EFFECTS OF TEMPERATURE AND ENERGY-PROTEIN RATION ON THE PERFORMANCE OF BROILER CHICKEN

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ABSTRACT

A study was conducted to investigate the effects of temperatures and energy-protein rations on performance of broiler chicken 3-6 weeks old. Three hundred twenty four 3 weeks old male Issavedet with the initial body weight of 574 ± 5.86 g was housed in close house with pad and fan cooling system. The chicken was divided into three groups and each group was replicated 3 times as a one unit experiment. Each unit (1x1x0,6m) with litter floor system was consist of 12 chicks. Two factors of treatments are zone temperature and energy-protein ratio. Factor one were zone I (20-27°C), zone II (23-30°C) and zone III (26-33°C). Factor two were P1 (2900 kcal/kg and 20% CP), P2 (3100 kcal/kg and 21% CP) and P3 (3300 kcal/kg and 22% CP). The parameters were feed consumption (FC), body weight gain (BWG), feed conversion ratio (FCR), Carcass presentation (CCP) and abdominal fat contain (AFC). The data was analyzed with the ANOVA and if there is significant different between treatment, the analysis was continued by multiple range test of Duncan. The result was suggested that zone temperature and energy-protein ratio has effected to all parameters significantly ($P<.05$). However, it was no correlation between zone temperature and energy-protein ration on the performance of broiler chicken. This experiment can be concluded that pad and cooling system house has three different zone temperatures and it should be have different energy-protein ratio.

Key words : Temperature, Energy protein ratio, Broiler chicken performance

INTRODUCTION

The broiler chickens in Indonesia are almost using open house system. The open-house system cannot raise the optimal production, because the temperature in the house always follows environment condition around 30-35°C. The optimal temperature for maximal broiler production was 19-21°C (Rasyaf, 1994).

The higher environment temperature in Indonesia should be solved by new technology in the house construction, feed and feeding system. There are known that feed consumption of the chicks were depended on the support of the growth of the chicks,

So, in this experiment was used a close house with pad and cooling system, which pad-cooling was set at one part of the short side of the wall and exhaust fan was set on the opposite side. The cool air was flow through a long of house and come out to exhaust fan.

In the preliminary study was founded that house with pad-cooling system have three different zones temperature, i.e. zone I (20-27°C) area around pad-cooling, zone II (23-30°C) area near The broiler chicken in Indonesia are almost using open house system. The exhaust fan and zone III (26-33°C) area between zone I and zone II. The (E-P) ratio also tested in this experiment to know the effect of temperature on the deference (E-P) ratio. This study was important to get the optimum growth of broiler chick. The (E-P) ratio was P1 = 145 (20% CP., 2900 kcal ME/kg); P2 = 147,6 (21% CP., 3100 kcal ME/kg) and P3 = 150 (22% CP., 3300 kcal/kg.ME).

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We hope this experiment can be give description and correction to using close house with pad and cooling system. The other hand, it was could be new information according to the E-P ratio needed broiler chicken reared in close house with pad and cooling system.

Therefore the present study was conducted to clarify the effect of zone temperature and E-P ratio on performance of broiler chickens.

MATERIALS AND METHODS

Animal

One day old broiler chicks were supplied by a commercial hatchery (Anwar Sierad Corporation Ltd, Jakarta, Indonesia). They were housed in litter floor system with gas brooders and were provided water and a commercial starter diet *ad libitum* for the first 3 weeks. On last of week 3, the 324 birds of similar body weight (573,87 ± 5,58) were selected and grouped into three groups.

Experimental diet and feeding

The experimental birds were housed in litter floor system (height 0.6 x width 1 x depth 1 m), and there were three replications per treatment. The birds were provided *ad libitum* by treatment diet as shown in Table 1.

During the experimental period (from 3 to 6 weeks of age), all of chicks were conducted in pad-cooling system house with a 14 h light - 10 h dark cycle. Temperatures of the house were 20-27°C, 23-30°C and 26-33°C in this experiment.

Parameter

The parameters were feed consumption (FC), Body weight gain (BWG), Feed conversion ratio (FCR), carcass presentation (CCP) and abdominal fat presentation (AFP). Body weights were determined every three days. At the end of experimental period, the birds were killed by slaughtered at jugulars vein. The carcass and abdominal fat content was divided and weighed.

Statistical Analysis

Data were analyzed using analysis of Variance (ANOVA) with the Duncan's multiple range test of means options (Srigandono, 1989).

RESULTS AND DISCUSSION

Feed consumption (FC), body weight gains (BWG) and feed conversion ratio (FCR) are shown in Table 2. FC, BWG and FCR were significantly ($P<.05$) effected

Table 1. Ingredient and Composition of Treatment Diet

Ingredient	Treatment		
	P1	P2	P3
Concentrate K_2O_4 (kg)	43.0	47.0	51.0
Grounded Yellow Corn (kg)	23.0	30.0	37.0
Rice brand (kg)	34.0	23.0	12.0
Analysis *:			
Crude Protein (%)	19.92	20.94	22.43
Fat (%)	9.97	9.15	7.33
Crude Fiber (%)	9.74	10.30	8.10
Ash (%)	22.01	24.14	20.81
P (%)	0.47	0.40	0.40
Ca (%)	2.47	2.60	5.24
Metabolize Energy (kcal/kg)**	2891	3096	3300

* Analyzed by Laboratory of Nutrition, Institute of Agriculture Bogor.
**Calculated analysis.

by temperature. Also, E-P ratio was significantly (P<.05) effected to FC, BWG and FCR. But, between temperature and E-P ratio have no correlation on FC, BWG and FCR.

