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The Effect of Environmental Temperature on Weight Gain, Feed Intake and Broiler House Revenue

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Abstract: The objective of this study was to determine the effect of two temperature regimens on the body weight gain, feed intake and revenue. This information is needed to select most profitable conditions for broiler production. The experiment began when the chicks were 21 days old and fed during the 21 days of experiment. The experiment consisted of male and female birds per temperature, repeated 12 times with 2 broilers per replicate. Room temperatures were set at 21±2 and 30±2°C by controlling two air conditioners (White Westinghouse). Birds were weighed and for each cage 2 male and 2 female birds were placed (50×50×50 cm). The data were analyzed statistically and shows that temperature has significant ($p<0.001$) effect on body weight gain, feed intake and revenue. Temperature have depressed body weight gain, feed intake and revenue. Revenue loss experienced male×female, male and female were 4.23, 2.3 and 6.2%, respectively.

Key words: Temeprture, weight, feed in take, revenue, profitability

INTRODUCTION

The considerable growth in the poultry meat industry is the result of technological breakthroughs in breeding, feeding and health and sizeable investments from the private sector. It is well documented that the poultry sector is highly prone to production and market risks which periodically affect the profitability of broiler production particularly on the small farms (Ramaswami *et al*., 2005). In order to minimize the risks to the producers and sustain the profitability of the industry, some large poultry began integrating their activities with that of broiler production through the institution of contract farming.

In a poultry contract, hatcheries provide day old chick and feed and medicines to contract growers. The contract growers supply land, labor and other variable inputs (like electricity). At the end of the production cycle, the farmer receives a payment for live broilers grown and an incentives for better than average feed:gain. Feed represents the major cost of broiler production, constituting up to 70% of the total cost (Ravindran, 2012). Thus, the feed required for a gram of gain is one of the most important factors in broiler production. It is well documented that the temperature to which broiler is exposed will affect performance. High environmental temperatures reduce feed intake, weight gain and feed conservation (Cowan and Michie, 1978; Cheng *et al*., 1997; Cooper and Washburn, 1998; May and Lott, 2001).

It has been reported that the optimum temperatures for growth and feed:gain sometimes differ for male and female broilers (Hurwitz *et al*., 1980).

Though, few studies have investigated the interrelationship between temperature and growth and fed intake. To the researchers knowledge, the impact of temperature on broiler house profitability through body weight gain, feed intake has not been well defined.

MATERIALS AND METHODS

A total of 96 Ross broiler chicks (48 male and 48 female) were used for the experiment. They were subjected to continuous light from day old to the end of the experiment (42 days of age).

The experiment began when the chicks were 21 days old and fed during the 21 days of experiment. All birds were wing tagged and placed into cages in two rooms (48 birds per room). Room temperatures were set at 21±2 and 30±2°C by controlling two air conditioners (White Westinghouse). Birds were weighed and for each cage 2 male and 2 female birds were placed (50×50×50 cm). The cage weights were adjusted by replacing individual birds to provide pen weights within 1 SD of pen weights for both sexes. The experiment consisted of male and female birds per temperature, repeated 12 times with two broilers per replicate. The ingredients used and the calculated nutrient content of the diet formulations used in this study are shown in Table 1.

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One feed trough and one water nipple were located at the front of each cage and all birds were fed *ad libitum*. Each day, the birds were allocated enough feed (1000 g) to exceed the expected daily food intake for broilers of this age and strain. Daily feed intake and body weight were measured gravimetrically every 24 h and recorded for each replicate during the 21 days of experimental period. The replicate-base of total and average feed intake and body weight gain were calculated. In profitability analysis all replicate-base results (overall) were used.

All replicate-base results (weekly and overall) were analysed statistically by analysis of variance using the GLM procedure of the SAS Program with temperature, sex and interaction between them as sources of variation.

