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EFFECT OF BANANA PEEL APPLICATION IN RATION ON HEMATOLOGICAL LEVEL, NITROGEN RETENTION AND BODY WEIGHT GAIN OF HEAT EXPOSED BROILER CHICKEN

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Abstract

Banana peel application on heat exposed chicken was conducted by using 80 broiler chickens aged 21 days in complete randomize design method. Four treatment that was given based on the level of banana peel ration are R_0=0%, R_1=10%, R_2=20% and R_3=30%. Each of the treatment was repeated 5 times to 4 chickens for each repetition. The study was held for 21 days. The observed variables are haematocrite value, haemoglobin level, erythrocyte, MCHC level, ration consumption, nitrogen retention and body weight gain. The result of this study showed that haematological parameters between the treatment was insignificant (P>0.5). The chicken body weight gain on R_0 (=978.00 g) was significantly higher compared to others (R_1=799.50 g, R_2=810.00 g and R_3=638.25 g). In conclusion, application of banana peel on 20% level to heat exposed chicken can increase nitrogen retention but it is not follow by body weight gain while haematological parameters for all treatment is remained the same.

Keywords: *banana peel, broiler chicken, heat stress, hematological parameters, nitrogen retention.*

INTRODUCTION

Broiler chickens have a lot of positives, for example it fast growth, could be harvested in a matter of time, but it also have a negative issues such as fragile body defence to natural cause, like nutrition, climatology and managerial (Ensminger, 1991). As homeoterm organism, broiler chickens will always constantly maintain its body temperature, but chickens have few sweat glands. These circumstances often lead to problems that obstruct the process of removing heat, so some of the heat accumulates in the body (Sugito, 2008) which in turn will trigger a stress.

Indonesia is a tropical country where the weather is characterized by high temperature and humidity, which ranged between 27.7 to 34.60^{0}C and humidity ranged between 55.8 and 86.8% (BPS, 2010), but the optimum temperature for raising broiler chickens 21˚C (Soeharsono, 1976) or in the temperature range 18-22^{o}C (Charles et al., 2002). The high temperature of the environment canal so lead to oxidative stress in the body, resulting in excessive free radicals (Miller et al., 1993; Aruoma, 1999), which can cause membrane to undergo lipid peroxidation, so that free radicals can attack DNA and cell protein (Rahman, 2003).

To maintain body temperature, chicken will trying to improve heat loss through evaporation (Campbell et al. 2004) and reduce the formation of body heat by reducing the consumption of rations, to change the behaviour and physiological activity (Indriani, 2008). When this condition occurs, chicken will suffer micronutrient deficiencies in the body and in turn will be manifested by inefficient use of feed and growth impairment (Donkoh, 1989; Mashaly et al., 2004). These circumstances resulted in unequal nitrogen and minerals in the body.

The farmers often supplement with macro minerals such as K, Na and Cl to replace lost ions in the event of stress directly even though this action will not ease the stress or discomfort of the chicken.

Ration plays an important role in supporting the growth of chicken, considering the growth cannot be separated from consumption, which in turn reflects the ration nutrients consumed anyway (Soeharsono, 1976) is shown by the quality of the feed is lost after digestion, absorption, and metabolism. While retained nitrogen is the food that not excreted in the

faeces and urine. Nitrogen is nitrogen is derived from protein ration so that retention of nitrogen can be used to assess protein ration.

Indonesia's rich flora can be utilized to meet the nutritional needs of broiler chickens, including natural ingredients found in many industrial waste, such as banana peels. Banana peel contains macro mineral (Margen, 2002), and a number of active compounds such as tannins, saponins (Anhwange, 2001), vitamin A, B, C and E (Kanazawa and Sakakibara, 2000)

Research experts from Chung Shan Medical University Taichung, Taiwan (Anonymous, 2009), banana skin is rich in vitamin B6, vitamin C, vitamin E, potassium and Cl, besides, many contain serotonin which plays a very vital to balance mood, for prevention of stress and depression in humans. The purpose of this study to determine the extent of the use of banana peels in the ration to reduce the impact of heat stress in broilers.

MATERIALS AND METHODS

Animal experiments were 80 broiler chickens, final stock 21 days old Ross strain weighing 450 g, and the coefficient of variation of 5.83%. Straight run system rearing. Cages are used as much as 20 units with stage system, a length, width and height of 1 x 0.5 x 0.75 cm (for five chickens). Enclosure temperature is maintained between 28-34^{o}C, each cage has two incandescent bulbs (60 watt), and thermometer for easy record keeping.

