# Effects of Dietary Turmeric and Red Ginger Meal on Broiler Chickens Performance in Tropical Area

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## ABSTRACT

A study using 180 male day-old broiler chickens was conducted to observe the effect of dietary turmeric (TR) and red ginger (RG) meal as source of phytobiotics in the ration on growth performance and carcass quality in the tropics. The chicks were randomly allotted into five dietary treatments. The birds were reared in an opened-system poultry house with ambient temperature between 27-34$^{o}$C. The five treatments were: basal diet without turmeric and red ginger meal supplementation (control diet; T1); control diet + 5g/kg TR + 7.5 g/kg RG (T2); control diet + 10 g/kg TR + 7.5 g/kg RG (T3); control diet + 5g/kg TR + 15 g/kg RG (T4); and control diet + 10 g/kg TR + 15 g/kg RG (T5). Each treatment was replicated 6 times with six birds in each replicate pen. Data obtained in current study were statistically analyzed using One way ANOVA. Results showed that when broiler chickens were kept in high temperature environment dietary supplementation of turmeric or red ginger meal did not show any significant effect on growth performance, carcass quality, and abdominal fatness. However, there was a tendency that supplementation up to 10 g/kg TR in combination with 15 g/kg RG improved final weight (P=0.066) and average daily gain (P=0.084). It might be concluded that when broiler chickens were raised under opened-system poultry house in tropical climate, supplementation of turmeric and red ginger meal with the rate of 15 g/kg was not enough to improve poultry productivity.

**Keywords**: Turmeric, Red ginger, Broiler chickens, Carcass quality, Growth performance

## INTRODUCTION

In recent years, livestock industries become a hot issue on the sustainable farming system due to the public concern on negative effects of the use of in-feed antibiotics for consumers. The presence of antibiotics in the feed stimulates the growth of pathogenic microbes that possibly resistant to antibiotics. There are also public fears on the possibility of antibiotic residues that might be retained in the products of livestock. This could be the reasons on why consumers afraid of the potency of allergic reactions, toxicity, microbial resistance, and physiological disorders which stimulated by the presence of antibiotic residues in the meat or eggs.

Poultry nutritionists, emphasize which study on the animal feed industries, must fight to seek alternatives for the in-feed antibiotics. One of the alternatives that can be selected is the phytobiotic. Phytobiotic, or green additives, is a kind of feed additive that is originally derived from a part of plants that contains bio-active compounds which might be useful to improve growth performance of poultry animals.

Turmeric and red ginger, for instances, have the potency to be used as candidates of phytobiotics in the feed. Turmeric contains bioactive compounds tetrahydrocurcuminoid, curcumin,

demethoxy-curcumin, and bisdemethoxycur-cumin which have been reported to be beneficial for enhancing poultry productivity. Red ginger has also many active compounds, such as: gingerol. Gingerol has antioxidant effects that beneficially protects the body from stress due to the oxidation processes in the body.

## RESEARCH METHOD

### Birds and Housing

One hundred and eighty male day old broiler chickens were randomly allotted into five dietary treatments in an opened-system poultry house. At day old, the chicks were tagged, weighed, and allocated to 30 wired pens (90x90x40) $cm^3$ which equipped with bell-drinkers and hanging feeders. The pens was situated in environment situation with facilities to control temperature, light, and humidity.

### Birds Grouping, Diets, and Experimental Design

One hundred and eighty male day old broiler chickens were randomly allotted into five dietary treatments in an opened-system poultry house. The five treatments were: basal diet without green additives supplementation (control; T1); control diet + 5.0 g/kg TR + 7.5 g/kg RG (T2); control diet + 10.0 g/kg TR + 7.5 g/kg RG (T3); control diet + 5.0 g/kg TR + 15.0 g/kg RG (T4); and control diet + 10.0 g/kg TR + 15.0 g/kg RG (T5). Each treatment was replicated 6 times with six birds in each replicate pen. The ingredients and chemical composition of the diets are presented in Tabel 1.

### Sampling Procedure

Body weight and feed intake were collected on day 0, 10, 21, and 35 for calculating of weight gain, average daily gain, and feed conversion ratio. By the end of the experimental period, one bird every replication were randomly slaughtered with islamic method to collect carcass quality data. The data include carcass weight, meat weight, carcass percentage, meat bone ratio, abdominal fatness weight, and abdominal fatness percentage.

### Parameter Measured

The variable include feed consumption, body weight gain, feed conversion ratio, carcass weight, meat weight, carcass percentage, meat bone ratio, abdominal fatness weight, and abdominal fatness percentage.

