

The Effect of Turmeric (*Curcuma domestica*) Extract on Water Holding Capacity, Cooking Loss, pH Values and Tenderness of Broiler Chicken Meat

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Abstract. This study was aimed to determine the influences of turmeric extract supplementation on water holding capacity, cooking loss, pH value and tenderness of broiler chicken meat. Data analysis was subject to completely randomized design 5 treatments namely T0, T1, T2, T3 and T4 containing non-turmeric extract, 100 mg/kgBW/day, 200 mg/kgBW/day, 300 mg/kgBW/day and 400 mg/kgBW/day, respectively. Each unit of experiment administered 3 heads with four replications. The results indicated no effect from turmeric extract supplementation on water holding capacity, cooking loss, pH value and tenderness of broiler chicken meat. The average treatments of T0, T1, T2, T3, T4 had water holding capacities of 39.86, 37.58, 36.41, 36.94, respectively; cooking losses of 26.00, 27.58, 27.57, 27.11, and 27.49%, respectively; tenderness of 1.97, 1.95, 1.63, 1.77 and 1.99 Nmm, respectively, and final Body weights of 1,618.5, 1,568, 1,692.5, 1,651.75 and 1,462 g/head, respectively. However, a highly significant influence was observed on the pH values of 6.46, 6.04, 6.21, 6.08 and 5.98. The results indicated that none of the turmeric extract supplementation increased water holding capacity, cooking losses, tenderness and body weight.

Key words: broiler, cooking loss, pH values, tenderness, water holding capacity, turmeric

Abstrak. Penelitian ini bertujuan untuk mengetahui pengaruh pemberian ekstrak kunyit terhadap daya ikat air, susut masak, nilai pH dan keempukan daging ayam broiler. Manfaat penelitian yaitu tersedianya informasi ilmiah tentang ekstrak kunyit terhadap daging ayam broiler. Perlakuan yang diterapkan adalah T0 tanpa ekstrak kunyit, T1 100, T2 200, T3 300, dan T4 400 mg/kgBB/hari. Data analisis yang digunakan adalah rancangan acak lengkap yang terdiri dari 5 perlakuan dan 4 replikasi. Setiap unit percobaan terdiri dari 3 ekor. Hasil penelitian menunjukkan tidak ada pengaruh pemberian ekstrak kunyit terhadap daya ikat air, susut masak, dan keempukan daging ayam broiler. Rataan untuk perlakuan T0, T1, T2, T3, T4 pada Daya Ikat Air masing-masing 39,86; 37,58; 36,41; 36,94; 34,78%; susut masak 26,00; 27,58; 27,57; 27,11; 27,49%, keempukan 1,97; 1,95; 1,63; 1,77; 1,99 Nmm, dan bobot badan akhir 1.618,5; 1.568; 1.692,5; 1.651,75; 1.462g/ekor. Namun, memberikan pengaruh sangat nyata pada nilai pH 6,46; 6,04; 6,21; 6,08; 5,98. Hasil menunjukkan bahwa pemberian ekstrak kunyit tidak meningkatkan daya ikat air, susut masak, keempukan dan bobot badan.

Kata Kunci : Broiler, Susut Masak, pH, Keempukan, Daya Ikat Air, Kunyit

Introduction

People need food for living and among animal product, broiler chicken is one of the favorable because of the nice taste, particular aroma, high nutrition and high variance of food as an alternative animal protein with cheap price and high edibility. However, the consumers prefer five-month old broiler meat that have five months to getting demand from consumer.

Chicken carcass has good meat with additives for maximum growth such as chemical or synthetic antibiotic. However, the negative impact appears on product residual which is dangerous for consumer. Research on natural antibiotic additives was conducted using turmeric or *Curcuma domestica* packed on capsule and orally given to broiler.

Turmeric helps digest food, stimulate pancreatic lymph containing enzyme amylase,

lipase and protease and therefore increase protein content and improves water holding capacity or meat ability to its cooking losses low to prevent excessive loss of fluids, especially water, vitamin and mineral content. Meat with lower cooking losses has better quality because of the less nutrient loss during cooking.