Banana peels used in this experiment are Ambon Banana (*Musa sapientum sp*.) It is first dried and then made into flour by machine. The content of nutrients and metabolic energy feed ingredients making up the ration can be seen in Table 1.

Ration prepared in accordance with the recommendation of Daghir (1995). The metabolic energy content of 3000 kcal/kg and 22% crude protein are presented in Table 2.

Table 1. Composition of the formula ration

Ration Ingredients	CP	CF	CFi	Ca	P	Lysine	Met	Cystine	ME
	……%.....								Kkal/kg
Soybean Meal	48.00	0.90	6.00	0.30	0.29	2.90	0.65	0.67	2240.00
Coconut Meal	18.58	12.60	15.38	0.21	0.20	0.64	0.29	0.30	2212.00
Fine Bean	12.00	13.00	12.00	0.12	0.21	0.71	0.27	0.40	160.00
Yellow Corn	8.60	3.90	2.00	0.02	0.30	0.20	0.18	0.18	3370.00
Coconut Oil	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	8600.00
Fish Flour	61.00	9.00	1.00	5.50	2.80	0.65	1.80	0.94	3080.00
Bone Flour	0.00	0.00	0.00	24.00	12.00	0.00	0.00	0.00	0.00
Top Mix	0.00	0.00	0.00	40.00	0.00	0.30	4.00	4.00	0.00
Banana Peel Flour	10.30	4.02	17.62	0.29	0.07	-	-	-	2915.00

Note : CP: Crude Protein CFi: Crude Fiber P:Protein
CF: Crude Fat Ca: Calsium ME: Metabolic Energy

Table 2. The nutrient and metabolizable energy in ration

The Nutrients	Ration				
	R0 (BP 0%)	R1(BP10%)	R2(20%)	R3(30%)	Needs
Crude Protein (%)	22.00	22.02	22.17	22.14	22.00
Crude Fat (%)	7.15	6.84	6.53	6.18	≤8.00
Crude Fiber (%)	4.08	5.28	6.46	7.51	≤8.00
Calsium (%)	1.07	1.09	1.11	1.13	0.90-1.00
Phosforus (%)	0.64	0.62	0.60	0.58	0.45-0.80
Lysine (%)	0.76	0.72	0.70	0.68	0.65-0.72
Methionine (%)	0.48	0.46	0.44	0.42	0.40-0.50
Cystine (%)	0.39	0.37	0.34	0.32	0.40
EM (Kkal/Kg)	3011	3023	3024	3020	3000

Parameters observed:

1. Haematology	:	a.	Number of of erythrocytes was calculated using hemocytometer Improve Neubaeur
		b.	Hemoglobin was measured using Sahli hemometer
		c.	Hematocrit was calculated using methods of microhematocrit
		d.	MCHC (Mean Cellular Hemoglobin Capsular) is calculated by comparing the amount of hemoglobin by the number of erythrocytes X 100%
2. Nitrogen Retention	:	Measurements conducted on nitrogen retention 36 days old chickens, collecting method to accommodate faeces for three days. Calculation of nitrogen retention by using Maynard and Loosli (1962), namely: $$RN = \frac{NI - (NF + NU) \times 100\%}{NI}$$ Description : RN = Nitrogen Retention (%) NI = Amount of Consumed Nitrogen (g) NF = Amount of Nitrogen in Feces (g) NU = Amount of Nitrogen in Urine (g)	

1. Ration Consumption : Consumed ration counts in 21 days of experiment with units of grams
2. Body Weight Gain : Weight gain is done by calculating the difference between weight loss-weight end of the week earlier in the week for three weeks of study with units of grams

Experiment methods

Research was conducted in experiment using a completely randomized design (CRD). Four treatments were used in which each treatment contained different percentage of banana peel in the given ration. For practical purpose, treatments were named R1, R2 and R3. R1 treatment contained 10% of banana peel in the ration, meanwhile R2 contained 20% of banana peel and R3 contained 30% of banana peel. These treatments were repeated five times so that there are twenty experimental units, each unit consisting of four broiler chickens. Other than the four treatments, another treatment was used as comparison. That treatment named R0 which contained no banana peel on the ration. Data were analyzed statistically (Gasperz, 1995), and the differences between treatments performed by Duncan Multiple Test distance.