### Data Analysis

Data obtained in this study were statistically analyzed using One way classification of variance using *Software Statistical Package for Social Science* (SPSS for Windows Version 21; SPSS GmbH, Munich, Germany)

**Tabel 1.** *Energy-nutrients contents*

| Items | Starter (0-10 days) | | | | | Grower (11-35 days) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| Metabolizable Energy, kcal/kg | 3007 | 3044 | 3059 | 3067 | 3082 | 3082 | 3119 | 3134 | 3142 | 3157 |
| Dry matter, % | 87.75 | 88.88 | 89.34 | 89.57 | 90.02 | 87.35 | 88.48 | 88.94 | 89.17 | 89.62 |
| Ash, % | 10.04 | 10.04 | 10.04 | 10.04 | 10.04 | 9.42 | 9.29 | 9.34 | 9.37 | 9.42 |
| Crude protein, % | 22.40 | 22.55 | 22.61 | 22.64 | 22.70 | 21.10 | 21.25 | 21.31 | 21.34 | 21.40 |
| Ether extract, % | 4.47 | 4.63 | 4.62 | 4.62 | 4.62 | 4.81 | 4.95 | 5.00 | 5.03 | 5.08 |
| Crude fibre, % | 5.19 | 5.03 | 5.03 | 5.03 | 5.03 | 3.93 | 4.07 | 4.12 | 4.15 | 4.21 |
| Nitrogen-free extract), % | 57.62 | 57.62 | 57.62 | 57.62 | 57.62 | 59.89 | 59.89 | 59.89 | 59.89 | 59.89 |
| Calcium | 1.11 | 1.11 | 1.11 | 1.11 | 1.11 | 1.01 | 0.98 | 0.98 | 0.98 | 0.98 |
| Phosphorus | 0.69 | 0.70 | 0.70 | 0.70 | 0.70 | 0.68 | 0.69 | 0.69 | 0.69 | 0.69 |

## RESULT AND DISCUSSION

The effect of turmeric and red ginger on growth performance and carcass quality are showed in Tabel 2 and Tabel 3.

**Tabel 2.** The effect of turmeric and red ginger on growth performance of broiler chicken

| Variable | Treatments | | | | | Statistic | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | SEM | P-*value* |
| Feed consumption (g) | 2838,1 | 2669,2 | 2728,0 | 2863,2 | 2627,4 | 59,126 | 0,684 |
| Final weight (g) | 1545,7 | 1602,9 | 1619,7 | 1555,1 | 1346,6 | 37,043 | 0,066 |
| Average daily gain (g) | 1498,1 | 1556,0 | 1573,0 | 1507,5 | 1299,5 | 1,376 | 0,084 |
| Feed conversion | 1,89 | 1,72 | 1,73 | 1,90 | 2,02 | 0,799 | 0,568 |

**Tabel 3.** The effect of turmeric and red ginger on carcass productivity of broiler chicken

| Variable | Treatments | | | | | Statistic | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | SEM | P-*value* |
| Carcass weight (g) | 1423,25 | 1453,83 | 1490,25 | 1476,75 | 1477,80 | 0,26 | 0,636 |
| Meat weight (g) | 898,25 | 915,50 | 941,33 | 932,25 | 905,00 | 18,66 | 0,857 |
| Carcass percentage (%) | 72,55 | 72,63 | 74,01 | 76,47 | 75,24 | 1,06 | 0,832 |
| Meat bone ration | 1,59 | 1,88 | 1,93 | 1,86 | 1,81 | 0,26 | 0,712 |
| Abdominal fatness weight (g) | 22,88$^{ab}$ | 16,02$^{b}$ | 15,78$^{b}$ | 27,40$^{a}$ | 28,82$^{a}$ | 1,55 | 0,037 |
| Abdominal fatness percentage (%) | 1,28$^{ab}$ | 0,89$^{b}$ | 0,88$^{b}$ | 1,64$^{a}$ | 1,61$^{a}$ | 0,09 | 0,015 |

### Growth Performance

This study was designed to investigate the response of broiler to supplementation of turmeric and red ginger meal and rate possible additivity and interaction between the additives. Results showed that supplementation of turmeric and red ginger meal in the ration did not show any significant effect on the growth performance of broiler chicken. However, there was a tendency that

supplementation up to 10,0 g/kg TR in combination with 15,0 g/kg RG improved final weight and average daily gain. Therefore, supplementation the both of dose (10 g/kg turmeric and 15 g/kg red ginger) did not enough to improve poultry productivity where the birds raised under opened-system of poultry house in tropic climate.

