

Effect of Four Dietary Lysine Concentration on Body Weight Gain of Broiler Breeders (29-50 weeks of age) Kept at Four Different Temperatures

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ABSTRACT

Broiler breeders have a much greater body weight in relation to their egg output; also they are restrictedly fed in commercial practice. These differences with egg laying strains could result in significant differences in response. The specific objectives of the experiment were first to examine and explain the effects of four different ambient temperatures 21, 26, 29 and 32°C on the response of the breeders body weight gain. Second, to examine their response of four dietary lysine concentrations (35, 50, 65 and 90 g/kg crude protein). Third, to examine whether there were temperature x lysine concentration interaction in the responses of broiler breeders. 224 (308 Ross Breeder) at 29 week old hens were randomly allocated to 16 identical pens within eight controlled rooms. Two male birds were chosen at random and also placed in each pen. Single wheat based, lysine deficient diet that contained 151 g/kg CP was formulated. The body weight change of each pen of birds was recorded at the end of each period and expressed as g/bird day. A split-plot design was used in which four main plots (rooms). Throughout the experiment the allocated amounts of feed were always eaten. Male body weight gain was decreased linearly ($P < 0.001$) by increasing temperature, but not ($P > 0.05$) for female body weight gain. There were no significant differences ($P > 0.05$) between the different lysine concentration levels in body weight gain, similarly there were no consistent ($P > 0.05$) temperature x lysine concentration interactions.

Keywords: Broiler Breeders, Lysine, Temperature, Weight Gain

INTRODUCTION

Kuwait has high chicken meat consumption (97.5 kg/person/year) (Paul and Alsaffar, 2014). Although Kuwait is still among the leading importers of chicken meat, there has been a recent trend to increase national production. In the past five years, chicken meat production in the region has increased by 35% compared to the overall world chicken meat production increase of 18.5% (CSB, 2016). Management of broiler breeder flocks in Kuwait has some major problems: First, although cereals can be produced in the region, a large proportion of protein concentrates must be imported to be included in the feeds. Proteins and particularly limiting amino acids therefore have a relatively high unit price. Second, there are very high ambient temperatures in many of the main poultry producing areas of the region that must be overcome and understood to enable efficient breeder production. Broiler breeder flocks in Kuwait usually undertaken in controlled environment buildings. These buildings will incorporate cooling equipment but still optimum environmental temperatures cannot always be maintained (Paul and Alsaffar, 2014). The laying birds will need to endure high ambient temperatures during daylight hours for large parts of the year. Broiler breeder producers need information to be able to predict and understand the effects on the birds of these high temperatures in order to be able to evaluate the economic efficiency of further investments in

new sites or in further investment in cooling equipment for existing sites. This experiment was conducted to determine the effects of four different ambient temperatures 21, 26, 29 and 32°C on the response of the breeders body weight gain. Second, to examine their response of four dietary lysine concentrations (35, 50, 65 and 90 g/kg crude protein). Third, to examine whether there were temperature x lysine concentration interaction in the responses of broiler breeders.

There is a lack of information of laying broiler breeders response to ambient temperature and to a limiting dietary amino acid. In addition, there is a lack of information as to whether these responses are interact with ambient temperature.

MATERIALS AND METHODS

Diets and Measurements. A single lysine deficient diet that contained 151 g/kg crude protein (Table1) was formulated based on wheat. The concentration of all amino acids and nutrients met or exceeded the requirements of the broiler breeder hens according to National Research Council (NRC 1994) and Ross Breeders Limited (1998). Three further dietary levels of lysine concentration were achieved by adding L-lysine-HCl to the deficient diet, to give four concentrations of lysine (35, 50, 65 and 90 g/kg crude protein). All experimental diets were stored at the same environmental conditions. A daily feed restriction programme was followed, 150 g/day bird, then a reduction of 2.5 g feed/ bird 28 days period (Ross Breeders Limited, 1998).