Meat nutrient content determines pH values and tenderness. The present study on the supplementation of turmeric extract was conducted to improve the water holding capacity, cooking losses, tenderness and to decrease the pH of broiler meat. The hypothesis was that turmeric extracts have effect on water holding capacity, cooking losses, pH value, and tenderness of broiler meat. The expected outcome of this research is to provide information for scientific development, especially for broiler farmers concerning the importance of turmeric extracts for broiler meat.

Materials and Methods

Research was conducted in two weeks and the average body weight of Day Old Chick/DOC was ± 36.57 g. The feed were BR 1 CP-11 for starting phase and BR 2 CP-11 for finishing phase. The water was given ad libitum and turmeric extracts were packed in capsules for 60 broilers. The treatment was administered from day 17 to day 30 with average body weight ± 562.6 g and the broilers were slaughtered on day 31. Twenty grams of chicken breast meat was taken for physical

quality test including variables: 1) Water holding capacity using 0.3 g of meat placed on 2 glass plates covered with filter paper, pressed with 35 kg of load for 5 minutes and the forming wet area was calculated and the total water content of the sample was drained in an oven for 8-24 hours at 105°C. The formula was $\text{mgH}_2\text{O} = (\text{wet area width (cm}^2\text{)}:0.0948) - 8.0$; $\text{free water content} = (\text{mgH}_2\text{O} \times 100\%): \text{weight}$; $\text{total water content} = \{(\text{sample weight} + \text{pre-baked filter paper}) - (\text{sample weight} + \text{post-baked filter paper})\} : (\text{pre-baked sample} + \text{filter paper weight})$; $\text{percentage of water holding capacity} = \text{total water content} - \text{free water content}$. 2) Cooking loss was determine using a sample of 10 g meat wrapped in a polyethylene hollow plastic bag tied tightly and placed into water bath for 30 min at 80°C. Cooking-loss formula = $\{(\text{pre-cooked weight} - \text{cooked weight}) : \text{pre-cooked weight}\} \times 100\%$ (Soeparno, 2005). 3) pH value was measured using electronic pH in 3 time replications. 4) Tenderness of meat was measured by texture analyzer.

Data analysis was subject to a Completely Randomized Design for F test ($P < 0.05$) and followed by Duncan test for the outcome effect (Steel and Torrie, 1993).

Results and Discussion

The result on the influences of turmeric (*curcuma domestica*) extract on water holding capacity, cooking loss, pH values, and tenderness of Broiler chicken meat is presented in Table 1.

Table 1. The average results of water holding capacity, cooking loss, pH value, tenderness and body weight of broiler chicken meat at different dose of turmeric extract.

Variable	Treatment				
	T0	T1	T2	T3	T4
Body Weight (g/head)	1618.5	1568	1692.5	1651.75	1462
Water holding capacity (%)	39.86	37.58	36.41	36.94	34.78
Cooking loss (%)	26.00	27.58	27.57	27.11	27.49
pH	6.46 ^a	6.04 ^b	6.21 ^{ab}	6.08 ^b	5.98 ^b
Tender-ness (Nmm)	1.97	1.95	1.63	1.77	1.99

Values bearing different superscript on the same row differ significantly ($P < 0.01$)

T0, T1, T2, T3 and T4 containing non-turmeric extract, 100 mg/kgBW/day, 200 mg/kgBW/day, 300 mg/kgBW/day and 400 mg/kgBW/day

