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THE EFFECT OF FEEDING INTERVALS ON THE LEVEL OF GLUCOSE, TRIGLYCERIDE, PERCENTAGEOF ABDOMINAL FAT AND CARCASS QUALITY ON BROILER CHICKENS

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Abstract

Broiler chicken has advantages in growth rate and conversion ration but these advantages are followed by increase of body fat level. This study was aimed to reduce the increase of body fat level by giving feeding interval treatment on 120 broiler chickens aged 8 days for 28 days. The study was conducted with randomized block design method. The treatment consisted of three feeding intervals (every 6, 8 and 12 hour for a day) and 2 groups of chickens which were maintained separated by sex. Commercial ration that was given contained 23% of protein and 3000 calories of metabolic energies. Observed variables are glucose, triglycerides, ration consumption, conversion ration and abdominal fat content. The result showed that the interval feeding treatment had no significant effect to glucose levels, triglycerides, ration consumption, conversion ratio and abdominal fat but the lowest percentage of carcass quality was achieved by feeding female with 12 hour interval and male 8-hour interval. In conclusion, feeding with 6, 8 and 12 hour interval did not give significant meaning physiologically while the highest percentage of carcass quality is produced in 6 and 8 hour interval for female and 6 and 12 hour interval for male.

Key words: *carcass quality, feeding interval, glucose, triglyceride.*

INTRODUCTION

Broiler chicken has a fast growth rate and good conversion ration (FCR) but along with aging process, these advantages are also followed by increase of body weight. Biologically, the male broiler chicken has greater growth rate and conversion ration (FCR) than the female, meanwhile the female has greater increase of body fat than the male (Amrullah, 2002). In Indonesia, broiler chicken is already harvested in 28-35 days old. Six week old chicken broiler that rearing in tropical area has 2.85 % of live weight (Yuniza, 2002).

One of reasons for the high level fat is the amount of ration consumption especially the energy that got in to chicken body. This energy exceeds the amount that needed for living and production so the exceeded energy will be stored as fat (Bun, 2010). The exceeded energy in broiler chicken will produce chicken carcass with high fat, meanwhile the low consumption of ration will affect the carbohydrate that stored in low glycogen form, (Tilman, et al., 1986). Not effective energy usage in body will be stored in adipose tissue (Junqueira, et al., 1986). Chicken's fat usually can be found in form of tissue in abdominal cavity, subcutaneous and abdominal fat (Klasing, 2000). Abdominal fat tissue is one of body parts that have highest potency of fat than any other parts. High level of abdominal fat will decrease the carcass percentage

Meanwhile the condition which is obtained from field shows that high level of fat on broiler chicken tends to decrease consumer's preference who wants good quality and low fat chicken carcass. One of solutions that can be used to solve that problem is by managing the feeding interval. Ration that been given in appropriate amount according to the ability of intestine to digest and absorb nutrient and also satisfy the needs for living and production will avoid excessive fat synthesis. This research's objective is to find the optimal feeding interval management in order to restrain excessive fat synthesis on chicken for a good quality chicken carcass.

MATERIALS AND METHODS

The research was done by using Block Randomize Design which the chicken sex was defined as the block. There were three treatment of

feeding intervals consist of 12, 8 and 6 hours of feeding interval. Each treatment was repeated four times. The research used 120 broiler chickens with Cobb 500 strain. Each of the chicken is 160 gram weight. Half of the chicken (60 chickens) is male while the other half is female. Ration that had been used was commercial ration with nutrient content showed in Table 1.

Table 1. Composition nutrient in ration

Nutrient	Ration (*)	Needs on Broiler Chicken (**)
Water (%)	8.66	
Crude Protein (%)	23	Min 18
Metabolic Energy (kkl/kg)	3000	Min 2900
Crude Fat (%)	6.79	Max 8
Crude Fiber (%)	6.49	Max 6
Ash (%)	4.95	Max 8
Calsium (%)	0.77	0.9 - 1.2
Phosphor (%)	0.39	0.6 - 1.0

Source : (*) Comercial Ration Label
(**) SNI 01-3931-2006 (Standard National of Indonesia)

Data were collected from 20% of samples. Recorded parameters are glucose level, triglycerides in blood, ration consumption, body weight, carcass quality and abdominal fat. The glucose level and triglycerides were measured with Trinder-GPO Enzymatic method. Body weight was measured at the end of the research while the ration consumption was measured cumulatively during the research. Abdominal fat was fat that was obtained from abdominal cavity and between internal organs. Evaluation of carcass quality was done by FDA USA standard (1998).

