EFFECT OF FEED RESTRICTION ON GROWTH PERFORMANCE AND ECONOMY OF PRODUCTION OF BROILER CHICKS

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ABSTRACT

An experiment was conducted to determine the effect of feed restriction on growth performance and economy of production using One Hundred and Twenty (120) ANAK 2000 broiler chicks. The dietary treatments consisted of providing feed ad libitum (full fed) and two feed restriction treatments: restricting feeding 80 % of ad libitum between 28 – 70 days of age (DOA); and for 28 – 47 DOA with re-alimentation to full fed 48 - 70 DOA. The three treatments were identified as D_1, D_2, and D_3 respectively. A one-way analysis of variance (ANOVA) in Completely Randomized Design (CRD) was used to analyze data collected on growth performance variables. A cost – benefit analysis was utilized for the economy of production. Analysis of results obtained revealed that final body weight and weekly weight gain of broilers on D_1 and D_3 were similar ($P < 0.05$) but differed from D_2 ($P < 0.05$). No significant difference ($P < 0.05$) was found between D_2 and D_3 and between D_2 and D_1 in weekly feed intake and feed efficiency respectively. Feed efficiency was improved by restriction followed with re-alimentation. A reduced feed cost (N)/Kg weight gain, highest revenue and least cost-benefit ratio were obtained from reduced from birds on D_3.

Keywords: Broiler chicks, feed restriction, Growth performance, Economy of production

INTRODUCTION

The production performance of the broiler chicks is greatest when free access to feed and water is given Feed, incidentally, is the most expensive factor in growing broiler birds (Obioha, 1992). Inadequacy and inconsistency of feed supply is a major bottleneck to efficient animal production in tropical farming system (Melaku and Peters, 2000). Nji *et al.*, (2002) attributed these short – fall in feed supply to two major factors viz: (1) scarcity and high cost of conventional protein and energy feedstuff, and (2) competition for these products by man, livestock and agro – industrial sectors. Quantitative feed restriction programme has been successfully applied in managing these scares feedstuff. However, improper use of this approach can lead to considerable weight loss and poor production (Bowes *et al.,* 1988). Thus, the application of the knowledge of feed management in nutrition must interact with economic consideration that influences the amount of feed supplied as ration. Plavink and Hurwitz (1988) observed that the timing, severity and duration of restriction had significant effect on the subsequent ability of broilers to recover from a growth defect. Several studies have shown that early nutrition and hydration has long – term benefits in growth rates than early deprivation (Noy and Sklan, 1999, 2000). This is, primarily, because the development of the digestive tract in poultry is rapid and more susceptible to variations with different nutrients and their availability to the body system (Dibner *et al.,* 1996). Nwachukwu and Ibe (1990) provided broilers 95, 90 or 85 % of the daily feed consumption of birds fed *ad libitum* from 2 –6 weeks of age before re-feeding them on *ad libitum* from 7 – 9 weeks of age. They reported a depressed body weight by all levels of feed restriction; furthermore, economic parameters considered did not show feed restriction as having advantage over full – feeding. Their findings could have been influenced by the time at which feed restriction was commenced and the duration. This study examined responses of broilers subjected to three different feeding regimes from 28 day of age. Measurements included growth performance variables and economic parameters.

MATERIALS AND METHODS

Experimental Site: The study was carried out in the Poultry Research Unit, Department of Animal Production and Fisheries Management, Ebonyi State University, Abakaliki.

Animal Management: a total of 120 day - old ANAK 2000 strains of broiler chicks obtained from S and D Farm Limited, Abeokuta were used for the study. The 120 chicks were brooded together in the brooding unit (deep litter system) for 28 days using 100 watts electric bulb. At 28 day of age (DOA), the chicks were randomly allotted to three dietary treatments consisting of 60 birds per treatment. Each treatment was replicated four times thus they were 10 birds per replicate. The feeding trial lasted for 6 weeks. The chicks were fed finisher diet (Guinea Feed).

Dietary Treatments: three dietary treatments were used for the study. These were identified as D_1 = Chicks fed *ad libitum* from 28 –70 DOA; D_2 = Chicks

fed 80% *ad libitum* 28 - 70 DOA; and D_3 = Chicks fed 80 % *ad libitum* 28 – 47 DOA and then re-alimented to *ad libitum* 48 - 70 DOA. The percentage feed restriction was based on previous 24 – hour feed consumption values of *ad libitum* control group (D_1).

