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The Effect of Feeding Red Ginger as Phytobiotic on Body Weight Gain, Feed Conversion and Internal Organs Condition of Broiler

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Abstract: This experiment was conducted to know the production performance and organs condition of broiler fed supplemented with red ginger (*Zingiber officinale* Rosc) as phytobiotic. Two hundred broiler chickens of 5 days old were divided into 5 different feed treatment groups, namely: control feed without red ginger (R-0) and treatment feeds (R-0.5, R-1.0, R-1.5 and R-2.0 which were control feed with 0.5, 1.0, 1.5 and 2.0% red ginger, respectively). Each group was divided into 5 sub groups as replication, consisted of 8 chickens each. The chickens were raised for five weeks. All chickens were weekly weighed and feed consumption was daily measured in each sub-group. After 35 days old, the chickens were slaughtered then the breast muscle, liver, kidney and proventriculus were taken for histological observation. Data obtained were subjected to analysis of variance of Completely Randomized Design one way classification and Duncan's New Multiple Range Test. The result showed that the production performance of broiler fed supplemented with red ginger showed higher body weight ($p < 0.05$), lower total feed intake ($p < 0.05$). The use of 2% red ginger in the ration gave higher body weight, lower total feed intake and lowest changeover on the muscle, liver, kidney and proventriculus conditions.

Key words: Feed intake, organ, performance, red ginger

INTRODUCTION

Chemical feed additives have been intensively used in broiler's ration to improve productivity. However, the feed additives have negative impacts on the consumers due to their residues which mostly remain in the broiler products. Thus, it is important to explore the potential of natural feed additives to replace the chemical ones. One of the natural feed additives is red ginger.

Red ginger contains bioactive substance such as oleoresin and ginger which give effect to optimize the body organ. Red ginger also contains vitamins and minerals as the peculiar plant (Rismunandar, 1988). Atsiri extract function as the anti inflammation and anti bacterial (Achyad and Rasyidah, 2000).

Red ginger is one of natural plants which can be used as phytobiotic to improve broiler's performance. Red ginger contains some atsiri extract because it spicy and special aromatic of ginger. The major component of ginger is Zingiberen and Zingerol that can stimulate the digestive systems by controlling the digestive pH and the activity of digestive enzyme and the microbial activity. Atsiri extract of ginger could immune the gastric and improve poultry appetite. Red ginger is also as bacteria static that reduce pathogenic microorganisms in the digestive tracts.

Moreover, red ginger spice has two types of digestive enzymes; one is protease enzyme that is used to break apart the protein and lipase enzyme that is used to break apart the fat. Both enzymes improve nutrients digestion and absorption by animals.

However red ginger contains also destructive agents. The agents may poisonous and destruct some organs

immediately (center-cellular) and not immediately (extra-cellular). The destruction depends on the dosage and the therapy. The mechanism of metabolism effect is also depended on the behavior and condition. The mechanism of direct action of poisoned agent or it metabolism will experience any processes. It result will be continued on target of an organ and gives effects, either biochemical functional or structural of it organs. The gingerol also protect the liver on it activity, especially on hold the toxic of carbon tetrachloride. The ginger works as vaccination by stimulate an organ of bursa febrisus to make an antibody of viral attack such as ND. Ginger as a natural material is good as additive because it has no residual that threat the body organ and safe for the consumer's health.

This research aims to study the potential of red ginger in improving broiler's performance and its internal organs conditions.

It is the hypothesis that the use of red ginger as feed additive upto 2% in the ration will improve performance of broiler and not influence the normality of internal organs.

MATERIALS AND METHODS

The materials used in this research were 200 heads of 5 days old Hubbard Strain broiler chicken produced by PT. Cipendawa Agro Industry Tbk, commercial broiler feeds (BR-I) produced by PT. Central Proteina Prima, Semarang and red ginger flour (*Zingiber officinale* Rosc), bought from traditional market Beringharjo-Yogyakarta.