1. Determining Glucose Level on Plasma

Glucose level on blood can be determined by Glucose Oxidase-Phenol Amino Phenozone (GOD-PAP) method by Schmid (1971).

$$\text{Glucose Level (mg/dl)} = \frac{\text{Abs.Test}}{Abs.Std} \text{ x standard level}$$

2. Triglycerides Level on Blood

Triglycerides level on blood can be measured by GOP (Calorimetric Enzymatic Test using Glycerol-3-Phosphateoxidase). The analysis was done by using spectrophotometer.

$$\text{Triglycerides Level on Blood} = \frac{\text{Abs.Test}}{Abs.Std} \text{ x standard level}$$

RESULTS AND DISCUSSIONS

Glucose Level

Glucose is an important carbohydrate that is absorbed in large quantities and is converted in the liver (Mayes, 1999). Glucose plays an important role in the body as precursor energy, especially in the process of glycogen synthesis, fatty acid synthesis, amino acids, vitamin C and some metabolite (Klasing, 2000).

Table 2. Average Of Glucose, Triglyceride, Abdominal Fat and Ration consumption

Parameters	Male			Female		
	12 Hours	8 Hours	6 Hours	12 Hours	8 Hours	6 Hours
Glucose (mg/dL)	266.25 ± 10.21	251.27 ± 15.06	242.25 ± 24.28	232.00 ± 16.06	255.50 ± 12.89	242.25 ± 24.48
Triglycerides (mg/dL)	76.33 ± 28.43	85.67 ± 43.73	118.33 ± 14.19	184.67 ± 47.00	127.00 ± 46.94	118.33 ± 14.19
Abdominal Fat (%)	1.49	1.55	1.32	2.24	2.18	2.3
Ration Consumption	2501.5	2497.8	2502.7	2498.15	2508.65	2493.1

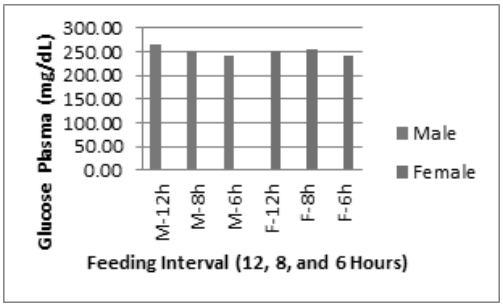

Figure 1. Average of glucose levels on Feeding interval chickens got 12.8 and 6 hours

The result of experiment can be seen in Figure 1. Male s have a range of averaging the lowest glucose levels 242.25 ± 24.28 mg / dL and the highest 266.25 ± 10.21 mg / dL, while the hen, the lowest value of 242.25 ± 24.28 mg / dL. and the highest 255.50 ± 13.89. Mean blood glucose levels in chickens tan jan 5-6% above the normal average, whereas in the range female showed a relatively normal glucose levels, which is 180-250 mg / 100 ml of blood (Hazelwood, 1986). Chickens have glucose levels that are much higher compared to mammals (Klasing, 2000).

The Chicken got feeding intervals 12, 8 and 6 hours showed a statistically not significant different (P> 0.05). Properties associated with the consumption of chicken rations, chickens will stop eating once their energy needs met (Wahyu, 1997). In this observation chickens fed with intervals and the amount of certain foods so that the chicken was forced to stop eating even though energy has not been fulfilled. Chicken with an interval of 12 hours would consume more numerous than interval 8

and 6 hours, but the difference in the amount of the consumption ration at each feeding interval had no impact on glucose levels.