Parameters Measured: The chicks were weighed as individual replicate groups at the beginning of the experiment (28 DOA). Taking the average weekly body weight of the birds and calculating the amounts of weight gained per week measured growth rates. From the feeder weights, the amount of feed consumed was calculated for the six weeks of experimentation. By dividing the average weekly weight gain by the average weekly feed consumed for individual bird/treatment, feed efficiency was established for the experiment. Multiplying total feed consumed by cost/kg feed got the total cost of feed. The quotient of total cost of feed and total weight gain gave the feed cost/ kg gain. Revenue referred to the product of final body weight and cost/kg live weight. Gross margin was obtained by subtracting the total cost of feeding from revenue whereas the cost – benefit ratio was obtained by dividing total cost of feeding by gross margin.

Statistical Analysis: Data obtained on all parameters, expect those on economics of production were subjected to a one – way Analysis of Variance in a Completely Randomized Design (Obi 2001). Significant means ($P < 0.05$) were separated using Duncan's New Multiple Range Test (Obi 2001).

RESULTS AND DISCUSSION

Table 1 shows the results of the growth performance variables of the birds fed the dietary treatments. There was no significant difference ($P < 0.05$) in final body weight of birds on D_1 and D_3. Such similarities did not exist between these two treatments and D_2. This observation could be traced to the fact that following re-alimentation, restricted chicks consumed feed voraciously, which translated to a good gain for the chicks on D_3 (Plavnik et al., 1986). The slight numerical difference in final body weight of D_1 and D_3 ($D_1 = 0.07 > D_3$) supports the submission of Mollison *et al.*, (1984) that although the compensatory growth of the restricted group at certain periods may equal that of the unrestricted group, the final body weight of the restricted group never catches up with that of the unrestricted group. The mean weekly weight gain, feed intake and feed efficiency of birds were significant ($P < 0.05$) improved by re-alimentation. Beane *et al.*, (1979) reported that re-alimentation following the restriction of feed intake of broilers fed 85% of full fed control birds resulted in greater weight gains and a better feed efficiency. Feed restriction often results in apparent decrease in maintenance requirement due to depressed metabolic rate, suggesting that birds become more and more efficient in utilizing reduced food intake. This is based on the concept of a reduced maintenance requirement in animals recovering from periods of growth/feed restriction – where the carry over effects of lowered metabolic rates allows more food to be available for growth purposes (Lawrence and Fowler, 1998).

Table 1: Effect of Dietary Treatment on Performance Characteristics of Broiler Chicks

Parameters	D_1	D_2	D_3	SEM
Mean Initial body at 28 DOA (kg/chick)	0.57^a	0.56^a	0.58^a	0.01
Mean final body weight (kg/chick)	2.45^a	2.15^b	2.38^a	0.04
Mean weekly weight gain (kg/chick)	0.31^a	0.27^b	0.30^a	0.01
Mean weekly feed intake (kg/chick)	0.93^a	0.79^b	0.81^b	002
Feed efficiency	0.34^b	0.34^b	0.37^a	0.01

^{ab} Means differently superscripted are significantly different from one another ($P < 0.05$); ± SEM = Standard Error of the Mean.

The results of the economics of production are summarized in table 2. Quantitative feed restriction proved a benefit of this procedure. Feed cost was highest in D_1 and least in D_2 (a difference of N40.32). Feed cost (₦)/kg weight gain decreased in this order D_3, D_1 and D_2 (₦129.60, ₦142.47 and ₦143.09 respectively). Revenue, a factor determined by final body weight and ruling market price was highest for D_1 and D_3. The result on gross margin (₦)/ bird showed a contrary trend with that of feed cost (₦)/kg weight gain ($D_3 > D_1 > D_2$). D_3, thus had a better cost-benefit ratio than the other treatments. These results were in agreement with results of Pasternak and Shalev (1983). They reported significant positive monetary returns due to feed restriction. Proudfoot and Hulan (1982) also indicated that bird subjected to initial feed restriction and later returned to *ad libitum* made higher profit than the control birds.

