

EFFECT OF SUPPLEMENTAL ASCORBIC ACID AND DISTURBANCE STRESS ON THE PERFORMANCE OF BROILER CHICKENS

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ABSTRACT

The study was conducted with four hundred day-old Anak broilers to determine the effects of dietary Ascorbic acid (AA) and disturbance (D) stress on the performance of broiler chickens in a tropical environment. There were four treatments consisting of two levels of disturbance (ID) and (4D) and two levels of dietary AA (0 and 250mgAA/kg feed). Each treatment was replicated four times with 25 chicks per replicate. The starter and finisher diets were formulated to be isonitrogenous and isocaloric.

Results showed that there were no significant interactions between dietary ascorbic acid supplementation and disturbance stress levels on any of the performance data considered. The disturbance stress had no significant effects on most of the measured parameters. However, there was a 35% increase in mortality rate as disturbance stress level increased from ID to 4D.

The dietary ascorbic acid supplementation level had no significant effect on feed intake and weight gain. Feed conversion ratios were significantly improved with AA supplementation during the starter phase only. Dietary AA supplementation also had a 90% reduction in mortality of chicks compared with the unsupplemented group. Likewise AA inclusion in diets had a feed cost advantage.

It may be concluded that disturbance induced stress increased mortality and lowered performance. However these effects were relieved by dietary AA supplementation.

Key words: Disturbance, Ascorbic Acid, Broiler Performance.

INTRODUCTION

Ascorbic acid (AA) has been characterised as a non-essential component of poultry diet (Garrick and Hauge, 1925) as it can be intrinsically synthesized by the bird in a normal condition

(Chatterjee *et al.*, 1975). It therefore follows that fowls do not require any exogenous supplementation of this vitamin.

Several reports (Perek and Kendler, 1963, Pardue and Thaxton, 1986; Njoku and Nwazota, 1989) have indicated the value of supplemental ascorbic acid in chicken production during periods of stress. Brake (1989) also postulated a shift in nutrient portioning from non-essential functions to essential functions during stress.

One of the major problems associated with most poultry farms in the third world countries is the frequent entry of personnel into poultry houses during manual feeding, watering, vaccination etc. This has been assumed to constitute stress factor which may result best in sub-clinical debilitation of the birds and may probably reduce the resistance to infection. Consequently, the efficiency of performance of the birds may be compromised.

In an attempt to evaluate the effect of some routine management stress factors on production, this study was undertaken to determine the effect of stresses caused by frequent entries into poultry houses, and to determine if ascorbic acid will reduce the effects of stress due to the management stressors.

MATERIALS AND METHODS

Four hundred day-old Anak broiler chicks (mixed sex) obtained from Kaduna Hatchery were used. Twenty-five chicks were randomly selected, group-weighted and assigned to each of 16 pens. The chicks were reared on deep - litter floor in an open sided, wire screened poultry house located on Ahmadu Bello University Farm. The open - sided portions were covered with polythene sheets to conserve heat for the first four weeks.

The basal, non-Ascorbic acid (-AA) diet consisted of a practical maize - groundnut cake, containing 21.5% crude protein and 288 Kcal of ME/Kg,

TABLE 1: COMPOSITION AND CALCULATED ANALYSIS OF BASAL DIETS.

INGREDIENTS	COMPOSITION	
	BROILER STARTER	BROILER FINISHER
Maize	51.00	54.00
Rice Offal	3.40	3.00
Groundnut Cake	41.00	38.00
Fish meal	-	0.50
Bone meal	2.50	2.00
Dicalcium Phosphate	-	1.00
Limestone	1.00	0.50
Lysine	0.20	0.20
Methionine	0.20	0.20
Vitamin-Mineral Premix ¹	0.30	0.25
Salt	0.30	0.25
Monensin	0.10	0.10
Total	100.00	100.00
Calculated nutrient levels		
Crude Protein (%)	21.5	20.9
Metabolisable energy Kcal/kg	2823	2889
Calcium (Ca)	1.18	1.06
Phosphorus (P Total %)	0.74	0.92
Phosphorus (Available %)	0.52	0.64

1. The Vitamin-mineral premix supplied per Kg diet: 1500i.u. Vitamin A, 3000 i.u. Vit. D₃, 48mg Vit. E, 3mg Vit. K₃, 2.4mg Vit. B₁, 7.2mg Vit. B₂, 42mg Nicotinic acid, 12mg Calcium D-Pantothenate, 0.2mg Vitamin B₆, 0.03mg Vit. B₁₂, 1.2mg Folic acid, 0.06mg Biotin, 360mg choline chloride, 48mg Zn Bacitracin, 120mg Mn, 60mg Fe, 1.86mg I, 0.27mg Co and 0.12mg Se₂.

20.9% crude protein and 2889Kcal ME/Kg for the broiler starter and finisher diets respectively. The ration composition and calculated analyses of nutrient are presented in Table 1.