Table 1: Total feed intake, body weight gain and feed conversion of broiler after reared for 5 weeks using feeds containing different levels of red ginger as phytobiotic

Parameter	Treatment: level of red ginger in the ration (%)				
	0	0.5	1.0	1.5	2.0
Feed intake (g/head)	4,180.00 ^a	4,405.50 ^a	4,108.00 ^a	4,196.50 ^a	3,966.70 ^b
Total weight gain (g/head)	1,899.71 ^a	1,888.44 ^a	1,858.25 ^a	1,955.53 ^b	1,859.50 ^a
Feed conversion*	2.27 ^b	2.15 ^a	2.20 ^a	2.15 ^a	2.14 ^a

^{a,b}Different superscripts on the same line shows significantly different ($p < 0.05$).

^{a,b}Different superscripts on the same line shows really significantly different ($p < 0.01$)

Red ginger flour was prepared by washing the ginger under water and then it was slashed and sun-dried for 1-2 days. Dry ginger was then ground to get ginger flour. To avoid chemically and microbiology damages, the red ginger flour was stored in the impermeable glass tubes. The chickens were divided into 5 groups, then, each group was further sub-divided into 5 sub-groups of 8 chickens per sub-group as replication. The chickens in each group were given different feeds as treatments. The feeds were R-0 (control feed without red ginger, R-0.5, R-1.0, R-1.5 and R-2.0 which were control feed with 0.5, 1.0, 1.5 and 2.0% red ginger, respectively.

The feeds of this research were made as iso-calorie and iso-protein. The feed contained Crude Protein (CP) 21-23%, energy as 3150 kcal ME/kg, Calcium (Ca) 1% and Phosphor (P) 0.5%. The feed and drinking water were given *ad libitum*.

The composition and nutrient content of feed used in this research was presented in Table 1.

The chickens were reared for 5 weeks. Every week, all the chickens were weighed and daily feed intake was measured. Finally, the chickens were slaughtered and the breast muscle, liver, kidney, as well as proventriculus were taken for histological observations. Data collected were subjected to analysis of variance of Completely Randomized Design of one way classification and Duncan's New Multiple Range Test according to Steel and Torrie (1993).

RESULTS AND DISCUSSION

Body weight and feed conversion: Data on total feed intake, body weight gain and feed conversion of broiler after reared for 5 weeks using rations containing different levels of red ginger as treatments were presented in the Table 1.

Data on Table 1 showed that broiler fed on ration with red ginger showed significantly lower ($p < 0.05$) feed conversion than those on control treatment. Addition of red ginger at level 1.5% in the ration gave the highest broiler body weight and considerably lowest feed conversion.

However, increase of red ginger in the ration up to 2.0% showed lower feed intake, total weight gain and feed conversion. Red ginger has potential as phytobiotic or stimulant which improve the efficiency of feed utilization by chickens.

Achyad and Rasyidah (2000); Rismunandar (1988) reported that red ginger contains active compounds such as atsiri oil (a-pinen, 3-felandren, borneol, kamfen, limonen, linalool, sitral, nonilaldehida, desilaldchida, metilhepte-non, sineol, hisaholen, 1-a kurkuinin, farnesen, humulen, zingiberen, zingiberol) and oleoresin (consist of the substance with hot taste, like: gingerol, zingeron, shogaol, tanin, gingerdiol, resin). All the compounds adding phytobiotic of red ginger causing an improve in feed digestion. The adding of phytobiotic of red ginger in the poultry also assumed also causing the digestion process for the poultry can be stimulated, hence the poultry conversion become meat can optimal. Red ginger has characteristic as stimulant for feed digestion and conversion which increase body weight gain (Conley, 1997).

Blend of phytobiotics from quantified essential oils extracts, plant extracts from Thyme, Origanum, Rosmary, Clove and Cynnamon. The advantage of phytobiotic is as growth promoter and prevents coccidial multiplication and reduces its damage effect on the intestinal wall (Hossain, 2009).

Inner organs condition: Muscles, liver, kidney and proventriculus conditions of broiler fed on ration without (R-0) and with red ginger in the ration (R-0.5, R-1.5 and R-2.0) were presented in Fig. 1, 2 and 3, respectively. Broiler fed on ration without (R-0) red ginger showed normal muscles condition, however, broiler fed on ration with red ginger (R-0.5, R-1.0 and R-1.5) showed muscles with some oedema and necrosis (R-0.5), necrosis and inflammation (R-1.0) and oedema and congesti (R-1.5) as shown in Fig. 1. Same conditions were found on liver, kidney and proventriculus (Fig. 2 and 3).

