APRW -36

Influence of Nutritional Stressors on Day Old Chicks Development in the Hot Humid Tropical Environment of Southeastern Nigeria

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Abstract

A study was carried out to investigate the effects of delayed feed and water startment periods on the performance of broiler chicks. In the study, 90 day old Marshall R broiler chicks were weighed and randomly divided into five groups (A, B, C, D and E) of 18 chicks each. Each group was further replicated three times with six chicks per replicate in a completely randomized design and weighed. Feed and water were denied all the groups except the control group 'A'. On the day of hatch chicks from group 'A' were weighed and sacrificed. The GIT (crop, proventriculus, gizzard, small and large intestine) and the yolk sac were weighed. The same procedure was adopted for all the groups at 24, 48, 72 and 96 hours respectively. All the weight recordings GIT sections were expressed as percentages of the respective body weight of the chicks. Body weight values of the control birds was significantly higher ($p<0.05$) than the values for the other groups. Body weight decreased as food and water startment period were delayed further, with group B values being significantly higher than groups D and E values ($p<0.05$). The control birds recorded 12.4 g GIT weight, which was significantly ($p<0.05$) higher than values recorded for the other treatment groups. Group B value was significantly higher than C, D and E, while group C value was significantly higher than group E value ($p<0.05$). The early denial of feed and water affected negatively the weight and development of the GIT of broiler chicks. Delays beyond 48 hours resulted in various levels of mortality.

Keywords: Day old chicks, stressors, gastro intestinal tracts, yolk sac

Introduction

The delays occasioned by hatchery management practices, transportation and delivery of day old chicks (DOCs) may result in chicks arriving at the farm many hours post hatch. The result is often DOCs that are denied access to feed and water for several hours after hatch in hot humid tropical conditions. The detriment of the starvation and stress on the chicks will usually be proportional to the hours wasted before feed and water are served.

It has long been thought that the day old chicks may be partially protected from starvation stress by the presence of energy and water reserves in the yolk sac (Freeman *et al*., 1984). Modern broiler breeds are associated with high metabolic rate and rapid utilization of yolk reserves is evident (Bigot *et al.*, 2003). In accordance with this, Gayra *et al*. (2001), who worked with Ross breed of day old broiler chicks recorded a decrease of 33 grams in weight on the 6th day compared to the control after 48 hours of starvation. Apart from feed denial, dehydration has also been indicted as one of the major nutritional stressors in day old chicks (Xin and Lee, 1997). However, these stressor effects may also be influenced by the climatic conditions. Specifically, since Okoli *et al.* (2005) highlighted poor chick quality and high mortality rates of chicks as major constraints to poultry keeping in Imo state. It is possible that the hot humid tropical climate of southeastern Nigeria may be exaggerating the effects of these stressors beyond that reported in literature.

The objective of this study is to determine influence of nutritional stressors on day old chick's development in the hot humid tropical environment of southeastern Nigeria.

Materials and Methods

The experiment was conducted using 90 day old chick Marshal Strain sourced from a local hatchery in Owerri. There is usually a time lag occasioned by recording, sales and distribution of these hatched chicks to the accredited wholesalers, who would re-sale or commence the onward transportation of the chicks to their farms. These hatchery practices usually last up to five hours or more depending on the volume of chicks hatched and number of attendants at the hatchery.

The experimental chicks therefore arrived the experimental site in two chick boxes at about 10 am in the morning after twenty minutes drive from the hatchery in a well-ventilated car and chick boxes. They were

thereafter certified clinically healthy and their initial weights were determined and recorded with an electronic weighing balance.

The 90 broiler day old chicks were randomly divided into five groups (A, B, C, D and E) of 18 chicks each. Each group was further replicated three times with six chicks per replicate in a Completely Randomized Design (CRD). Thereafter, their individual weights were measured with an electronic weighing balance and recorded. Group A served as the control. The chicks were housed in a room divided into 15 compartments with wire mesh to accommodate the 15 replicates. No feed and water were supplied to all the groups except the control group, which were given a commercial broiler starter ration (Vital Feed(R), 21% crude proteins, 8.5% fats, 1.2% calcium, 0.45% available phosphorus and 2800 kcal/kg metabolizable energy) and water *ad libitum*.