RESULTS AND DISCUSSIONS

Haematological level

Erythrocytes, haemoglobin, hematocrit and MCHC

Erythrocytes play a role in the transport of oxygen by haemoglobin assistance. The ability of blood to carry oxygen depends on the level of haemoglobin in the blood and chemical characteristics of haemoglobin (Cunningham 2002). Haemoglobin fully is one-third of the components of erythrocytes (Reece, 2006). About 400 million haemoglobin molecules are inside the erythrocytes (Jain, 1993). Under normal circumstances erythrocytes, haemoglobin and hematocrit in parallel are observed.

Observations using a banana peel in the ration of broiler chickens exposed to heat are presented in Table 3 and illustration 1.

In Figure 1 it appears that erythrocytes from each treatment giving a banana peel (R1, R2 and R3) in the ration showed a higher tendency of treatment without banana peel (0%) erythrocyte count range 1.84 - 2.29.10^6/mm^3. Haemoglobin from each treatment (R1, R2 and R3) showed a decrease compared to R0, i.e. in the range of 7.8 – 8.54 g%. Hematocrit of each treatment (R1, R2 and R3) showed a declining trend compared to R0. While MCHC (mean capsular Haemoglobin Concentration) seems to treatment (R1, R2 and R3) tends to decrease as compared with the treatment of R0, MCHC number range 28.80 - 35.41%.

Table 3. Levels of haematological in blood of broiler chicken heat exposed

Treatments	Variables			
	Erythtrocytes (10^6 mm^3)	Hemoglobin (Gr %)	Hematocryte (%)	MCHC (%)
R0	1.824	7.8	27.2	28.8
R1	2.292	8.1	25.7	33.41
R2	2.177	8.54	24.2	35.41
R3	2.291	8.54	24.9	34.78

Description : R0 = 0 % BP; R1 = 10 % BP; R2 = 20 % BP; R3 = 30 % BP
BP = Banana Peel

Haematological levels still within the normal range, which is about $3.10^6/mm^3$ for erythrocyte (Bell, 2002); 7.0 to 13.0 g/dL for haemoglobin (Jain, 1993); 24-43% (Smith, 1988) and 30-33% for hematocrit (Swenson, 1984) and normal range MCHC is 26-35% (Hodges, 1977).

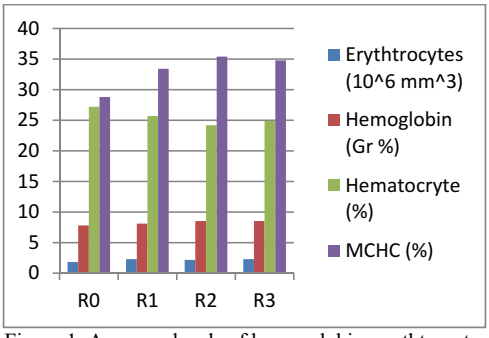

Figure 1. Average levels of haemoglobin, erythtrocytes, hematocyte and MCHC

Statistical analysis showed that the erythrocytes, haemoglobin, hematocrit and MCHC did not differ significantly (P>0.05). This suggests that the provision of rations containing banana peels (0, 10, 20 and 30%) in chickens exposed to heat does not affect the value of erythrocytes, haemoglobin, hematocrit and MCHC.

Erythrocytes, haemoglobin, hematocrit and MCHC are very susceptible to changes in environmental temperature and nutrient levels (Roth, 1970). In hot conditions, chickens will show changes in behaviour, metabolism aimed at maintaining the balance of the milieu interior of physiological and biochemical processes that keep it running. Chicken behaviour of the most prominent is the increase in water consumption, decreased feed consumption, improving the metabolism. In hot temperatures, the cell will be damaged structure and function due to excessive production of free radicals, which in turn will damage the enzyme haemoglobin (especially the sulfhidryl) and membrane lipids. Membrane oxidative damage can lead to intravascular hemolysis or eritrofagositosis and erythrocyte life span is shorter.

