RESPONSE OF HEAT STRESSED BROILERS TO VARIATION IN THE FREQUENCY OF POTASSIUM CHLORIDE SUPPLEMENTATION

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Story in Brief

Broiler chickens were reared under cycling temperature conditions (80 F to 98 F) and supplemented with potassium chloride in the drinking water. Treatments evaluated were potassium chloride supplemented continuously, during the hot 12 hours of the ambient temperature cycle, during the cool 12 hours, and for the last 3 days of the 21-day trial. No treatment difference for feed consumption was observed. Birds continuously supplied with potassium chloride gained more weight than unsupplemented birds.

(Key words: Potassium Chloride, Frequency, Gain)

Introduction

The necessity for including potassium in the diets of chicks has long been demonstrated. Hutson (1978) observed that the mean blood potassium concentration of chickens kept at 86 F was lower than that of chickens kept at 46.4 F, while Deetz and Ringrose (1976) observed urinary potassium output to be greater in birds held at 100 F than those kept at 80 F.

A potassium requirement for protein synthesis has been demonstrated in the cell-free system of the mammaliam liver and in the E. Coli. It has been demonstrated that potassium deficient chicks incorporated significantly less leucine into skeletal muscle protein than non-deficient controls. Experiments performed on potassium-and/or protein-deficient rats to elucidate the relationship between potassium and protein metabolism, indicated that poor growth resulting from protein deficiency, is in part, related to protein metabolism.

The improved weight gain observed in potassium supplemented birds may be due to any one, or a combination of factors. Two of these are increased tissue synthesis and increased water retention. The addition of potassium salts to the drinking water results in increased water consumption which could be reflected in increased body weight.

The objective of this experiment was to determine if the frequency and duration of potassium chloride administration would affect weight gain response of heat stressed broilers.

Materials and Methods

Four hundred and eighty Arbor Acre X Vantress broiler chickens were weighed and randomly assigned to treatments within an environental chamber at four weeks of age.

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Six chicks (3 males, 3 females) were housed in each wire floored grower battery compartment and the compartments randomly assigned to treatment groups to provide 16 replicates per treatment. Feed (Table 1) and water were continously available while the temperature within the chamber was allowed to cycle between 80 F and 98 F over a 24-hour period. The chamber temperature was below 92 F for a total of twelve hours and this was considered to be the cool part of the cycle, while the remaining twelve hours above 92 F was classified as the hot part of the cycle. Experimental treatments in which potassium chloride was added to the water are shown in Table 2.

Feed and water consumption were monitored throughout the 21 day trial. At the end of the experimental period after an overnight fast, birds were processed and carcass values determined.

Results and Discussion

Broiler chickens receiving potassium chloride continously for the duration of the 21-day study, gained significantly more weight ($P<.01$) than unsupplemented birds or birds receiving potassium chloride for 12 hours only (Table 3). The birds that were supplemented for the last 3 days only gained more weight ($P<.05$) than unsupplemented birds or those

Table 1. Composition of basal diet.

Ingredient	%
Ground corn	56.8
Soybean Meal	36.0
Fat	3.0
Dical. Phosphate	2.35
Calcium Carbonate	.90
Salt	.50
Vitamin Mix	.25
Trace Mineral	.10
DL-Methionine	.10
Total	100.00

Table 2. Experimental Treatments.

Treatment	Description
1	No potassium supplementation
2	.24% K as potassium chloride continuously
3	.24% K as potassium chloride last 3 days
4	.24% K as potassium chloride hot 12 hours
5	.24% K as potassium chloride cool 12 hours

Table 3. Body weight gain and feed efficiency of birds supplemented with potassium chloride.

Treatment No.	Gain per Day (g)		Gain/Feed
	21 Days	Last 3 Days	
1	43.7^{b}	38.4^{b}	.43
2	46.7^{a}	42.2^{ab}	.43
3	45.4^{ab}	44.1^{a}	.43
4	44.6^{bc}	40.2^{ab}	.41
5	43.2^{c}	39.4^{b}	.45

^{abc}Means in columns with unlike superscripts differ ($P<.05$).

that were supplemented during the cool 12 hours only. There was no treatment difference in feed consumption (Table 4), while water consumption tended to be greater when birds consumed potassium chloride. The addition of potassium to the drinking water did not impact carcass fat of carcass protein content, nor was meat yield influenced (Table 5).

The data indicates that heat stressed birds receiving supplemental potassium chloride continously will gain more weight than unsupplemented birds, and that periodic supplemention will only result in limited response

Table 4. Feed and water consumption of heat stressed birds supplemented with potassium chloride in the water.

Treatment No.	Daily Feed Intake (g)	Daily Water Intake	
		12 Days	Last 3 Days
1	103.2	251.6	251.2
2	105.3	340.6	360.1
3	104.0	254.4	341.6
4	105.6	310.9	330.2
5	101.4	260.1	285.5

Table 5. Carcass characteristics of heat stressed birds supplemented with potassium chloride.

Treatment No.	Fat (%)	Protein (%)	Percent Dress
1	13.5	17.9	67.1
2	13.4	17.9	66.9
3	14.0	17.8	66.6
4	13.6	17.9	66.6
5	14.1	17.8	67.0

Literature Cited

Deetz, L. E., and R. G. Ringrose. 1976. Effects of heat stress on the potassium requirement of the hen. Poultry Sci. 55:1765.

Huston, T. M. 1978. The effect of environmental temperature on plasma potassium concentration in the blood of the domestic fowl. Poultry Sci. 57:54