At approximately 24 hours after hatch, chicks from group 'A' were weighed again and sacrificed, and yolk sac and the gastro intestinal tract (GIT) carefully separated from the carcass using a surgical blade. The weight of the yolk sac was determined with an electronic balance. The GIT was dissected out from the crop to the rectum and the weight determined. Thereafter, the GIT was sectioned into crop, proventriculus, gizzard, duodenum, ileum, large intestine and caecum and each segment weighed separately and their respective weights recorded. For the control chicks, care was taken to remove the feed materials in the gastro intestinal tracts before weighing. The same procedure was adopted for the rest of the groups (B, C and D) at 48, 72 and 96 hours respectively. All the weight were thereafter expressed as percentages of the respective body weight of the chicks.

Data generated from the experiment were analyzed using the analysis of variance (ANOVA). Significant means were compared using Duncan's New Multiple Range Test (DNMRT) as outlined by Steel and Torrie (1980).

Result and Discussions

The effects of delayed feed and water startment periods on the body weight, GIT and yolk sac weights of broiler chicks were shown in table 1.Body weight values of the control birds (50.35 g) was significantly higher ($p<0.05$) than the values reported for the other groups. The body weight decreased as food and water startment period were delayed further, with 24 hours (group B) values being significantly higher than groups D (72 hours) and E (96 hours) values ($p<0.05$).

Table 1: Effects of delays in feed and water startment periods on body weight, yolk sac and intestinal weights of broiler chicks (g)

Parameters	Control A	24 hours delay (B)	48hours delay (C)	72hours Delay (D)	96hours Delay
Body weight	50.35±3.34^{a}	36.84±0.75^{b}	33.17±1.02^{bc}	32.14±0.76^{cd}	28.30±0.86^{d}
GIT weight	12.41±0.91^{a}	8.12±0.20^{b}	6.79±0.21^{c}	6.38±0.27^{cd}	5.33±0.29^{d}
Yolk sac wt	1.08±0,21^{b}	1.92± 0.25^{a}	0.07±0.01^{b}	0.96±0.24^{b}	0.42±0.11^{c}

^{abcd} Means with different superscripts along the rows are significantly different ($p<0.05$)

The group C value was also significantly higher than groups D value ($p<0.05$). This agrees with earlier report of El-Hussein *et al*. (2008.) that delayed access to feed for 1-2 days impairs post hatch growth, overall growth and ultimate meat yield and may result in mortality of the chicks. The trends in GIT weight values across the different treatments were similar to that of body weight values (Table 1). The control birds recorded significantly ($p<0.05$) higher than values than the other treatment groups. Again, group B value was significantly higher than C, D and E, while group C value was significantly higher than group E value ($p<0.05$). These results show that the body weight loss in the treatment birds is accounted mostly by GIT weight loss. There is however the need to fully determine the sections of the GIT responsible for this weight loss.

The yolk sac weights also shown in table 1 highlighted significant treatment effects, with the group B recording significantly ($p<0.05$) higher value than the other groups. The control, C and D values were statistically similar ($p>0.05$), while group D returned statistically the lowest value. Yolk is utilized more rapidly in fed than in fasted chicks. This follows that the fed chicks should have the lowest weight of the sac, which this work could only confirm within the first 24 hours of life (Noy and Sklan, 1998).

The effects of delayed feed and water startment periods on the weights of the different sections of the GIT of the chicks are shown in table 2.The control chicks recorded significantly heavier GIT parts ($p<0.05$) than the other groups (Table 2) probably due to digestive activities and stimulation in size and weight by feed particles. Group E on the other hand recorded significantly lower values of crop, proventriculus and large

intestine but similar gizzard and small intestine values (p>0.05).Generally, weight of all GIT segments decreased with increasing delay in feed and water startment.

