKLY FEED INTAKE OF BROILERS IN TREATMENT P1, P2, P3, P4, AND P5.

Weekly feed intake (gram)				
treatment	**D-7**	**D-14**	**D-21**	**D-28**
P1	168	577.33	1288.31	2243.64
P2	168	565.97	1274.46	2235..43
P3	168	567.83	1281	2246.83
P4	168	574.48	1263.11	2237.59
P5	168	574.76	1278.42	2276.18

Based on Table 1, the feed intake of chicken feed in the first week (D-7) until the last week (D-28) of all treatment groups there was not significantly different. It can be seen from the average amount of feed consumption from each treatment. The highest feed consumption was in the second and third weeks, namely 577.33 and 1288.1 grams / head in the control group. In this study, the light was applied continuously for 24 hours. Provision of light continuously can increase feeding behaviour and frequency of eating chickens so that it has an impact on the amount of feed consumption and body weight gain. This is in accordance with that reported by several researchers [10,11,12] which states that the provision of light continuously for 24 hours will enhance the eating and drinking behaviour thus improving body weight gain and increases the formation of feathers. Less feed intake with the addition of maximum body weight will provide something efficient for the broiler poultry industry.

B. Feed Conversion

The results of the calculation of feed conversion of broilers in treatment P1, P2, P3, P4 and P5 were maintained for 28 days are shown in Table 2.

TABLE II. THE FEED CONVERSION OF BROILERS IN TREATMENT P1, P2, P3, P4 AND P5 FOR 28 DAYS (G / HEAD)

Treatments	**Feed Conversion**
P1	1,82
P2	1,76
P3	1,66
P4	1,65
P5	1,78

FCR value can indicate feed efficiency which will affect the effectiveness of growth and weight gain of chickens [13]. High FCR value indicates a high feed intake but low growth of chicken weight. Meanwhile, if the FCR value is low, it indicates that the feed consumption is small, but it can have a big impact on the growth and weight gain of chickens. Treatment with the addition of chitosan, fermented tofu dregs and turmeric flour showed a positive effect on the resulting feed conversion. Treatment 4 with the addition of 3% crab flour chitosan resulted in the lowest feed conversion rate, so with the feed that was given additional chitosan to the control. The feed conversions in treatment 1,2, 3, 4, and 5 were 1.82; 1.76; 1.66; 1.65; and 1.78. The average feed conversion rate as shown in Table 2 ranges from 1.65 to 1.82 [14]. The feed conversion of broiler strain Lohmann at 28 days is 1.42 [15]. also added that the good feed conversion is less than two. There are several factors that influence the size of the feed conversion value, including the ability of livestock to digest, the harmony of the nutrient values contained in it, oxidative stress, and the quality of the feed consumed [16].

C. Organoleptic Test

The test that is commonly used as an aspect of the level of consumer acceptance of a material or product is the organoleptic test. The results of the organoleptic test analysis based on the panellists' assessment can be seen in Table 3.

TABLE III. ORGANOLEPTIC TEST OF BROILER CHICKEN MEAT

Treatments	**Hedonic Quality**		
	Colours	***Aroma***	***Texture***
P1	2,80 ± 0,41[a]	3,00 ± 0,00[a]	2,95 ± 0,22 [a]
P2	2,90 ± 0,30 [a]	3,00 ± 0,00 [a]	3,00 ± 0,00 [a]
P3	2,85 ± 0,36 [a]	3,00 ± 0,00[a]	3,00 ± 0,00 [a]
P4	2,75 ± 0,44 [a]	2,95 ± 0,22[a]	2,90 ± 0,30 [a]
P5	2,80 ± 0,41 [a]	3,00 ± 0,00 [a]	3,00 ± 0,00 [a]

Note: The same lowercase letter to the row shows the results are not significantly different (P> 0.05)

Based on the analysis of questionnaires panellist on organoleptic test showed that of the five treatments P1, P2, P3, P4, and P5 given there is no significant effect (P> 0.05) to test the colour, aroma, and texture of broiler meat. This indicates that panellists provide a good assessment on all of the meat from the five treatments. For colour assessment, based on the hedonic quality assessment, the average score is 3 (yellowish white) and 2 (reddish). Colours have a special attraction for consumers before buying although flesh colour does not affect the nutritional value. Colours that are not pale have a higher attractiveness and sale. Yellowish white colour indicates that the meat comes from healthy chickens, free of chemicals and preservatives. This is in accordance with the opinion of Afrianti et al [17] and Yulistiani [18] that the colour of fresh broiler chicken meat is yellowish white. Colours on broiler meat is influenced by several factors, including: total haemoglobin, myoglobin, cytochrome c, the pH of the meat, age, sex, race, cage environment, and the content of the feed given [19]. For the aroma test, usually consumers would like foodstuffs which have a distinctive smell and odour inconspicuous.

For the assessment of aroma, based on the assessment of the panellists, the average hedonic quality gave a score of 3 (typical meat and not fishy) and 2 (fishy does not sting). This shows a good assessment of the aroma of meat from the five treatments. There are differences in the scoring of the panellists depending on the taste and sense of smell in responding to the stimulus in the form of smells produced from each given sample. . In this study, the organoleptic test was only carried out on uncooked chicken meat, so it only relied on the sense of smell. Based on the results of the panellists' assessment showed that the five meat samples from the five treatments showed good meat criteria. This is in accordance with the criteria of good meat according to Russel et al [20] that is the smell of fresh meat, no strong odour, and no foul odour.

To test the texture of chicken meat, texture is the external appearance of the meat with regard to the level of smoothness and roughness of meat that is closely related to consumer acceptance. Texture assessment can be felt by touch with the fingertips and felt with the tongue. However, generally panellists use their fingers to determine the texture of broiler chicken. With increasing age, the level of roughness of texture will increase [21]. Muscles with small muscle fibres did not show a marked increase in texture roughness with increasing age. Based on the analysis of the organoleptic texture of broiler chicken, it did not show a significant difference in each treatment. The assessment results for the texture of the panellists give it a score of 3 (smooth) and 2 (rough). No panellist gives a score of 1 (very roughly) in the five treatments. Smoothness and roughness seen from the appearance of the meat fibres are almost the same in each treatment [22]. The level of fineness in chickens is influenced by the small muscle fibres so that they have small myofibril structures as well.

IV. CONCLUSION

From result of this research, it can be concluded that the provision of rations in all treatments resulted in a feed conversion value below 2. For feed consumption and organoleptic tests on broiler chicken meat there was also no significant difference. It was concluded that fortification of rations with crab shell chitosan provided better benefits than commercial rations.

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