Broiler fed on ration containing 0.5% red ginger showed microscopically, the infiltration inflammation cell changeover in the kidney, especially in the tubuli cell. This condition was caused by existence of atsiri oil which contains toxic substances especially seskuiterped with high toxicity. If not all of the toxic substances can be detoxified in the lever, then it will go to the ren which is as one of the metabolism site for strange substance in the body.

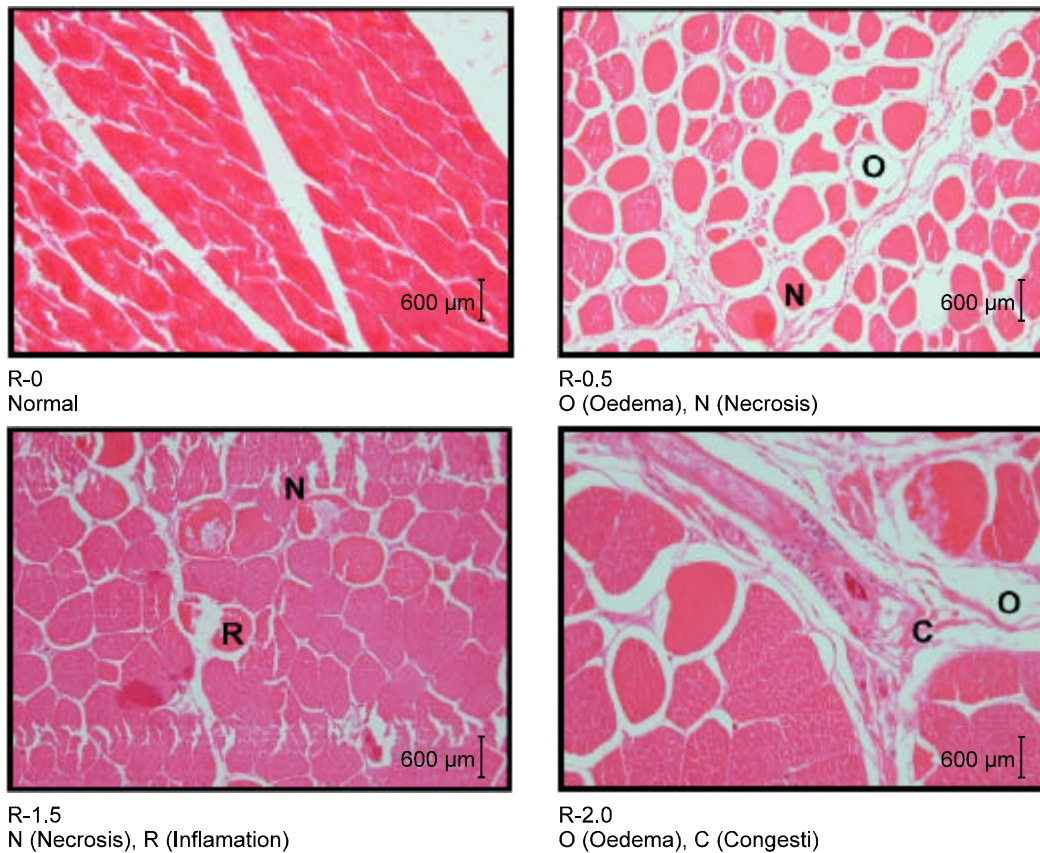


Fig. 1: Microscopic description of muscle (100 x) of broiler fed on ration without (R-0) and with red ginger in the ration (R-0.5, R-1.5 and R-2.0)

Necrosis caused of the phytochemistry in the red ginger that appearing the toxic characteristic. The ginger consists of atsiri sescuterpen oil which potentially cause toxicity for animal (Zhou, 2002). Atsiri oil cause dilatation of blood vessel wall when local irritation happen, which hence cause inflammation.

Basically, all chemical substances (phytochemistry) have toxic characteristic. Their toxicity is determined by the dose and the way of feeding. Giving high dose of such substances can evoke the symptom of toxicity, like degeneration, congesty, oedema and necrosit (Ganiswarna, 1995).