This study was conducted to clarify the effects of temperature and E-P ratio on performance of broiler chickens. In the present experiment, FC, BWG and FCR were significantly (P<.05) influenced by temperature and E-P ratio. But, there is no correlation between temperature and E-P ratio to the parameters. Table 2 was shown that FC decreased by increasing temperature. The different in FC between T1 with T2 and T3 was caused by convertible temperature. Temperature in T1 is more close to ideal temperature for broiler chickens as well documented (Soeharsono, 1976; North and Bell, 1990; Ensminger 1994).

The deferent in FC by E-P ratio it was do to the energy consumption. Wahju (1992) North and Bell (1990) and Daghir (1995) reported that increase energy in the diet was decreased feed consumption as well as the decrease energy in the diet was increase feed consumption. But, the protein level of the diet was not effected feed consumption (Card and Nesheim, 1972 and Soeharsono, 1976).

Table 2 shown that BWG was influenced by temperature and E-P ratio, however it was no correlation between temperature and E-P ratio. The increase in temperature was decreased BWG significantly (P<.05). But, increasing E-P ratio was supported BWG significantly. This result was exhibited that T1 (20-26°C) has the higher BWG compared the other treatment. It's also was suggested that increasing protein and energy level also was elevated growth. This result was similar with the report of Soeharsono (1976), Williamson and Payne (1978), North and Bell (1990) and Mahfudz, *et al.* (1996).

Feed conversion ratio (FCR) was influenced significantly (P<.05) by temperature and E-P ratio. Increasing temperature was increasing FCR, but on the opposite manner increasing E-P ratio was decreased FCR. This result was suggested that broiler chicken more efficient on low temperature than higher. It's also was exhibited than higher protein and energy more support the growth of chickens, as well documented (Soeharsono, 1976; Ensminger 1990; Mahfudz, *et al.* 1996).

Carcass presentation (CCP) and abdominal fat presentation (AFP) were shown in Table 2. The temperature and E-P ratio influenced CCP and AFP significantly, but it was no correlation between temperature and E-P ratio on CCP and AFP.

The carcass presentation was effected significantly (P<.05) by temperature and E-P ratio. Increasing temperature was decreased CCP, but increasing E-P ratio was increasing CCP. This result is consistent with the result was reported by Soeharsono (1976) that CCP was higher when broiler chicken was reared in temperature 19-26°C than 25-32°C. The higher CCP by increasing E-P ratio in was do to more efficient of protein metabolism. The increasing protein content following by increase of energy metabolize was resulted in supporting growth of the chicken as well documented (Jull, 1972; Ensminger 1990; North and Bell, 1990).

Table 2. Effects of Temperature and E-P Ratio on Feed Consumption, Body Weight Gain and Feed Conversion Ratio of Broiler Chicken

Parameters	T1			T2			T3		
	P1	P2	P3	P1	P2	P3	P1	P2	P3
FC	3278 ^{a}	3203 ^{b}	3142 ^{b}	3209 ^{a}	3114 ^{b}	3088 ^{b}	3197 ^{a}	3094 ^{b}	3093 ^{b}
BWG	1045 ^{a}	1066 ^{a}	1186 ^{b}	1008 ^{a}	1022 ^{a}	1081 ^{b}	978 ^{a}	987 ^{a}	1042 ^{b}
FCR	3.14 ^{a}	3.01 ^{b}	2.65 ^{c}	3.18 ^{a}	3.05 ^{ab}	2.86 ^{b}	3.27 ^{a}	3.13 ^{ab}	2.93 ^{b}

* FC=Feed consumption; BWG=Body weight gain; FCR=Feed conversion ratio.

** Results are the men SD, and the mean bearing different letters are significantly different (P<.05).

Table 3. Effect of Temperature and E-P ratio on Carcass Presentation and Abdominal Fat Presentation of Broiler Chicken

Parameters	T1			T2			T3		
	P1	P2	P3	P1	P2	P3	P1	P2	P3
CCP	70.9[a]	71.6[a]	73.9[b]	68.2[a]	68.3[a]	70.8[b]	66.8[a]	68.2[b]	69.7[b]
AFP	0.46[a]	0.55[a]	0.62[b]	0.64[a]	0.71[a]	0.92[b]	0.72[a]	0.95[b]	0.98[b]

* CCP = Carcass presentation; AFP = Abdominal fat presentation

** Results are the men SD, and the mean bearing different letters are significantly different (P<.05).

Abdominal fat presentation was significantly effected by temperature and E-P ratio. Increasing temperature was increasing significantly (P<.05) AFP. It is do to metabolize stress of the chicken, and manifested to deposition of abdominal fat. This result in accordance to the report of Soeharsono (1976), Daghir (1995) and Mahfudz, *et al.* (1996) that broiler chicken was reared in hot climate more fatty than in intermediate or low temperature. Increasing E-P ratio was elevated significantly AFP in these experiments as well documented by Anggorodi (1985).

CONCLUSION

1. Close house with pad and cooling system have three zone temperature
2. Zone temperature and E-P ratio was significantly affected to all parameters
3. There are correlation between temperature and E-P ratio on all parameters
4. The combination of T1 and P3 (20-26°C and 22% CP+3300 kcal/kg) has resulted the better performance.

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