

Addition turmeric extract on ration to reduce fat deposit of broiler

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Abstract. The purpose of this research was to investigate the effect of turmeric extract in ration to reduce fat of broiler. Ninety-day old chicks randomly divided into five treatments: T1 is group received basal diet (control), T2 (0.02% of turmeric extract); T3 (0.04% of turmeric extract); T4 (0.06% of turmeric extract), and T5 (0.08% of turmeric extract). Each treatment consists of three replications and each repetition consist of six chickens. This research using a completely randomized design. The parameters of research were carcass weight, abdominal fat weight and the percentage of abdominal fat. The result of this research showed that turmeric extract had significantly effect ($P < 0.05$) to increase carcass weight (T1: 1476,7 g; T2: 1503,8 g; T3: 1577,0 g; T4: 1633,7 g; T5: 1605,0 g), to reduce abdominal fat weight (T1: 34,33 g; T2: 30,69 g; T3: 27,03 g; T4: 26,96 g; T5: 25,92 g) and the percentage of abdominal fat (T1: 2,33%, T2: 2,04%, T3: 1,72%, T4: 1,65%, T5: 1,63%). The result showed addition turmeric extract on ration increased carcass weight and decreased abdominal fat weight and the percentage of abdominal fat.

1. Introduction

Broilers have a large amount of fat in the form of abdominal fat and meat fat so that consumers tend to reduce consumption of broiler meat. Using turmeric (*Curcuma domestica* Val.) can reduce fat of broiler. Turmeric contains colagoga which can increase production and secretion of bile into the small intestine. The bile is produced by the lipase enzyme and cholic acid which function is important to eliminate cholesterol and fat from the blood and liver cells through the process of absorption by the digestive organs then excreted by feces.

Broilers are chicken breeds that growth and development are very fast [1]. Broiler has been improved genetic quality so that it is effective in producing meat [2] broilers aged five to six weeks have bodyweight about 1.5 to 2 kg and contain about 4% fat [3].

The feed is a mixture of several feed ingredients that are arranged specifically according to the type of livestock. Feeding of broiler must be considered by chicken age, feed quality, nutrition requirement

and maintenance [4]. Furthermore [5] reported nutritional needs appropriately, both species, quantity and nutritional balance for livestock.

Turmeric belongs to the family Zingiberaceae which is a plant area tropical [6] and abundant in India, China, Indonesia, Solomon Islands, Haiti, and Jamaica. Turmeric is a medicinal plant that grows in clumps, body composition the plant consists of roots, artificial stem rhizomes, leaf midribs, leaves, stems flowers and flower buds [7]. Branched and turmeric a whole forms a clump. The shape of the rhizome is very varied, generally elliptical, growing to the right and left in a row. Young colored rhizome skin yellow while the old rhizome skin is brownish-orange and flesh color bright yellowish-orange. Turmeric rhizome has a distinctive taste hot, bitter, and spicy [8] and [9].

Turmeric is a crop which has enough potential high as a medicinal plant [10]. In Indonesia, turmeric is the most needed for the traditional pharmaceutical industry. Benefits of Turmeric as medicine is as a medicine for diarrhea, itching, gout, wound medicine, shortness of breath, urination congestion, constipation, diarrhea, fever, intestinal pain, ulcers, ringworm, poison insects, eliminate body odor, nourish the body, increase lust eating, menstrual pain, indigestion, booster of the heart, booster of the stomach [7] and [11]. As for the other benefits of turmeric is as a yellow rice coloring chart, cosmetic ingredients, herbal ingredients industry, bridal scrubs, textile dyes, crafts hands, seasoning, and spices.

Turmeric has chemical content, among others; 6% water content, 8% protein, 63% carbohydrate, 7% crude fiber, mineral ingredients, 6.8%, volatile oil 3%, curcumin 3%, and ingredients non volatile 9% [12]. Furthermore, [13] turmeric has content of nutrients such as starch, protein, fat, ash, water, essential oils, fiber rude, and so on. The main component of turmeric nutrition is starch with a range of 40 to 50% dry weight. The most important main component of turmeric is curcuminoids which is a major component in turmeric pigment and essential oils [14], [15] and [16].

The substance of pure curcumin is crystalline powder orange which is not soluble in water but dissolves in ether, alcohol, acetic acid glacial, and alkali which gives a reddish-brown color. Curcumin is efficacious as an antioxidant, antibacterial, antihepatotoxic [17] and curcuminoids accelerate the fat metabolism. Antihepatotoxic which is to prevent damage to liver cells and accelerate the regeneration of liver cells [17] and [18] which can increase the production and secretion of bile and pancreas into the small intestine.