Congesty is defined as the increase of total blood in the blood vessel. Oedema is the abnormal accumulation of liquid in the compartment of extravascular and extracellular of the body. Oedema is not the disease, but sometime it can cause some disturbing for the disruption in the physiological function of the body. Oedema cause are 1) increasing the presure in the filtration of capiler, 2) decreasing the osmotic pressure of osmotic coloid capiler, 3) increasing the permeability of capiler and 4) obstruction of the limbic flow (Mattson, 1994). When local irritation happen, atsiri oil contained in ginger can cause dilatation of the blood vessel, the

change of hydrostatic pressure and blood osmosis pressure which then cause oedema to happen.

This change happened due to the substances in the red ginger rhizome which caused the lever work harder (too hard), hence the lever showed the dilation. The lever has function to netralize the toxic and subtrance of toxic, drug and some hormone in the body. Therefore, if there is strange substance and toxic substance enter to the body, so the lever will work harder. The impact of overload activity, the lever will dilation and weightier.

Banks (1993) explain that the lever also has job to syntetic and keep the salts bile and biliary secretion, that incidentally can be secreted into the blood and into the biliary system. The secretion of these salts bile related with the exocrine of the lever function as the producer hormone. These sals bile have function to digest the fat in the intestine. Beside salt bile, the lever also produce the bile pigments (bilirubin) that also content some other substances, like colessterol, fat, fosfolipid, electrolite and some other organic substances.

Degeneration hydropic is the inflammation that showed the empty room (vacuole) in the cytoplasm from the cell, generally it around of the nuclei. Some vacuole merger built bigger vacuole and the cells look bigger.

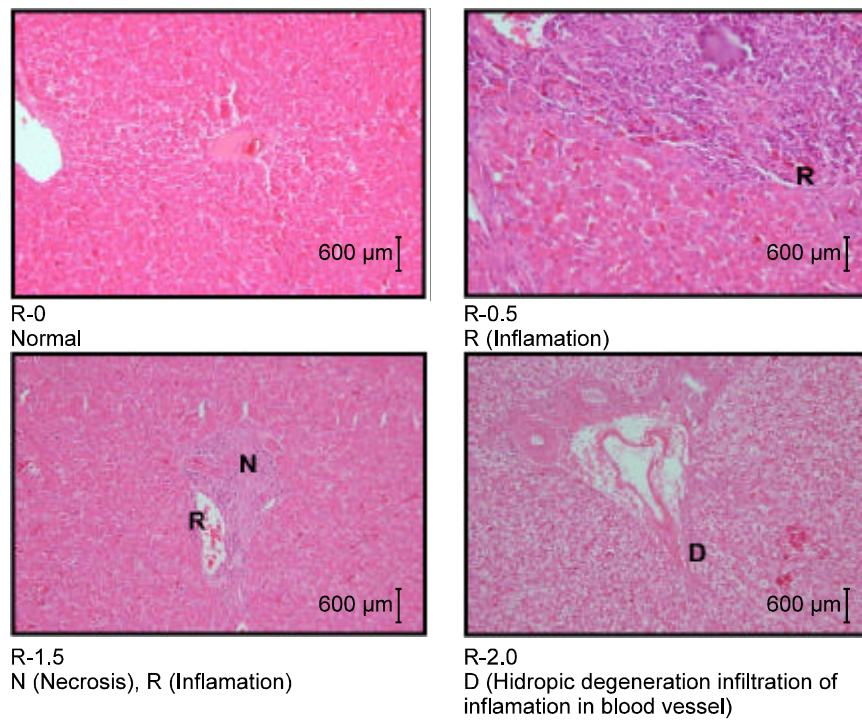


Fig. 2: Microscopic description of liver (100 x) of broiler fed on ration without (R-0) and with red ginger in the ration (R-0.5, R-1.5 and R-2.0)