Table 1: Ingredients and chemical composition of broiler diet (21-42 days)

Compositions	Diet (g kg^{-1})
Ingredient	
Corn	565.30
Soybean meal	344.60
Limestone	14.00
Maize oil	58.30
Dicalcium phosphate	11.40
NaCl	3.30
Vit./Min. Premix[1]	2.50
DL-Methionine	0.60
Calculated nutrient composition[2] (%)	
Crude protein	20.00
Calcium	0.90
Available phosphorus	0.35
Sodium	0.15
Lysine	1.12
Methionine	0.38
Methionine+cystine	0.72
Threonine	0.79
Tryptophan	0.24
AME (kcal kg^{-1})	3.20

[1]The composition of vitamins and minerals in the premix provided the following amounts per kilogram of diet: Vit. A: 15000 IU; Vit. D_3: 2500 IU; Vit. E: 40 mg; Vit. K_3: 5 mg; Vit. B_1: 3 mg; Vit. B_2: 7 mg; Vit. B_6: 5 mg; Vit. B_{12}: 0.02 mg; Pantotenic acid: 10 mg; Niasin: 40 mg; Folic acid: 1 mg; Biotin: 0.07 mg; Mn: 80 mg; Fe: 60 mg; Zn: 60 mg; Cu: 5 mg; Co: 0.2 mg; Se: 0.15 mg; Cholin cloride: 300 mg ; [2]Based on NRC in 1994

RESULTS AND DISCUSSION

Based on the statistical analysis, temperature significantly ($p<0.001$) depressed weight gain and feed intake during the 21-42 days. Results for weight gain and feed intake for broilers are presented in Table 2. The impact of different temperature regime have resulted revenue differences. It can be seen from Table 2, weight gain and feed intake both are higher in 30°C than that of 20°C. There is 4.23% revenue differences between 20 and 30°C. Results show that temperature has considerable impact on profitability of broiler house.

Based on statistical analysis temperature significantly ($p<0.001$) depressed both body weight gain, feed intake for male and female broilers. Body weight gain, feed intake and revenue for male broilers are given in Table 3. Body weight gain and feed intake are depressed with higher temperature. Depressed gain and feed intake resulted loss in revenue of 2.3%.

Body weight gain, feed intake and revenue for female broilers are given in Table 4. Body weight gain and feed

Table 2: Effect of temperature regime on body weight gain, feed intake and revenue gain

	21-42 days		21-42 days		
Temperature (°C)	Body gain (g)	Feed intake (g)	Revenue gain* ($) (1)	Feed intake expenses* ($) (2)	Revenue differences (1-2)
20	1673.00	2915.00	3,965.000	1,894.000	2,071.000
30	1590.00	2741.00	3,768.000	1,781.000	1,987.000
Differences from temperature	83.00	174.00	0.197	0.113	0.084
Differences (%) from temperature	5.22	6.35	5.230	6.340	4.230

Table 3: The effects of temperature regime on body weight gain, feed intake and revenue gain by male broilers

	21-42 days		21-42 days		
Temperature (°C)	Body gain (g)	Feed intake (g)	Revenue gain* ($) (1)	Feed intake expenses* ($) (2)	Revenue differences (1-2)
20	1780.00	3090.00	4,218.00	2,010.00	2,21.00
30	1706.00	2903.00	4,043.00	1,880.00	2,16.00
Differences	74.00	187.00	175.00	0.13	0.05
Differences (%)	4.34	6.44	4.33	6.91	2.31

Table 4: The effects of temperature regime on body weight gain, feed intake and revenue gain by female broilers

	21-42 days		21-42 days		
Temperature (°C)	Body gain (g)	Feed intake (g)	Revenue gain* ($) (1)	Feed intake expenses* ($) (2)	Revenue differences (1-2)
20	1566.00	2740.00	3,711.000	1,781.000	1,930.000
30	1474.00	2578.00	3,493.000	1,676.000	1,817.000
Differences	92.00	162.00	0.218	0.105	0.113
Differences (%)	6.24	6.28	6.240	6.260	6.200

*Feed cost: 0.65 $ kg^{-1}; broiler price: 2.37 $ kg^{-1}

intake are depressed with higher temperature. Data shows that the revenue loss is 6.2% which have considerable impact on broiler house profitability.

CONCLUSION

It can be said that there is negative impact of temperature regime on gain, feed intake and revenue. Revenue loss due to temperature significantly higher in female broiler than that of male broiler.

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