

## Application turmeric as antioxidant for broiler chickens

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**Abstract.** The purpose of this study was to test the activity of turmeric as an antioxidant which is believed to be a traditional Indonesian medicine as an antioxidant therapy in broiler chickens. The study was carried out with a completely randomized design (CRD) using 100 broiler chickens distributed into 3 treatments with 5 replications and 5 each replicate. The treatments are control, commercial feed, ascorbic acid group (commercial feed and addition of ascorbic acid 60 mg per day) and turmeric group (commercial feed and addition of turmeric dose 500 mg per kg body weight). Data were analysed using variance analysis (ANOVA) and continued with Duncan's multiple range analysis. The result shows that addition of ascorbic acid 60 mg per tail per day and turmeric 500 mg per kg was not able to increase the bodyweight gain of chicken with 30 days maintenance but were able to increase the composition of the meat in the chest and thighs and reduce the total cholesterol level of broilers.

### 1. Introduction

Along with the increase in the population of Indonesia, increasing living standards and understanding of the population about the importance of health causes changes in the pattern of life of the lives of Indonesian people with minimal consumption to life by paying attention to the balance of nutritional intake. Animal protein that used to be a luxury intake and only consumed by certain groups is now a very important requirement, one of which comes from meat, especially broiler. This increase in consumption patterns has not been matched by an increase in the supply of poultry meat in Indonesia.

In an intensive farming business, feed is the biggest factor in production costs, namely 60-70%. For this reason, breeders must make every effort so that the feed can be used optimally by increasing the rate of conversion of rations. Increased feed efficiency is one of the efforts that can be taken to reduce production costs by increasing livestock digestibility. Another factor that is often overlooked by farmers, but very influential in production is the emergence of stress. Indonesia as an agrarian country with high temperature and relative humidity (RH) causes broilers to be very vulnerable to heat stress. Heat stress will cause a lot of energy loss. The presence of stress will also cause stress oxides in the body or commonly called oxidative reactions/ free radicals. The emergence of free oxides will cause many things, including a decrease in cell work or humans known as premature aging.

The handling of this event is by giving antioxidants. Antioxidants are compounds that can inhibit reactive oxygen species/ reactive nitrogen species (ROS/ RNS) and also free radicals so that antioxidants can prevent diseases associated with free radicals such as carcinogenesis, cardiovascular and aging [1]. Heat stress is the condition of chickens experiencing stress due to higher ambient conditions than normal conditions. This condition will cause the release of excess energy which affects the productivity of the chicken that is declining. In addition to wasted energy, it will also cause free oxygen or free radicals.



Free radicals that are formed will cause the cell damage process to progress faster, thus accelerating cell aging. The handling of this event is by giving antioxidants. Antioxidants are compounds that can inhibit reactive oxygen species/ reactive nitrogen species and also free radicals so that antioxidants can prevent diseases associated with free radicals such as carcinogenesis, cardiovascular and aging. In this study, the researchers will test several antioxidants commonly used as therapy in the event of heat stress in chickens that are safe for food safety, namely ascorbic acid, tocopherol, and herbal plants, namely turmeric. The purpose of this study was to test the activity of turmeric as an antioxidant which is believed to be a traditional Indonesian medicine as an antioxidant therapy in broiler chickens.

## 2. Materials and methods

The study was carried out with a completely randomized design (CRD) using 100 broiler chickens distributed into 3 treatments with 5 replications and 5 each replicate. The four treatments are Control: Commercial feed; ascorbic acid group (commercial feed and addition of ascorbic acid 60 mg per day) and turmeric group (commercial feed and addition of turmeric dose 500 mg per kg body weight) [2]. Data were analyzed using variance analysis (ANOVA) and continued with Duncan's multiple range analysis.

Broiler chickens are maintained for 4 weeks by feeding according to standards and giving unlimited drinking (*ad libitum*). The parameters of observation in this study include:

- Body Weight gain  
Body weight gain was obtained utilizing final body weight reduced by initial body weight.
- Feed Conversion  
The conversion value is an estimate of the amount of ration needed to get 1 kg of meat. The value obtained by ration consumption is divided by body weight gain during the study.
- Feed efficiency  
The ration efficiency is the percentage of ration used by the chicken's body to be converted into meat. The efficiency value of the ration is obtained by increasing body weight divided by the consumption of rations then multiplied by 100 %.
- Carcass quality  
A measured percentage of carcass compared to weight, percentage of chest weight, thigh to a carcass and weak abdominal content.
- Income Over Feed and Chick Cost  
Income in rupiah obtained from the sale of one chicken at the end of the study with the average expenditure of the purchase of one DOC tail at the beginning of maintenance and the average of the food spent on one chicken during maintenance.
- Gross Income [3]  
Gross income per 100 chickens is calculated by formula = (the price of live chicken per kg × average weight of × 100 × percent of live chicken) - (cost of chicken ration).