Giving a banana skin can maintain relatively normal hematologic level, allegedly contains active compounds, vitamins (A, B, C and E), β - carotene (Kanazawa and Sakakibara, 2000) and phenolic compounds such as catechin, epicatechin, lignin and tannins (Someya et al., 2002) work synergistically. Pantothenic acid, vitamin B2, B12 and folic acid play a role in the formation of erythrocytes. Vitamin B_2 is responsible for the turn folic acid into coenzyme, vitamin B_{12} plays a role in the maturation of erythrocytes (Pilliang and Djojoseobagio, 2006). Vitamin C and E act as antioxidants to protect the membrane from damage by preventing oxidation (peroxide). In addition, vitamin C acts as a reducing agent (antioxidant) in aqueous solutions such as blood and in cell (Gropper et al., 2005).

Red blood cells with normal haemoglobin concentration called normochromic (Nordenson, 2007). Therefore, the role of haemoglobin, erythrocytes in the circulatory system carries oxygen to run properly. Normal, haemoglobin levels indicate the adequacy of oxygenated to circulate throughout the body tissues of chicken is physiologically meaningful in good health. Using banana peels to the level of 30% peel until level 30% were able to maintain normal levels of haemoglobin, erythrocytes, hematocrit and MCHC or in other words no chicken physiological disorder. The content of active compounds from banana peels are prominent tannins (24 ± 0.27 mg/g) and saponin (6.84 mg/g) (Anhwange, 2001) is still below the limit of tolerance, ie 2.6 g/kg ration (Kumar, 2005) and saponin 3.7 g/kg ration (FAO, 2005), so that the hematologic level can be maintained within normal limits.

Ration consumption, nitrogen retention and body weight gain

A growth rate of chicken is a sensitive index of protein quality. Weight gain is comparable to the addition of essential amino acids in the body. Average consumption of ration, nitrogen retention value, and weight gain of broiler finisher phase exposure to heat from each treatment sequence ranges: 2900-3600 g, 74.03

to 82.28%, and 638.00 to 978.00 g presented in Table 4 and to clarify the effect of BP on ration consumption, the value of nitrogen retention and weight gain depicted in Figure 2.

Table 4 shows that the highest ration consumption obtained at R0 treatment and the lowest in R1 treatment. Highest nitrogen retention values obtained in treatment R2 and the lowest in R3 treatment. The highest weight gain on treatment R0 and the lowest in R3 treatment. Ration treatment R2 significantly ($P<0.05$) had the highest nitrogen retention compared to the other two treatments.

Table 4. Feed consumption , nitrogen retention and body weight gain on broiler chickens heat exposed

Treatment	Parameter		
	Feed Consumption	Nitrogen Retension	Body weight gain
	.....(g/e/p).....	.....(%).....	.....(g/e/p).....
R0	3,600 d	75.33	978.00
R1	2,900 a	74.03	799.50
R2	3,300 c	82.28	810.00
R3	3,120 b	75.29	638.25

Description : R0 = 0 % BP; R1 = 10 % BP; R2 = 20 % BP; R3 = 30 % BP
BP = Banana Peel

To clarify the data, Table 4, Figure 2 describe the tendency of the effect of the banana peel in the ration on feed consumption, the value of nitrogen retention and weight gain. It was a decrease in feed consumption and body weight gain by increasing the provision of scene percentage in the ration, while the highest value was shown nitrogen retention ration R2.

Chicken is a homeoterm animal that always maintain body temperature which is relatively constant. Changes in the external environment will affect the function of organs in the body, so that there is always a balance between heat production and heat loss through thermal regulation. Chickens suffering from heat stress showed increased activity of evaporation, the increase in respiratory rate in certain circumstances even look for behavioural changes such as hoops, and in addition an increase in heat dissipation are taken with urine (Hoffman and Walsberg, 1999; Ophir et al., 2002). Behavioural changes such as increased respiratory rate impact on the concentration of electrolytes in the body is the electrolyte flow or expenditures as Na^+ and K^+ from the body (Indriani, 2008), the impact on the balance of electrolytes in the intracellular and extracellular fluid. In this condition, much chicken micronutrient deficiencies in the body and in turn manifested by inefficient use of feed, and growth impairment (Donkoh, 1989; Mashaly et al., 2004).