Table 2: Economics of Production of Feed Restriction on Broiler Chicks[1]

Parameters	D_1	D_2	D_3
Total feed consumed (kg/chick)	5.58	4.74	4.86
Cost (₦) kg feed	48	48	48
Total cost of feeding (₦/chick)	268.64	227.52	233.28
Final Body Weight (kg/chick)	2.45	2.15	2.38
Total weight gain (6 weeks) kg/chick	1.88	1.59	1.80
Feed cost (₦)/ kg Weight gain	142.47	143.09	129.60
Cost of production (₦)[2]	267.84	227.52	233.28
Revenue (₦)	857.50	752.50	833.00
Gross Margin (₦)	589.66	524.98	599.72
Cost – benefit Ratio	0.45	0.43	0.39

[1] Cost/kg live weight chicken = ₦350; [2] Cost of production based on feed cost only (other costs remain constant)

Conclusion: There were signs of improved growth performance detected in birds fed D_3, resulting in a concomitant improvement in cost – benefit ratio of the dietary treatment. The results of this trial, thus, help in emphasizing the importance of feed restriction (80% *ad libitum*) of broiler chicks from 28 – 47 DOA, followed by re-alimentation to *ad libitum* (48 – 70

DOA). With such approach, our results indicate that the farmer would certainly achieve least cost of production and at the same time maximize profit.

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REFERENCES

BEANE, W. L, CHERRY, J. A and WEANER Jr. W. D. (1979). Intermittent Light And Restricted Feeding of Broiler Chickens. *Poultry science, 58:* 567 – 571.

BOWES, V. A., JILLIAN, R. J., LEESON, S. and STRITZINGER, T. (1988). Effect of Feed Restriction on Feeding Efficiency and Incidence of Sudden Death Syndrome in Broiler Chickens. *Poultry Science, 67:* 1102 – 1104.

DIBNER, J. J, KITCHELL, M., ATWELL and C., IVERY, F. (1996). The Effect of Dietary Ingredients and Age on the Microscopic Structure of the Gastrointestinal Tract in Poultry. *Journal of Applied Poultry Research, 5(1):* 16 – 21.

LAWRENCE, T. L. J. and FOWLER, V. R. (1998). *Growth of Farm Animals.* CAB International, Wallingford, Oxon, United Kingdom.

MELAKU, S. and PETER, J. K. (2002). Effects of Supplementation of Sole or Mixtures of Selected Multipurpose Trees (MPT) on Feed Intake, Live weight and Scrotum circumference Changes in Menz Sheep Fed a Basal diet of Tef (*Eragrostis tef*) straw. *Deutsher Tropentag Book of Abstracts and Proceedings:* 231 – 233.

MOLLISON, B., GUENTER, W. and BOYCOTT, B. R. (1984). Abdominal Fat Deposition and Sudden Death Syndrome in Broilers: The Effect of Restricted Intake, Early Life Calorie (Fat) Restriction and Caloric: Protein Ratio. *Poultry Science, 63:* 1190 – 1200.

NJI, F. R., NIESS, E, and PFEFFER, E. (1999). Performance of Growing Broiler Chicks Fed Bambara Groundnuts (*Vigna Subterranean*). *Deutsher Trogentag, Book of Abstracts and Proceedings:* 156.

NOY, Y. and SKLAN, D. (1999). Different Types of Early Feeding and Performance in Chicks and Poultry. *Journal of Applied Poultry Research, 8 (1):* 16 – 24.

NOY, Y and SKLAN, D. (2000). Hydrolysis and Absorption in the Small Intestines of Posthatch Chicks. *Poultry Science*, *79(9):* 1306 – 1310.

OBI I. U. (2001). *Statistical Method of Detecting Differences between Treatment Means.* SNAAP Press Nigeria Limited, Enugu, Nigeria.

OBIOHA, F. C. (1992). *A Guide to Poultry Production in the Tropics.* Acena Publications, Onitsha, Nigeria.

NWACHUKWU, E. N. and IBE, S. N. (1990). Effects of Quantitative Feed Restriction on Broiler Growth and Monetary returns. *Nigerian Journal of Animal Production, 17:* 10 – 13.

PROUDFOOT, F. G. and HULAN, H. W. (1982). Effect of Reduced Feeding Time using all Mash or Crumble Pellet Dietary Regimes on Chicken Broiler Performance Including the Incidence of Death Syndrome. *Poultry Science, 61:* 750 – 754.

PASTERNAK, H. and SHALEV, B. A. (1983). Genetic Economic Evaluation of Traits in a Broiler Enterprise: Reduction of Food intake. *British Poultry Science, 24:* 531 – 536.

PLAVNIK, L., MCMURTY, J. P., and ROSE BROUGHT, R. N. (1986). Effects of Early Feed Restriction in Broilers: Growth Performance and Carcass Composition. *Poultry science, 50:* 68 – 69.

PLANVIK, L. and HURWITZ, S. (1988). Effect of feed Restriction on Chicks: Effects of Age, Duration and Sex. *Poultry Science,* 67: 384 – 390.