Turmeric extract is by extraction of rhizome, which is a separation method based on differences in solubility. In general, extraction can be defined as a process of separation and isolation substances from two substances with the addition of certain solvents to excrete mixture component of a solid or a liquid. In this case, the solid fraction is it is desirable to be soluble in the solvent, while the other solid fractions were insoluble. The process will be perfect if the solid fraction was deep the solvent is separated from the solvent, for example by distillation and evaporation.

2. Materials and methods

The study was conducted in Politeknik Negeri Jember, the making of turmeric extract and was carried out at Animal Production Laboratory. The study was conducted using an experimental method. The experimental design using Completely Randomized Design with five treatments and each treatment repeated three times, each experimental unit consisted of six chickens. The treatments were T1: control, T2: 0.02% of turmeric extract, T3: 0.04% of turmeric extract, T4: 0.06% of turmeric extract, and T5: 0.08% of turmeric extract.

The making of turmeric extract is by extraction method use alcohol solvents because curcumin is soluble in alcohol. The process using a combination two extraction methods: maceration (immersion) and distillation (evaporation). Mixing the treatment feed is manually by mixing turmeric extract and commercial feed.

Feeding is adjusted to the treatment given to each trial unit. The frequency of feeding is three to six times a day during the brooding period, and twice a day when the brooding release. Feeding on each ad-libitum trial unit was guided by on the standard consumption of broiler feed. Drinking water is given ad-libitum with a frequency of twice a day.

Data collection in this study was carried out at the end of maintenance or after the slaughter process, which is at 42 days. The parameters measured in this study were carcass weight, fat weight abdominal, and the percentage of abdominal fat. Carcass weights were weighed on the 42 days by weighing carcasses after being slaughtered minus the weight of blood, hair, internal organs (visceral), head, neck, and legs (shank). Abdominal fat weights are calculated on the 42 days by weighing fat in the abdominal cavity. The percentage of abdominal fat weights is by dividing abdominal fat weight with carcass weight then multiplied by 100%.

Analysis of the data in this study using software from Statistics Package for The Social Service (SPSS) version 16. Average analysis results significant ($P < 0.05$), then the average difference test using Duncan's New Multiple Range Test (DMRT) test.

3. Results and Discussion

3.1 Carcass Weight

The carcass is the bodyweight of a chicken after it is cut minus the head, legs, blood, and internal organs. The quality of carcasses and meat is influenced by factors before cutting, including genetic, species, nation, type of livestock, type sex, age, feed, and the process after cutting, including withering and cooking.

The results of carcass weight analysis revealed the addition of turmeric extract in the feed significant effect ($P < 0.05$) on the administration of turmeric extract on ration. Average carcass weight is shown in Table 1.

Table 1. Effect of addition turmeric extract on carcass weight

| Treatment | Replication | | | Average |
|-----------|-------------|---------|---------|----------------------|
| T1 | 1460.00 | 1450.00 | 1520.00 | 1476.67 ^a |
| T2 | 1480.00 | 1520.00 | 1511.30 | 1503.77 ^a |
| T3 | 1540.97 | 1600.00 | 1590.00 | 1576.99 ^b |
| T4 | 1590.00 | 1660.00 | 1650.96 | 1633.65 ^b |
| T5 | 1574.96 | 1640.00 | 1600.00 | 1604.99 ^b |

^{a, b} Means within each line and under the same factor with different superscripts are significantly different ($P < 0.05$)

The carcass weights at T3, T4, and T5 were significantly higher ($P < 0.05$) than T1 and T2, while T2 is not significantly different from T1. The control of carcass weight (T1) is the lowest compared to the weight of the treatments carcass, this showed that the addition of turmeric extract is increasing carcass weight effectively. T3, T4, and T5 were not significantly different in increasing carcass weight.

3.2 Abdominal Fat

The results of the analysis of abdominal fat weight showed that addition turmeric extract on ration influenced significantly ($P < 0.05$). Using a level of less than 0.06 percent on ration did not increase carcass weight significantly (Table 2.).

Table 2 . Effect of addition turmeric extract on abdominal fat

| Treatment | Replication | | | Average |
|-----------|-------------|-------|-------|--------------------|
| T1 | 34.35 | 36.30 | 32.33 | 34.33 ^c |
| T2 | 30.07 | 30.85 | 31.15 | 30.69 ^b |
| T3 | 26.32 | 28.43 | 26.35 | 27.03 ^a |
| T4 | 26.05 | 28.14 | 26.69 | 26.96 ^a |
| T5 | 25.10 | 27.10 | 25.55 | 25.92 ^a |

^{a, b, c} Means within each line and under the same factor with different superscripts are

significantly different ($P < 0.05$)

According to [19] and [20] function of turmeric in improving the work of the digestive organs is to stimulate the gallbladder, secrete bile, and stimulate the discharge of pancreas which contains amylase, lipase, protease enzymes that are useful for improve digestibility of feed ingredients such as carbohydrates, fat, and protein. It can be concluded that turmeric extract is effective in reducing abdominal fat weight. So that the feed can be converted into meat, not as excess energy or deep fat body.