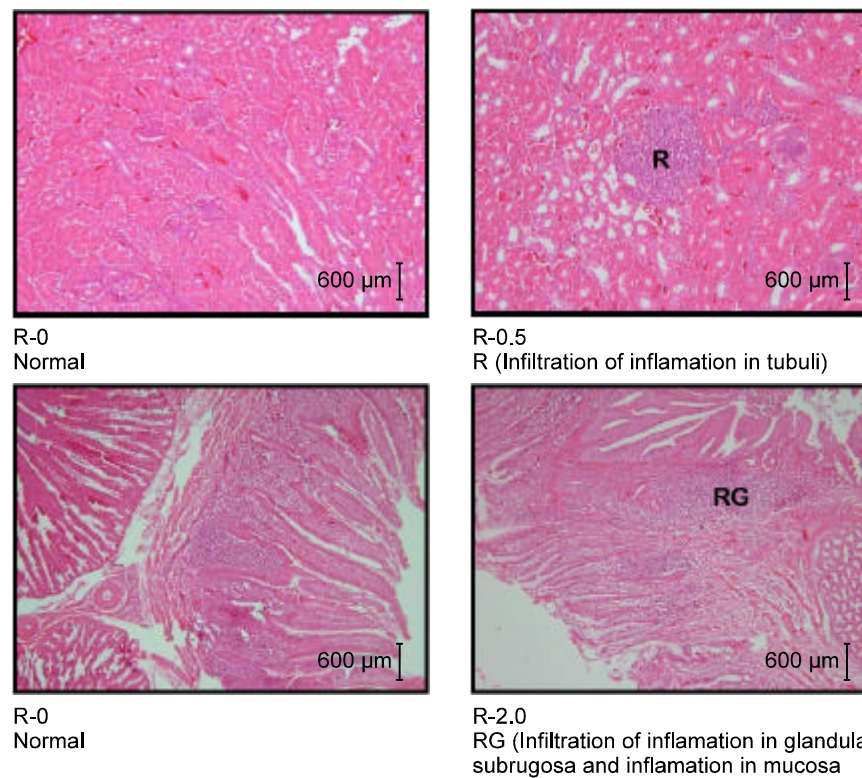


Fig. 3: Microscopic description (100 x) of kidney (top) and proventriculus (lower) of broiler fed on ration without (R-0) and with red ginger in the ration (R-0.5 and R-2.0)

Inflammation is a series of the vital changeover that happen in the net that still live as the respond to the inflammation or the disruption. The second respond of the inflammation, are the celluler respond and vascular respond. For the celluler respond will happen the migration cell primerly from the venula after happen the damage. The first element that exit is the neutrophyl that actively find the damage net, while for the vascular respond showed there is the exudation from the cell and the liquid from the small venula and capiller. The damage of the capiller will stop the blood flow and conduce the trombosist then will agglutinate the white blood cell which will blocked the lumen of capilair (Banks, 1993).

Some important cells which are involved in imflamation process are neutrophyls, eosinophyls, basophyls, limphocytes, cell plasm and macrophages. Neutrophyls have function as paghocytosis and bacteriocidal. Neutrophyls secrete endogenic phyrogen when there is present of bacteria or toxic secreted by bacteria. There are two types of lymphocytes, lymphocytes B and T. Lymphocytes B secrete cell plasm, while lymphocytes T secretes immunoblast for cellular immunity and lymphotoxin which have function to localize damaged tissues (Hariono, 1993).

Condition of inflammation is always dominated by heterophyl in the sepcist condition and lenght of the inflammation. Lymphocites and cell plasm increased in the cronic inflammation and when there is virus infection.

Infiltration of cell inflammation is as heterophyls due to the influence of chemical substances such as Cd, Zn, Pb and Hg contained in the ginger which are detected by the tissues as toxics (Donatus *et al.*, 1983). Heterophyls mostly migrate to the damaged tissues or to the inflammation area. This conditions, therefore, increased the release of heterophyls from bone marrow to the blood circulation.

In few hours after infection, number of heterophyl cells in the blood increased. It is caused by inflammation products which enter the blood and push the heterophyl cell to enter the blood circulation faster, hence make a lot of heterophyl cell in the inflammed tissues (Guyton, 1991).

Conclusion: Based on the research, it can be concluded that adding red ginger as the phytobiotic in the ration of broiler up to 2.0% gave a good effect on feed intake, total body weight gain and feed conversion as well as changeover in the muscle, liver, kidney and proventriculus conditions.

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