Laboratory Analysis. a lysine deficient diet sample was collected for amino acid analysis. The samples were treated with 6M hydrochloric acid in sealed bottles at 110°C for 22 hours in order to hydrolyse the protein chains. For the analysis of cystine and methionine, the samples were oxidised with performic acid at 2-8°C for 16 hours prior to acid hydrolysis. The resulting hydrolysate was diluted and filtered. An aliquot was then adjusted to pH 2.2, and a known quantity of norleucine was added as an internal standard before making up to volume (AOAC, 1990).

Birds and Housing. 224 Ross (308 Broiler Breeder) 29 weeks old hens (Ross Breeder Ltd., Newbridge, Midlothian, Scotland) were placed equally arranged and randomly in 16 identical pens within eight room environmentally control facilities. Two male birds randomly were also placed in each pen. Each pen was equipped with two galvanized metal nest boxes with an alighting bar. Additionally one cup drinker allowed *ad libitum* access to water and two single feeders. The daily lighting programme hours was kept at 14 hours of artificial illumination to the end of all the experiment with a mean light intensity of 60 lux. A thermohygrograph computer programme continuously recorded temperature and humidity. The body weight change of each pen of birds was recorded at the end of each period and expressed as g/bird day.

Temperatures. There were four different temperatures used in the experiment (21, 26, 29 and 32°C). Each room was randomized for temperature at the beginning of each period. After the completion of each 28 days period, the whole temperature treatments were immediately changed for three days to 21°C and 73%RH. On the fourth day if necessary, a gradual daily change in temperature was made so that the ambient temperature applied in the next period could be reached.

Statistical analysis. A split-plot design was used in which four main plots (rooms) were kept at four constant temperatures each for a 28 day period. The temperature of the room was then changed to another constant experimental temperature decided upon in a latin-square design. Within each main plot, four sub-plots (pens) were each fed the four different diets each for a 28 day period. Data were compared by analysis of variance of the measured

and calculated variables, using a split-plot design that examined the effects of temperature (main-plot) and the effect of diet and the lysine x temperature interactions within the sub-plot (*GenStat* statistical package, 2016). For both the temperature and lysine treatments, the treatment sums of squares was partitioned into their linear and non-linear (quadratic) effects.

RESULTS AND DISCUSSION

Throughout the experiment the allocated amounts of feed were always eaten. The mean mortality during the experiment was 2.3% (6 birds in total), which was not associated with particular treatments. The lysine concentrations in the four experimental feeds were checked and they contained the correct concentrations of lysine. Similarly, the concentrations of all other amino acids were present in the correct amounts.

Average weight gain of birds (female and males) during the 21 weeks experimental period of 29 to 50 weeks age, on the four temperature and four feeding treatments have been summarized in Table 2. Male body weight gain was decreased linearly ($P < 0.001$) by increasing temperature, but not ($P > 0.05$) for female body weight gain. There were no significant differences ($P > 0.05$) between the different lysine concentration levels in body weight gain variables. There were no consistent ($P > 0.05$) temperature x lysine concentration interactions.

Ambient temperature (heat stress) is one of the most important environmental challenging poultry production worldwide (Lucas and Marcos, 2013). The negative effects of heat stress on poultry chickens range from reduced growth and egg production to decreased poultry and egg quality and welfare (Pradeepta *et al*, 2015).

The objectives of this experiment were to examine the effects of four different ambient temperatures 21, 26, 29 and 32°C on the response of the breeders body weight gain. Second, to examine their response of four dietary lysine concentrations (35, 50, 65 and 90 g/kg crude protein). Third, to examine whether there were temperature x lysine concentration interaction in the responses of broiler breeders. There was no statistical evidence of a temperature x lysine concentration interaction in any of the body weight gain measured variable.

CONCLUSIONS

This study has given clear effects of different ambient temperatures on the body weight gain of broiler breeders. Although increasing dietary lysine increased female weight gain.

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