Windisch *et al*.(2007) reported that phytobiotic level on ratio have not been shown to increase broiler productivity. Every animal have own respons to phytobiotic dose on the body. Another possibility was prepared method to make meals of turmeric and red ginger meal less precised. One of bioactive component in turmeric and red ginger is essential oil (Hayani, 2006). It easily volatiled, so it so fast damaged, and it was be unavailable component in the body. The feed was keep at opened warehouse, so the ambient temperature tendence highly. This condition decrease volatility of essential oil and can't show the potential of essential oil to stimulate appetite (Rodianawati et al.,2015).

The other wise, bioactive compound that was act is essential oil. This compound play a role in stimulating work digestive glands by stimulating way their secretion of digestive enzymes. The characteristic of essential oils was easily volatiled, so the essential oils contained in the feed treatment can't work optimally in stimulating production of digestive enzymes. These conditions make the macro-nutrients in digest was undigested feed optimally, so that the micro-nutrients absorb process is not optimal. So, the nutrients were not absorbed perfectly able to make the process growth were not optimal (Dibner and Richards, 2004; Pelicano et al., 2005).

In this research were used opened house system. Opened house system keeps chickens from conditions like heat stress because temperatures tend to be uncomfortable for chicken growth. Song et al. (2012) reported that a decrease in feed consumption occurs the chickens are keep in hot environmental conditions. The suitable temperature for chicken growth is 16-25$^{o}$C, while on research in enclosure temperature ranges from 27-34° C. These conditions make chicken experiencing heat stress which causes neuroendocrine mechanisms can't work optimally in growth, so that the process of metabolism and nutrient absorbtion not running optimally. This makes the chicken can't show optimal growth (Lei et al., 2014).

Curcumin compounds in the body indicates a low bioavibility because curcumin was properties of water insoluble at acidic or neutral pH, thereby difficult absorbed in the body (Maiti et al., 2007). Research Sharma et al. (2005) in vivo used mice showed that the rate of absorption of compound curcumin is relatively low, at only around 40%. This was presumably because their changes in the structure of curcumin compounds in the digestive tract, thus curcumin compounds can't be absorbed by the body optimally (Suresh and Srinivashan, 2007).

This decision was also supported by the found of Al Sultan (2003) and Herawati (2010) in which dietary supplementation of turmeric with the dose 10 g/kg and red ginger with dose 15 g/kg did not enough improve performance and carcass productivity of broiler chicken.

**Carcass Productivity**

Biovailability of curcumin are lowest in the body, so it was not optimal process for antimicrobial in the gastrointestinal tract (gut). The presence of pathogenic bacteria in the digestive tract causes the competition in the use of available micronutrient, so that absorption is not optimal (Ferrer et al., 2006). Furthermore, presence of pathogenic bacteria also cause toxins in numbers many. If this happened then it was goblet cells will produced mucus highly to protected the intestinal villus of the toxin (Ferked, 2004). Excessive production of mucus in the digestive tract make the intestinal villus covered by mucus and can prevent the absorption of micronutrients. Still, the process that occurs in the digestive tract can make absorption micronutrients not optimal, so the

highly of micronutrients that can be utilized for the body's metabolism and the formation of the meat was not optimal (Dono, 2012).

The other wise, animal growth process was also supported by environmental influences. One of the environmental factors that influence the housing. In this study, we used opened house, so that the chickens suspected of experiencing heat stress. This condition made the declined in physiological responses of animal and feed consumption declined too. The decreased in feed consumption would affected the inhibition of the growth of chickens. Nutrients were mobilized for subsistence cooling mechanism (Song et al., 2012). Bonnet et al. (1997) reported that heat stress resulted in a declined in the body's metabolism, among others: AMEn decreased by 72-155 kcal, protein digestibility decreased approximately 4.2%, fat digestibility decreased about 5.2%, and starch decreased about 4.2%. This makes the nutrients can't be used for growth, so that the process of forming the meat was not optimal.

## CONCLUSIONS

In conclusion, the supplementation of turmeric and red ginger meal did not show any significant effect on growth performance, carcass quality, and abdominal fatness when broiler chickens when keep in high temperature environment. However, there was a tendency that supplementation up to 10 g/kg TR with 15 g/kg RG improved final weight (P=0.066) and average daily gain (P=0.084). Bioavailability of essential oil was easily volatiled, so it was unavailable component in the body. This condition decreased the potential of essential oil to stimulated appetite. Furthermore, in this study, we used opened house, so that the chickens suspected of experience heat stress. This condition made the declined in physiological responses of animal and feed consumption declined too. The decreased in feed consumption would affected the inhibition of the growth of chickens. This made the nutrients can't be used for growth, so that the process of forming the meat was not optimal.

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