A 2x2 factorial arrangement was employed with the main effects being ascorbic acid (AA) supplementation and disturbance (D). AA was added to the basal ration at levels of 0 or 250mg/Kg and was fed for the duration of the study. The AA was chemically modified to retard oxidation (L - ascorbic acid, coated, Hoffmann - La Roche, NJ). At day-old, chicks in the first half of the pens (8) were exposed to four entry (4D) with hovering of the feeders over them to mimic any stress associated with disturbance during feeding, the other half (8) pens were exposed to one entry (1D) per day followed by hovering of the feeder over them too. Within these fed diets containing 0(-AA) or 250mg (+AA) ascorbic acid per Kg diet disturbance levels, half of the pens (4) were randomly selected and

Feed and water were supplied *ad libitum*. The birds and feed were weighed fortnightly, mortality was also monitored daily. The collected data were subjected to analysis of variance and

where appropriate, differences between treatments were partitioned by Duncan's multiple-Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

The effects of supplemental ascorbic acid and disturbance stress on the performance of broiler chickens are summarized in Table 2.

There were no significant ($P > 0.05$) interactions between ascorbic acid supplemental levels and disturbance stress levels on any of the performance parameters measured.

Disturbance stress level also had no significant effect on feed intake, weight gain and feed conversion ratio. There was however a 35.2% increase in mortality as disturbance stress increased from 1D to 4D.

Level of ascorbic acid supplementation had no significant effect ($P > 0.05$) on feed intake and weight gain, but it significantly ($P < 0.05$) affected feed conversion ratio during the starter phase (0 - 4wk). Feed conversion ratio of birds fed the 250mg/kg supplemental ascorbic acid

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TABLE 2: EFFECT OF ASCORBIC ACID SUPPLEMENTATION AND DISTURBANCE ON PERFORMANCE OF BROILER CHICKENS.

Variable	Level of Disturbance (D)	Level of Ascorbic acid added (Mg Kg ⁻¹ feed)							
		0-4 weeks				5-8 weeks			
		0	250	Mean	SE ²	0	250	Mean	SE ²
Av. initial weight (g)	1D	35.31	35.30	35.31					
	4D	35.29	35.30	35.30					
	Mean	35.30	35.30		0.32				
Av. Wt gain (g/bird/day)	1D	21.94	23.86	22.90		39.78	41.98	40.88	
	4D	20.85	23.78	22.32		36.92	38.91	37.92	
	Mean	21.40	23.82		1.06	38.35	40.45		150
Av. daily feed intake (g/bird/day)	1D	51.76	47.93	49.84		110.76	108.20	109.48	
	4D	50.68	49.22	49.95		106.02	105.25	105.63	
	Mean	51.22	48.58		2.04	108.39	106.72		3.32
feed/gain ratio	1D	2.36	2.01	2.19		2.78	2.59	2.69	
	4D	2.43	2.07	2.25		2.86	2.72	2.79	
	Mean	2.40	2.04		0.11	2.82	2.66		0.13
Feed cost (N/Kg gain) ²	1D	5.67	4.93	5.30		6.67	6.34	6.51	
	4D	5.86	5.07	5.47		6.89	6.66	6.78	
	Mean	5.77	5.00		0.25	6.78	6.50		0.32
Mortality (%), 0-8 wks	1D	3.10	1.50	2.30					
	4D	4.00	2.21	3.11					
	Mean	3.55	1.86						

¹ SE - Standard error

² Feed cost as at 1995

was significantly (P<0.05) superior to that of the unsupplemented group during the starter phase (0 - 4wks) only but no significant difference was observed during the 5-8 week period although the same trend was maintained.

Ascorbic acid supplementation also had considerable influence on mortality of chicks. There was, on the average, a 90.9% reduction in mortality of chicks by supplementing the feed with 250mg ascorbic acid kg of diet compared with the unsupplemented group. Earlier reports (Jalaludin and Loon, 1974 and Kafri and Cherry, 1984) had shown improved weight gain with diets supplemented with ascorbic acid for broilers raised at 32°C. Although there was no significant improvement of weight gain by ascorbic acid supplementation in the present study, the superior feed conversion ratio at 0 - 4 weeks and significant reduction in mortality due to ascorbic acid supplementation shows that the birds also exhibited a positive response to

ascorbic acid supplementation. Several reports of improvement in feed conversion efficiency following AA supplementation have also been made by Fah (1978), Alisheihov (1980), Njoku and Nwazota (1989) and Njoku *et al.*, (1990).

It is plausible to postulate that since mortality of chicks increased by 35.2% as disturbance stress increased from 1D to 4D and since the ambient temperature was as high as 32°C, the positive response to ascorbic acid supplementation by way of significant reduction in mortality was a response to both disturbance stress and temperature stress.

The feed cost analysis showed that as disturbance level increased from 1D to 4D, feed cost per kg of weight gain increased by N0.17 at 0 - 4 weeks and by N0.27 at 5-8 weeks of age. On the other hand, supplementing the diet with 250mg AA per Kg of diet reduced the cost per Kg of weight gain by N0.77 at 0-4 weeks of age and by N0.28 at 5 -8 weeks of age compared to the unsupplemented group.

We concluded that disturbance stress increased

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mortality of chicks by as much as 35% while there was a positive response to 250mg/kg ascorbic acid supplementation by way of improved feed conversion ratio at 0-4 weeks of age and over 90% reduction in mortality when compared to the unsupplemented group. As ambient temperatures where high (up to 32°C) we postulate that the supplemented ascorbic acid was beneficial in relieving not only the disturbance stress but also the temperature stress.

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