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ISSN NO: 978-34777-2-2

CONTRIBUTORY ROLE OF ANIMAL PRODUCTION IN NATIONAL DEVELOPMENT

ASAN

Proceedings of 7th Annual Conference of Animal Science Association of Nigeria
September 16th - 19th, 2002.
University of Agriculture, Abeokuta.

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ISSN 978-34777-2-2

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Published by
The Animal Science Association of Nigeria

Printed by
GOAD Educational Publishers,
2,Igbein Street, Abeokuta. 0803-7179120

Copies of the Proceedings can be purchased from:
The National Secretariat, Animal Science Association of Nigeria (ASAN)
36, Suru Street, Off Akilo Road, Ijaye-Ogba, Lagos.
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Performance Characteristics of Broilers Fed Varying Levels of Salt

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Introduction

Experimental evidence on the amount of salt required by chicks varies considerably [Ososanya and Omojola, (1988). Salt, a compound containing sodium and chloride ions bound together by ionic bond, functions in various ways. Nesheim et al (1979) reported that sodium and chloride ions are the principal inorganic ions of the body fluids. Also, sodium ion is found chiefly in fluids outside cells such as blood, lymph and intracellular fluids. Also it was reported that sodium is important in maintaining acid-base and fluid balance of body tissues (Epple and Stetson, 1980). Likewise chlorine is a constituent of hydrochloric acid secreted by the proventriculus. Ganong (1983) reported that sodium helps in the transportation of nerve impulses. The transport is made possible by adenosine diphosphate, which is activated by sodium, and potassium ions to form sodium-potassium activated adenosine triphosphate. In addition, sodium is an important element needed in the function of the electrogenic pump. In animals, the maintenance of normal cell volume and pressure depends on Na^+ and k^+ pumping. In the absence of such pumping, Cl^- and Na^+ would enter the cells causing the cells to swell until the pressure inside the cell balances the influx. However, this does not occur because the osmolality of the cells remains the same as that of their interstitial fluids because Na^+ and k^+ are actively transported (Maynard and Loosli, 1975; Hall, 1980). Therefore,

Common salt requirement for poultry is primarily a requirement for sodium rather than chlorine. It is used in the ration as an appetizer as well as a nutrient in order to stimulate the secretion of saliva and promote the action of certain enzymes. The purpose of this study was to assess the performance of broilers when fed different levels of salt in their rations observing the following parameters; body weight gain (WG), feed intake (FI), moisture content of droppings (MCD) and feed conversion efficiency (FCE).

Materials and Methods

Presented in Table 1 is the composition of the five diets formulated for the study. Diet 1 served as a control [0 % salt] with the remaining four diets containing graded levels of salt at 0.5, 1.0, 1.5 and 2.0 %. One hundred and fifty day old White Hybro broiler chicks with approximately the same average initial live weights were randomly divided into ten groups, each group containing fifteen birds. Two groups were assigned to each of the five experimental diets in a complete randomized design. The broiler chicks were weighed initially before they were subjected to experimental treatments and were subsequently weighed at the end of each week for a feeding trial of ten weeks. Weekly feed intakes were also observed for the determination of the feed conversion efficiency. The moisture content of the faecal droppings was determined at the fifth and tenth weeks. Four birds were randomly selected from each diet and transferred to metabolic cages. The droppings were collected for five days after three days of adjustment. Droppings collected were weighed, oven dried at 105 °c for 24 hours. The oven-dried droppings were cooled in desiccators and subsequently reweighed. The chicks were vaccinated by intra-ocular administration against Newcastle disease on the first week and vaccinated against infectious bursal disease by oral administration on the third week. The broiler chicks were fed *ad libitum* and given fresh water twice daily. All observed data were subjected to analysis of variance [Steel and Torrie, 1960]. Where means were significantly different, they were separated with Duncan's Multiple Range Test [Duncan, 1955].