Ration energy sources comes mostly from carbohydrates, which in turn will result in simpler molecules digest (glucose). High and low amount of consumption will be correlated with glucose levels, but in fact feeding interval had no impact on glucose levels. It is suspected that the chickens have a mechanism in regulating glucose homeostasis related to eating habits.In the chickens,more than a third of glucose or 37% absorb during a meal is converted to lactic in the wall intestine (Klasing, 2000, Riesenfeld et al, 1982, Reisenfeld 1985, Sturkie, 2000) before transfer into the blood circulation. Glucose will be cleared from the circulation (diclearence) by the difference between the concentration gradient in the cells of the gut and circulation.

At mealtimes lasted more than one third of the glucose or 37% or is converted to lactic acid through anaerobic gut wall epithelium (Klasing, 2000, Riesenfeld et al, 1982, Reisenfeld 1985, Sturkie, 1986) before transfer into the circulation. Glucose will be cleared from the circulation (diclearence) by the difference between the concentration gradient in the cells of the gut and circulation. Therefore happened entry into the mucosal cells. This process may explain the low level of glucose relative to mucosal glucose uptake, in addition to the conversion of glucose flux into the intestine and intestinal lactate flux sole reliance on glucose uptake of glucose turnover (Riesenfeld et al, 1982).

These circumstances reinforce a statement by Klasing (2000), although the amount of the gift rations, feeding frequency or different dietary levels but still maintained a certain extent. Production of lactate produced will be carried through the circulation to the heart and serve as the primary precursor for syntesis glucose, glycogen and fatty acids.

Triglyceride levels

Triglycerides are esterglicerol with three fatty acids that can be found in the blood circulation and an energy savings that will be used when the body lacks energy. Triglycerides come from rations and de novo process results in the body (Poedjiadi, 1994).

In Table 3 served average triglyceride levels in male s ranged from 76.33 ± 28.43-118.33 ± 14.19 mg / dL while the female have a higher average is 118.33 ± 14:19 ± 47.00-184.67 mg / dL.

Table 3. Percentage of carcass quality, meat and breast conformation in broiler chickens fed different feeding intervals

Sex	Feeding Interval (Hours)	Carcass Quality (%)		Meat and Fat Weight (gr)	Meat and Fat Percentage From Carcass (%)	Abdominal conformation (cm)	
		Grade A	Grade B			Length	Width
Male	12	100	-	864.5	70.88	17	16
	8	50	50	799.75	72.23	16	15.8
	6	100	-	864.5	70.88	17	16.25
Female	12	75	25	799.75	74.26	14.5	15.25
	8	100	-	868.75	74.26	14.33	15.33
	6	100	-	864.5	74.53	15.75	16.25

Average levels of triglyceride in male with 12 hour feeding intervals tend to be lower compared with other treatments, while the female actually feeding intervals 12 hours showed the highest triglyceride levels compared with the other two treatments. Figure 2 clarify average triglyceride levels of each treatment. On the male looks trend triglyceride levels increased with decreasing feeding interval, while in females decreased triglyceride levels in line with the decline in feeding interval

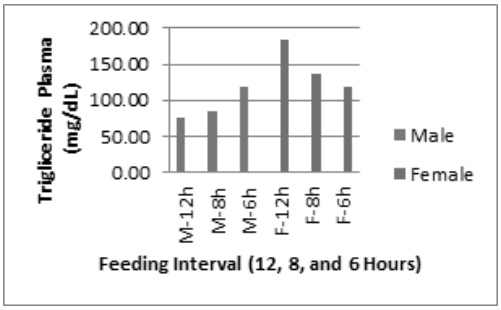

Figure 2. Average of triglyceride plasma in male and female chickens

The results of statistical analysis showed that the feeding interval, triglyceride levels did not differ significantly (P> 0.05) in chickens male or female.

The difference in feeding interval 12, 8 and 6 hours, or intervals of feeding analogy as fast, so it will change the pattern of feed intake.

In the fasted state, the metabolic processes to keep running. Broiler chicken has a high level of growth, therefore requires some energy to

supply metabolic processes. In this case, the converted savings energy due to decreased glucose availability, the liver glycogen is converted into glucose through glycogenolysis to maintain blood glucose levels and in turn through gluconeogenesis.

In order to homeostasis, decreased glucose concentration between the two feeding times will result in a decrease in circulating of insulin that will increase the glucagon hormone. With reduced use of glucose in adipose tissue and decreasing the inhibitory effects of insulin on lipolysis, fat (triglycerides) will be mobilized as free fatty acids and glycerol (Mayes, 1999), which would then be converted into energy the glucose precursors.