Table 2Effects of delays in feed and water startment periods on the weights of different segments of the GIT of broiler chicks

Parameters (g)	Control (Fresh DOC)	24hr Delay (B)	48hrs Delay (C)	72hrs Delay (D)	96hrs Delay (E)
Crop	0.70 ± 0.04^{a}	0.38 ± 0.04^{b}	0.36 ± 0.02^{b}	0.29 ± 0.03^{bc}	0.26 ± 0.02^{c}
Proventriculus	0.68 ± 0.05^{a}	0.61 ± 0.12^{ab}	0.44 ± 0.03^{bc}	0.38 ± 0.02^{c}	0.29 ± 0.02^{c}
Gizzard	4.66 ± 0.48^{a}	2.44 ± 0.07^{b}	2.38 ± 0.09^{b}	2.25 ± 0.12^{b}	2.07 ± 0.12^{b}
Small Intestine	3.34 ± 0.36^{a}	1.94 ± 0.16^{b}	1.71 ± 0.05^{b}	1.63 ± 0.07^{b}	1.83 ± 0.35^{b}
Large Intestine	1.91 ± 0.20^{a}	1.02 ± 0.08^{b}	0.83 ± 0.03^{bc}	0.81 ± 0.04^{bc}	0.74 ± 0.04^{c}

^{abcd} Means with different superscripts along the rows are significantly different (p<0.05)

These result indicate that effects of delayed feed and water startment were least pronounced on the gizzard at 24 hours and on the proventriculus at 48 hours, while at 96 hours all the sections were uniformly affected. This tissue depletion has been variously reported by Geyra *et al.* (2001). Appropriate feed and water treatment, results in the GIT weight increasing more rapidly in relation to the body weight and other organs and tissues in both chicken and turkey (Noy and Sklan, 1998). In this study, the weight of the small intestine in the control group increased remarkably when compared to those of the starved groups. Earlier reports by Geyra *et al*. (2001) showed that delayed access to external feed arrests the development of the small intestinal mucosal layer, resulting in decreased villi length, crypts size, crypts per villi, entero-crypts migration routes, and mucin dynamics, which may affect absorptive and protective functions of the small intestine (Yamuchi *et al.,* 2001).

Table 3 showed the results of GIT and yolk sac weights. By the 96th hour, the values of all parameters with the exception of the yolk sac became significantly higher than their 24 hours value (p<0.05). The 72 and 96 hours yolk sac weights became significantly lower than the 24 hours value (p<0.05). This is in agreement with earlier reports by (Noy and Sklan, 1998) that the yolk is utilized more rapidly in fed chicks. Similarly, Abroud and Alrayes (2009) reported that birds fed 6 hours after hatch showed superior yolk sac absorption over those fed 24 to 48 hours post hatch. The present result is in agreement with the earlier report (Yadav *et al.,* 2010) that in the days following hatch, the proventriculus, gizzard and the small intestine weight increased more rapidly than the body weight.

Table 3: Effects of early feed and water startment on the various parameters of broiler chick's body and GIT weights

Parameters (g)	24 hours	48hours	72 hours	96 hours	SEM
Body weight of DOC	42.06^{b}	43.83^{b}	47.66^{b}	67.83^{a}	5.9445
GIT per DOC weight	9.16^{b}	10.96^{b}	12.73^{ab}	16.76^{a}	1.6250
Weight of yolk sac	2.10^{a}	1.06^{ab}	0.66^{b}	0.43^{b}	0.3695
Weight of the crop	0.53^{b}	0.63^{ab}	0.76^{ab}	0.83^{a}	0.0668
Weight of Proventriculus	0.56^{b}	0.61^{b}	0.70^{ab}	0.86^{a}	0.0658
Weight of the gizzard	2.60^{b}	4.0^{ab}	5.63^{a}	6.40^{a}	0.8489
Weight of small intestine	2.06^{b}	2.93^{b}	3.16^{b}	5.20^{a}	0.6644
Weight of the large intestine	1.13^{b}	1.83^{ab}	2.20^{ab}	2.86^{a}	0.4192

^{abc} Means with different superscript are significantly different (p<0.05)

Conclusion

The early denial of feed and water affected negatively the weight and development of the GIT of broiler chicks. Delays beyond 48 hours resulted in various levels of mortality.

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