The results of the analysis of abdominal fat weight data are known that turmeric extract in ration significantly influences ($P < 0.05$) on abdominal fat. Using a level of less than 0.06 percent in feed did not increase carcass weight significantly. According to [19] and [20] function turmeric in improving the work of the digestive organs is to stimulate the walls gallbladder, secrete bile, and stimulate the discharge of sap pancreas which contains amylase, lipase, protease enzymes that are useful for improve digestibility of feed ingredients such as carbohydrates, fat, and protein. It can be said that turmeric extract is effective in reducing abdominal fat weight.

Abdominal fat is a layer of fat found around the gizzard and the lining between the abdominal and intestinal muscles. Abdominal fat is a combination of abdominal fat weight and fat attached to the gizzard, used as a guide to fatty broilers. Visceral organ is a part of internal organs of chicken after being separated from the body and before cleaning giblet (liver, gizzard, and heart), and viscera heaps influenced by the amount of feed, feed texture, feed fiber content, and feed additional form of grit that affects the size of the gizzard, so that the weight viscera also increased. Data collection on abdominal fat weight is done using of weighing fat that is under the stomach (abdomen) [21]

Abdominal fat weights of T5, T4, and T3 are lower than T1 and T2 ($P < 0.05$), while T2 significantly different ($P < 0.05$) compared to T1. Addition of turmeric extract affected in reducing abdominal fat weight. The treatment levels T3, T4, and T5, i.e. 0.06% and 0.08% decreased abdominal fat weight, so it can be concluded the treatment with using a level of less than 0.04% on ration did not reduce abdominal fat weight significantly.

The turmeric extract is effective in reducing the weight of abdominal fat. The active compound of turmeric, which is essential oil and curcumin can increase the production and secretion of bile and pancreatic fluid [22]. According to [23] bile functions in emulsifying fat so that fat can be mixed with water and can be digested by enzymes. Most of the bile acids reabsorbed from the portal vein back to the liver. The liver synthesizes bile acids come from cholesterol, so overall cholesterol will be reduced including blood cholesterol. Cholesterol can be converted into bile acids, carried by blood and deposited deep the walls of the blood vessels which when accumulated will cause constriction of blood vessels. After deposited in the wall blood vessels, cholesterol that is still carried will be deposited in the abdomen (abdominal fat), subcutaneous (fat under the skin), and meat [24].

3.3 The Percentage of Abdominal Fat

According to [25] that the percentage of broiler abdominal fat ranges from 2% to 5% of carcass weight. The amount of abdominal fat is influenced by the carbohydrate content in the feed. Carbohydrates as a source of energy will chicken is used as digestible energy, metabolic energy, wasted energy (stool, urine, and heat), as well as energy for production including growth, meat formation, and fat reserves. The average percentage of abdominal fat weight is shown in Table 3. Based on the results of the study showed that the treatment had a significant effect ($P < 0.05$) to the percentage of abdominal fat. The average percentage of fat abdominal research results in the range from 1.63 to 2.33%.

The results differ from the treatment of turmeric extracts at the level from 0.02 to 0.08% has a significant effect. According to [26] the addition of turmeric in broiler chicken ration had affected on the percentage of abdominal fat. Abdominal fat decreased at T5, T4, and T3 which is lower than T2 and T1. This showed that turmeric extract has reduced the abdominal fat.

Table 3 . Effect of addition turmeric extract on the percentage of abdominal fat

| Treatment | Replication | | | Average |
|-----------|-------------|------|------|-------------------|
| T1 | 2.35 | 2.50 | 2.13 | 2.33 ^a |
| T2 | 2.03 | 2.03 | 2.06 | 2.04 ^b |
| T3 | 1.71 | 1.78 | 1.66 | 1.72 ^c |
| T4 | 1.64 | 1.70 | 1.62 | 1.65 ^c |
| T5 | 1.64 | 1.65 | 1.60 | 1.63 ^c |

^{a, b, c} Means within each line and under the same factor with different superscripts are significantly different ($P < 0.05$)

3. Conclusion

Based on the results of the research can be concluded that addition turmeric extract on ration up to 0.04% have a significant effect ($P < 0.05$) increased carcass weight, the optimal increases in carcass weight are the treatment addition of turmeric extract 0.06% is 1633.65 gram. Adding turmeric extract on ration has a significant effect ($P < 0.05$) to decrease abdominal fat weight and the percentage of abdominal fat.

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