The dynamics of change and the synthesis of triglycerides in male and female chickens are experiencing feeding interval 12.8 and 6 hours is quite high. Shortly after feeding, a lipid that is consumed will hydrolysed into triglycerides and also some that do not oxidize glucose to be converted into triglycerides.

Therefore, there was high levels of triglyceride in the blood cirulation.It will be increased far beyond normal levels of triglyceride. So also when the two feeding time, a number of triglyceride hydrolyzed when reserves of glycogen are not sufficient.

Abdominal Fat Percentage

Average percentage of abdominal fat are presented in Table 3 male s have average from 1.32 to 1.55%, while the hen has a range of 2.18 to 3.24%. Abdominal fat percentage range of observations is lower than the proposed Summer and Lessons (2005). Abdominal Fat Percentage male and female chickens ranged respectively 3.2-2.6; 3.2-3.4%. Therefore in this case, feeding interval tends to lower of percentage of abdominal fat. The results of the statistical analysis showed feeding intervals giving 12.8 and 6 hours on a male or female chickens had no effect on levels of abdominal fat ($P > 0.05$). Fat is the body's energy savings, which are synthesized from an excess of energy that is not oxidized, especially in granivora poultry such as chickens, using carbohydrates in rations, especially glucose to fatty acid synthesis.

In this observation, the amount of abdominal fat percentage is a reflection of the deposit triglycerides in adipose tissue, particularly in the abdominal cavity. Feeding and 6-hour interval 12.8 shows the percentage of abdominal fat were not different. One of the alleged, was not different abdominal fat, it is closely related to the amount of feed intake. In the Table 3 the Average consumption ration spent during the observations ranged from 2497.8-2502.7 and 2493.1 g in males-2503.65gr for a hen. Nutritional and metabolic energy of the ration is the same, containing 23% protein and EM 3000 kkcal / kg. Rations were given according to the needs of broiler chickens by SNI 01-3930-2006, (2006). Another factor that also has a strong contribution is gender. Male s. have a high metabolic activity so that the lower energy savings, while the female have a tendency mendesposisikan fat due to low activity (Sturkie, 1986).

Carcass Quality

Carcass quality assessed based on the USDA (1998) standard criteria include fatty, meat and body conformation. Display broiler carcass quality of each treatment are presented in Table 3. In this the observation, grade A male obtained from treatment of feeding intervals of 12 and 6 hours, respectively at 100%, while the 8 hour feeding intervals resulted in 50% grade A and 50% grade B. Treated female feeding intervals 8 and 6 hours produced 100% grade A, while the 12-hour interval feeding treatment produces 75% grade A and 25% grade B.

Judging from meat and fatty, apparently male-and female including good quality or grade A.

The low quality of the carcass at 8 hour intervals feeding in males and 12 hour in females allegedly instead of meat and fat considering the average percentage meat above 70%, in accordance with the opinion Murtidjo (1987) chicken carcasses ranged from 65-75% of the live weight. Weight of meat between 50-70% of the carcass weight or approximately 40% of the live weight.

Body conformation assessment covering the sternum, back and both legs and wings (USDA, 1998), the observations showed that all samples belong to the quality of A, while the observations are focused on assessing conformation by comparing the length and width of the chest (Table 3).

Male and female chickens fed different feeding intervals (12.8 and 6 hours) showed a compact conformation. Sternum has a normal conformation, the curved one-eighth inch (Afifah, 2009). Alleged loss of quality or Grade B, male chicken with feeding intervals of 8 hours and females at feeding intervals of 12 hours, apparently not because meat and fatty or conformation of the body (chest), but from the look. Carcass looked more pale, the pale colors of carcass subcutaneous fatty allegedly uneven, or low levels of fat under the skin, subcutaneous fatty function in carotenoids absorption, especially xanthophylls (North, 1978, and Maynard et al 1979).

CONCLUSIONS

Feeding with 6, 8 and 12 hour interval did not give significant meaning physiologically while the highest percentage of carcass quality is produced in 6 and 8 hour interval for female and 6 and 12 hour interval for male.

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