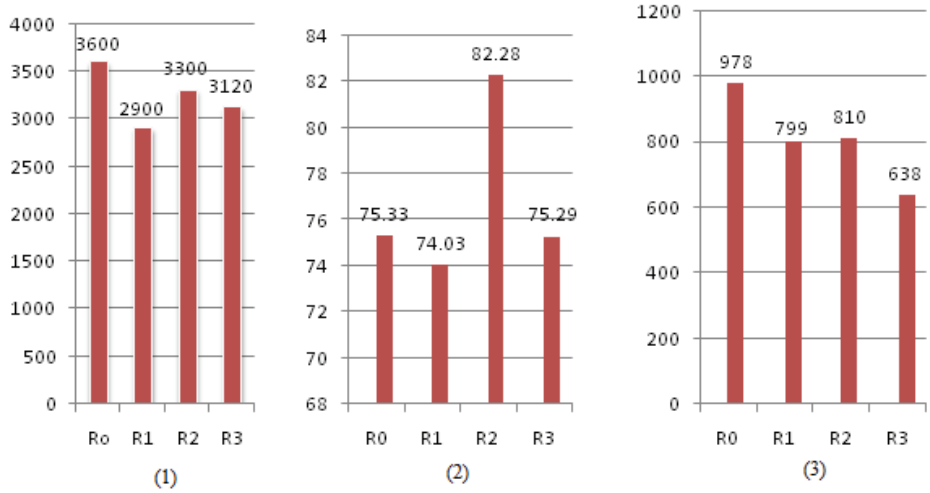

Figure 2. (1) Consumed Ration in Heat Exposed Broiler Chicken
(2) Nitrogen Retention Mean Value of Heat Exposed Broiler Chicken
(3) Weight Gain of Heat Expossed Broiler Chicken

Banana peel has a lot of nutrients, one of which is a high mineral content such as Na and K (Margen, 2002). The use of 20% of banana peel in ration providing the highest nitrogen retention value (82.28%). It gives the sense that is the optimal levels of the mineral needs of Na

and K, when we use 20% banana peels in the ration.

Banana peel can replace lost electrolytes in broiler chickens exposed to heat. This is in line with Borges et al. (2004) which shows that the presence of Na and K minerals play an important role in the absorption of nutrients in the small intestine and increases nitrogen retention (Nor and Yusoff, 2008).

The low body weight gain in the treatment of R1, R2, and R3 caused by the amount of the consumption ration lower than R0 treatment. Total consumption of ration at finisher phase normal circumstances (temperatures at thermoneutral zone) is 4000 g/head (Cheng et al., 1997). Ration consumption in this study is 3600 g/head for the treatment of R0, and other treatments were lower (R1 = 2900 g/head; R2 = 3300 g/head, and R3 = 3120 g/head).

Alleged lack of feed consumption would come on the composition of the ration, the results are reported on a banana peel contains a many macromineral, vitamins and some active compounds such as tannins and cyanide, oxalic acid, phytat (Ahnwange, 2001) and saponins (Tartrakoon, 1999). Tannin content by 24 ± 0.27 mg/g peel bananas and 0:37 ± 6.84 mg saponin/g banana peel, so the ration R1 (10% BP), R2 (20% BP) and R3 (30% BP) sequentially contains tannin 0.69; 1.37 2.05 g/kg and saponin 2.40; 2.48; 7.20 g/kg. Associated with tolerance limit (2.6 g/kg ration (Kumar et al, 2005), third ration were below the limit of tolerance. The content of saponin in rations R3 (30% BP) has a tolerance limit of 0.37 g/kg ration (FAO, 2005) seems to ration R3 already well above the limit of tolerance. Tannins are polyphenolic compounds with high molecular weight and has the ability to bind to the protein. Actually, tannin is a means of protection from animal attacks, bacteria and insects, the attack will soon give rise to a sense of being protected by Sepat, namely the interaction of tannins with salivary proteins (Cheeke, 1989; Widodo, 2000). Transient attacks of microorganisms and insects protected by means turn off the protease enzymes from bacteria and insects in question (Cheeke, 1989), tannins will bind feed protein in the digestive tract making it difficult to digest. While saponin with nature such as soap (foaming) will clean up the materials attached to the intestinal wall and increase the permeability of the intestinal wall (Francis et al., 2002), but also have a negative effect in feed intake that is caused intestinal damage and lack of protein digest. Provision of rations containing 30% BP showed a reduction in feed consumption affecting body weight gain.

CONCLUSIONS

In conclusion, application of banana peel on 20% level to heat exposed chicken can increase nitrogen retention, but it is not follow by body weight gain while haematological parameters for all treatment is remained the same.

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