## 3. Results and discussion

### 3.1. Broiler performance

The results of research on broilers maintained in heat stress and given two types of antioxidants namely ascorbic acid synthesis and turmeric was presented in Table 1. The administration of these two antioxidants was not statistically significantly different in body weight gain, carcass percentage, feed conversion and the level of efficiency of ration use. The presence of heat stress in chickens will cause physiological changes in the body of the chicken. Chicken energy will be wasted to neutralize the heat of the environment so that the body's condition remains in homeostasis. The use of energy in maintaining this homeostatic condition disrupted the level of nutritional use of the diet into the meat so that the addition of antioxidants statistically did not make a real difference.

**Table 1.** Increased body weight, ration conversion and efficiency of the addition of ascorbic 60 mg per tail per day and turmeric 500 mg per kg in broilers.

	Control	Ascorbic Acid	Turmeric
Body Weight Gain	1241±123.69 <sup>a</sup>	1326.6±77.6 <sup>a</sup>	1264±143.23 <sup>a</sup>
Feed Conversion	1.58±0.16 <sup>a</sup>	1.44±0.08 <sup>a</sup>	1.54±0.16 <sup>a</sup>
Feed efficiency	63.8±6.36 <sup>a</sup>	69.63±4.07 <sup>a</sup>	65.66±7.44 <sup>a</sup>

The results showed that the administration of synthetic antioxidants (ascorbic acid 60 mg per tail per day) and turmeric 500 mg per kg as natural antioxidants had not been able to provide differences in body weight gain, feed conversion, and efficiency of ration use.

Indonesia, which is on the equator, causes high temperatures in Indonesia, as well as relative humidity. This high temperature will cause physiological changes in the chicken which causes the use of the body's basal energy to increase. Continuous stress heat will result in the emergence of free radicals which cause a decrease in function to cell damage. Free radicals are a group of chemicals that are very reactive because they have one or more unpaired electrons. Free radicals are also normal products of the metabolic process. As long as the food is oxidized to produce energy, a number of free radicals are also formed. Free radicals are oxidants, but not all oxidants are free radicals. Oxidants are compounds that can accept electrons and free radicals are atoms or groups whose outer orbitals have unpaired electrons. The effect of the synthesis of antioxidants (ascorbic acid 60 mg per tail per day) and turmeric 500 mg per kg on broilers on the quality of carcass and chicken meat is presented in Table 2.

**Table 2.** The of broiler carcasses added ascorbic acid 60 mg per tail per day and turmeric 500 mg per kg per 30 days.

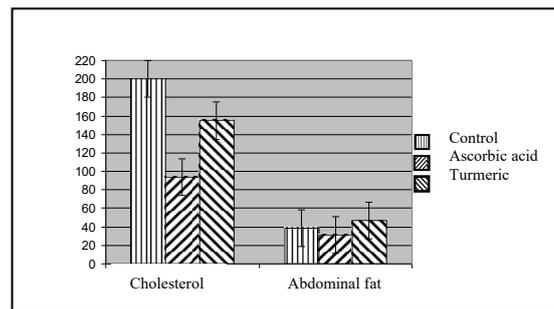
	Control	Ascorbic Acid	Turmeric
Carcass percentage	96.95±0.05ab	96.35±0.42ab	97.34±0.98a
Percent of thigh meat	17.54±0.14b	19.71±0.58b	22.44±1.67a
Percentage of breast meat	20.42±0.87ab	19.49±3.52b	23.25±0.87a
Liver weight	29.33±4.16a	33±2.65a	31.3±4.16a
Gizzard weight	17.66±4.04a	18.66±1.54a	24.6±2.30a

Description: numbers on the same line with different superscript indicate significant difference at the 0.05 level.

The addition of synthetic antioxidants (ascorbic acid 60 mg per day) and ginger 500 mg per kg for 30 days gave no significant difference at the 0.05 level. when compared to the control. However, giving turmeric as an antioxidant gives a better percentage value of chest and thigh weight compared to ascorbic acid. Something that was contradicted was reported by Berliana who stated that the addition of curcumin as an active component of ginger to 12 ppm in pork rations could not significantly influence the appearance of production and carcass characteristics [4]. This is possible because of the composition of fatty meat for more complex than chicken so that the addition of 12 ppm curcumin has not been able to influence the percentage of the pork carcass. Sun *et al.* states that the carcass composition will determine the economic value of additional treatment in the feed [3]. The economical addition of turmeric will provide a real contribution to economic analysis based on formulas.