Results and Discussion

The performance characteristics of broiler chicks fed various levels of salt are presented in Table 2. The average feed consumption per week per bird showed a progressive increase as the level of salt in the diets increased. However the differences in means were not significant. This is in contrast to the findings of Quigley and Waite (1932) who ascribed a reduced growth rate to the non-palatability of diets and depression in feed consumption as the level of salt increased. Means observed for weight gain per week indicated a linear increase from 0 % to 1.5 % salt inclusion, then a decline at 2.0 %. From this observation it appears that the optimum body weight gain is obtainable from a diet containing 1.5 % salt, while the diet containing 1.0 % compared favourably. These observations are in agreement with those of Halpin, Holmes and Hert (1936), in contrast to the optimal level of 1.0 % reported by Barlow, et al (1948). A linear increase in the moisture content of the droppings of the experimental birds was also observed as the level of salt in the diet increased. This was probably due to the concomitant increase in fluid intake as the level of salt in the diets increased. This illustrated the attempt of the birds to maintain isotonicity of the body fluid. The observation is in agreement with those of Halpin et al (1936) and Kare and Beily (1948), who reported that the water intake per gram of feed consumed increased progressively with an increase in the level of salt in broilers' diets. Forbes (1962) also stated that raising salt levels increased water intake and the moisture content of droppings. The result of the FCE for the experimental diets suggested a better performance on a diet containing 1.0 % salt. Birds on diet containing 0.5 % compared favourably. This is in agreement with the result obtained by Bearse and Berg (1946), and Partrick and Schaible (1980).

Conclusion

From results observed, the inclusion into broiler chicks' diets salt at 0.5 % to 1.5 % did not appear to elicit negative effects on the utilization of nutrients to weight gain. Levels of salt inclusions outside this range suggested depressions in growth rate. Putting the economics of litter management into consideration, this study suggests the optimum level of salt inclusion into broilers' rations to be 1.0 %.

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Table 1 Composition of Experimental Diets

Ingredients	Dietary Salt				
	1 [0 %]	2 [0.5 %]	3 [1.0 %]	4 [1.5 %]	5 [2.0 %]
Maize	55.0	54.5	54.0	53.5	53.0
Groundnut cake	25.0	25.0	25.0	25.0	25.0
Soyabean meal	7.0	7.0	7.0	7.0	7.0
Fish meal	2.0	2.0	2.0	2.0	2.0
Brewer's Dry Grain	5.0	5.0	5.0	5.0	5.0
Di-calcium Phosphate	1.0	1.0	1.0	1.0	1.0
Bone meal	2.0	2.0	2.0	2.0	2.0
Vit. Min. Premix	1.0	1.0	1.0	1.0	1.0
Salt	0.0	0.5	1.0	1.5	2.0
Total	100.0	100.0	100.0	100.0	100.0
Calculated CP	20.23	20.30	20.25	20.20	20.15

Table 2. Performance characteristics of broiler chicks fed various levels of salt

Parameters	Dietary treatments [Means ± S.E]					Level of Significance
	1[0 %]	2[0.5 %]	3[1.0 %]	4[1.5%]	5[2.0%]	
Av. FI/Week (g)	412.85	463.67	500.59	543.59	563.33	
	±67.83	±62.39	±60.13	±77.23	±88.03	ns
Av. WG/Week (g)	82.35^a	127.35^b	137.20^b	143.35^b	123.65^b	
	±15.67	±26.00	±26.25	±32.33	±23.50	P<0.05
Moisture content	68.15^a	69.00^b	69.7^b	72.10^c	77.00^d	
of droppings (%)	±0.15	±0.00	±0.20	±0.10	±0.20	P<0.05
FCE (Feed/Gain)	4.28^a	3.09^b	3.06^b	3.35^c	3.63^d	
	±0.26	±0.14	±0.08	±0.10	±0.04	P<0.05

ns= not significant; S.E.= standard error

a, b, c, d = means within the same row with different superscript are significantly different