The result of body weight showed that turmeric extract was not significant ($P>0.05$) because it was not affected by the additive turmeric extract through oral treatment. The body weight of T0, T1, T2, T3, and T4 was 1618.5, 1568, 1692.5, 1651.75 and 1462 g, respectively. The table indicated the highest body weight was T2 or 1692.5 g/head because of the optimal dosage of turmeric extract. One of turmeric benefits was to increase appetite. Broiler chickens were harvested on 28-45 days and the body weight was 1.2-1.9 kg/head (Fatma, 2010). The chemical ingredient of turmeric decreased fat and body weight. Moreover, turmeric has two important components, curcumin and atsiri oil. Essential oil organizes efficacy on the balance of gastric acid and also lessens the intestinal peristaltic. Therefore, digest process is completed (Nisarani et al., 2009). Curcumin can stimulate bile bladder wall for vehicle bile fluid that can accelerate the process of digesting fat. It also affects the HCL secretion, pepsin, and bile fluid accelerates on process of digesting and absorbing the food nutrition.

The result of water holding capacity gave no significant effect ($P>0.05$) on T0, T1, T2, T3 and T4 namely 39.86, 37.58, 36.41, 36.94 and 34.78%, respectively. The highest water holding capacity was T0 or 39.86% due to the ion capability to convert isoelectric point increased. Water holding capacity was influenced by ion to convert isoelectric point into acid and improved water holding capacity (Zhuang and Savage, 2008; Yoshinora et al., 2013). When pH decreased, H^+ ions increased so the ions were more likely to bind oxygen on water molecules, thereby increasing water holding capacity (Jayasena et al., 2013).

The result of cooking loss showed no significant effect ($P>0.05$) on T0, T1, T2, T3 and T4, namely 26, 27.58, 27.57, 27.11 and 27.49% at respectively. The lowest cooking loss was 26% in T0 which was the best because the meat

lost insignificant amount of fluids. Lower cooking loss indicated better quality than those with higher cooking loss because the former lost a smaller amount of nutrients. The variation of cooking loss from 1.5 to 54.5% with approximate from 15 to 40% indicated characteristic of myofibril and also the connective tissues regarding animal age, especially the increase on long sarcomere (Liyan and Shiyu, 2012; Youngseung et al., 2014).

The result of pH value described significant value ($P<0.01$) on T0, T1, T2, T3 and T4 or 6.46, 6.04, 6.21, 6.08 and 5.98, respectively. Normal pH for broiler chicken meat was 6.0 (Jayasena et al., 2013). The previous discussions explained that the additive of turmeric on broiler chicken meat was not significant according to annova analysis, but contrastive result was indicated for pH value because turmeric served in abdominal fat formation, resulting in low fat and non denatured protein. Turmeric content that helps lower the fat may decrease pH value (Anna and Kwiecień, 2014). The effects of pH postmortem came into two groups, intrinsic and extrinsic factors; the former were species, type of muscle, and variant of fat, and the latter were environmental temperature, treatment of additive and stress before slaughter. Both factors complied at the same of weather on pH value of broiler chicken meat.

The result of meat tenderness illustrated was not significant ($P>0.05$) in T0, T1, T2, T3 and T4 or 1.97 Nmm, 1.95 Nmm 1.63 Nmm, 1.77 Nmm and 1.99 Nmm, respectively. Turmeric chemical content in chicken body tends to play greater role in lowering fat, therefore it did not affect the tenderness which in fact is influenced by meat pH (Lee et al., 2009). Meat tenderness improves when the proteins were denatured. The impaired protein component of myofibril may also improve the meat tenderness (Dosković et al., 2013).

Curcumin stimulated digesting process and thus nutrient absorption were more efficient. As a result, bowel movement occurred faster and thereby both ration consumption and body weight increased. Turmeric contained two components, curcumin that stimulated bile bladder wall to excrete bile and thereby helps in fat digestion, and essential oil that balanced gastric acid and helps intestines to digest nutrients (Rajput et al., 2013).

Conclusion

Turmeric extracts supplementation does not improve broilers' water holding capacity, cooking loss, tenderness, and body weight but decreased the pH value of broiler meats. Further comprehensive research on turmeric extract supplementation to determine the correct dose to improve the quality and quantity of meats was of important conduct. In supplementation, pre-study was necessary to anticipate the constraints during the research.

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