### 3.2. Cholesterol analysis

Addition of ascorbic acid 60 mg. per tail per day and turmeric 500 mg. per kg as antioxidants affect broiler total cholesterol. The total cholesterol level of broilers with the addition of ascorbic acid 60 mg. per tail per day and turmeric 500 mg. per kg was lower than control cholesterol levels. This shows that the addition of these two antioxidants for 30 days can reduce the cholesterol value of broilers.



**Figure 1.** Cholesterol and abdominal fat with the addition of ascorbic acid 60 mg per tail per day and turmeric 500 mg per kg body weight.

Cholesterol reduction due to the addition of ascorbic acid 60 mg per tail per day and turmeric 500 mg per kg bodyweight because both of these ingredients have activities as antioxidants that suppress damage to digestive cells due to free oxides so that the process of sterol digestion becomes more perfect. This causes cholesterol levels in the blood to be lower than controls. Factors that cause low cholesterol levels in the blood with the addition of turmeric 500 mg per kg body weight are the workings of turmeric as a colagoga [5]. A study to use curcumin done by shows [6] that there is a tendency of low-dose curcumin reduces total cholesterol and LDL cholesterol level. There is also a tendency that the higher the curcumin dose, the lower its lowering effect on LDL cholesterol level. The colagoga is the activity of increasing bile secretion from the liver. The more bile produced due to the addition of turmeric will work as an emulsion for weak digestion in the small intestine so that fat digestion is more effective and results in low cholesterol levels in the blood.

Another research has been done by Mondal *et al.* The mean body weight gain and average feed efficiency (feed per gain) per broiler significantly increased ( $P < 0.05$ ) improved due to by turmeric supplementation in the diets [6]. Inclusion of turmeric powder caused slightly increased the carcass traits of broiler chicks i.e., the average weight of liver, heart, and gizzard but the differences were non-significant ( $P > 0.05$ ). A significant decrease ( $P < 0.05$ ) in dressing yield was observed in chickens fed the turmeric supplement diets. The result of the present study suggests that the use of turmeric powder as feed additive at a level of 0.5% enhances the growth performances and carcass yield of broiler chicken.

### 3.3. Income over feed and chick cost (IOFCC)

Overfeed and chick cost (IOFCC) income is used as a parameter of livestock business efficiency [7]. The value of business income is determined by the value of seeds, consumption of rations, and revenue from sales [8]. A formula that was used to calculate the economic value based on the appearance of chickens [3]. Results of analysis with the formula of obtained gross income for 100 chickens. The IOFCC and gross income values are presented in Table 3.

Income Over Feed and Chick Cost maintenance of broiler chicken with the addition of ascorbic acid 60 mg per tail per day gives chicken chick profits higher than control with the income difference of IDR 1,490. The addition of turmeric is 500 mg per kg body.

Weight gives a difference in profit of IDR 473 per head. Similarly, the formula published by [3] that the addition of ascorbic acid 60 mg per tail per day and turmeric 500 mg per kg body weight gave higher profit compared to the control. It is also reported by Candra *et al.* that the addition of turmeric would increase IOFCC and gross income on the maintenance of broiler infected by *Eimeria Maxima* [2].

**Table 3.** Income overfeed and cost and gross income broiler business with the addition of ascorbic acid 60 mg per tail per day and turmeric 500 mg per kg body weight gain [3].

Variable	Control	Ascorbic acid	Turmeric
Price doc (IDR)	4,500	4,500	4,500
Price ration (IDR/Kg)	4,400	4,400	4,400
Consumption (kg/tail)	1,954	1,905	1,925
Cost Ration (IDR)	8,597.6	8,382	8,470
Cost Ration and DOC (IDR)	13,097.6	12,882	12,970
Average weight gain (Kg/tail)	1,281	1,366	1,304
Price Carcass (IDR/Kg)	15,000	15,000	15,000
Revenue (IDR/tail)	19,215	20,490	19,560
IOFCC (IDR/Kg)	6,117.4	7,608	6,590
Gross income [3]	1,061,740	1,210,800	1,109,000

#### 4. Conclusions

Addition of ascorbic acid 60 mg per tail per day and turmeric 500 mg per kg bodyweight were not able to increase the body weight gain of chicken with 30 days maintenance but were able to increase the composition of the meat in the chest and thighs and reduce the total cholesterol level of broilers.

#### 5. References

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