THE EFFECT OF FEED RESTRICTION IN REARING PERIOD ON GROWTH PERFORMANCE OF ISA BROWN EGG-TYPE CHICKEN

Adewole F.A[1*], O.A. Adeyemi[1], Daisy Eruvbetine[2], O.M. Sogunle[1], L.T. Egbeyale[1]
[1]*Department of Animal Production and Health, Federal University of Agriculture Abeokuta*
[2]*Department of Animal Nutrition, Federal University of Agriculture Abeokuta*
*adewolefaith@yahoo.com

Abstract

This study was conducted to determine the effect of restricted feeding at rearing phase of egg-type chicken on the growth performance. A total of two hundred and seventy chicks of Isa Brown strain were randomly divided into three such that the first, second and third treatment groups were fed ad libitum (R_0), one day restriction (R_1) and two days restriction (R_2) per week respectively from second to seventh week. At the grower phase (8-20th week), each group was sub-divided into three (ad libitum (r_0), one day (r_1) and two days restriction (r_2)) to make nine equal groups; The birds were fed chicks and growers mash for the first 7 weeks and 8 – 20 weeks of age, respectively. Data obtained from the completely randomized design in a 3x3 factorial arrangement were subjected to least squares analysis of variance. Results showed significant ($p<0.05$) reduction in feed intake and body weight of birds due to restricted feeding. The birds maintained on R_0 and R_1 feed restrictions recorded higher ($p<0.05$) feed intake (73.06g, 71.38g) and daily weight gain (11.02g, 11.02g) respectively, when compared with birds on R_2. Furthermore, R_0 and R_1 had better ($p<0.05$) feed conversion ratio (6.64, 6.50) and mortality (0.00%, 0.00%) respectively, than R_2 birds with 6.94 and 5.56% respectively. The main restriction and sub-restriction interactions revealed that grower-restricted birds (R_0r_2) were better than the starter-restricted birds (R_2r_0) in feed intake, final weight, weight gain and protein intake. The group also had lower mortality. It could be concluded that one day feed restriction is more beneficial and feed restriction above one day, should be applied at grower phase

Keywords: Growth performance, Isa Brown, Feed restriction,

1ntroduction

The general increase in feed cost and occasional feed scarcity in Nigeria calls for the need to look for the most economic means of production. One of the methods suggested to ascertaining optimal use of feed and reduction in feed wastages is feed restriction. Feed restriction was reported to correct the adverse consequences of *ad libitum* feeding on performance which include high mortality and multiple ovulations resulting in reduced breeding performances and output Hocking *et al.* (1996). Hurwitz and Plavink (1989) applied feed restriction in growing egg type pullets and reported delay in the onset of egg production leading to some increase in egg weight and improved overall feed efficiency. However, feed restriction in laying birds is a delicate practice to embark upon and any restriction that is not carefully carried out will result in much loss than the expected gain of restriction. In most cases, restriction has been accompanied by a decrease in egg production, egg weight, egg mass or one or more of these depending on the strain of bird and the level of restriction (Scott *et al.*,1999). Hence, this research is aimed at determining the effect of restricted feeding at chick and grower phases of Isa Brown chickens on their growth performance.

Materials and Methods

The research was carried out in the Poultry Unit, Directorate of University Farms (DUFARMS), Federal University of Agriculture, Abeokuta, Nigeria, over the period of twenty weeks. A total of two hundred and seventy chicks of Isa Brown strain were randomly divided into three such that the first, second and third treatment groups were fed *ad libitum* (R_0), one day restriction (R_1) and two days restriction per week respectively at the chick phase. At the grower phase, each group was sub-divided into three to make nine equal groups. The birds were fed chicks and growers mash for the first 8 weeks and 9 – 20 weeks of age, respectively. The feed composition for chick and grower mash was 50,42 % maize, 16,26% wheat offal, 12,5% soybean meal, 9.08,7.3% groundnut cake, 2.50,00% fish meal, 2, 2% bone meal, 2,2% oyster shell, 0.10,0.10% lysine, 0.10,0.10% methionine, 0.25,0.25% vit/mineral premix and 0.25,0.25% salt respectively. Water was made available *ad-libitum* during the experimental period. Birds were vaccinated against Marek, New Castle and Gumboro diseases. Body weights and feed consumption were recorded weekly. Mortality

record was also taken. Data collected were subjected to analyses of variance in a randomised design with 3x3 factorial arrangement. Duncan Multiple Range test was utilized to separate means that were significantly different (SAS Version, 1999).

Results and Discussion

The main effects of restriction and sub-restriction on the growth performance of pullets at grower phase are presented in Table 1. The severity and length of feed restriction applied on the various bird groups reflected on the influence it has on the feed intake, body weight gain and mortality. While there were no significant differences between R_1 birds with lesser restriction programme and the control (*ad libitum*) birds in all parameters measured, the R_2 birds with more severe restriction programme differed significantly from the control and the R_1 birds. The birds in control group consumed more compared to the birds kept under restricted feeding. This trend might be due to longer period of feed restriction as reported by Kim *et al.* (2004). The body weights in birds of *ad libitum* and R_1 groups were higher than that of R_2 group and this is in line with Fassbinder-Orth and Karasov (2006) who showed that feed restricted practices cause a decrease in body weight in Leghorn layers. Newcombe *et al.* (1992) also observed that feed restricted birds gained less weight than full-fed control birds. The probable explanation of the lower body weight in feed restricted birds of group R_2 is the decrease in feed intake compared to the *ad libitum* fed birds (Mahmood *et al.*, 2007). The present result was however at variance with that of Sarica *et al.* (2009) who observed no difference between the body weights of control birds and the restricted groups. Ohtani and Leeson (2000) and Lee and Leeson (2001) reported higher weight gain in feed restricted birds than those fed *ad libitum*. The differences may be due to feed restriction schedules used in these studies. The FCR of the *ad libitum* fed birds was significantly better than that of the birds of R_2 group. Kwakkel *et al.* (1991) recorded greater feed conversion ratio (FCR) for the feed restricted birds than the control group at starter phase and lower FCR than the control birds at the grower phase. There was no significant difference however, in the FCR between the one day a week feed restricted (R_1) birds and the non-restricted control birds. This result is in harmony with the report of Fanooci and Torki (2010) which showed no significant difference in the overall FCR between chicks fed the restricted and non-restricted control diet, except for chicks fed on 20% restricted diet that had the highest FCR during the experiment. The poor feed utilization observed in R_2 bird group compared with the other two groups might have been caused by the more severe restriction in the two days feed restriction. Feed restriction has been reported to reduce mortality (Bruggeman *et al.*, 2005, Mahmood *et al.*, 2007). However, in this study, Mortality was higher in the two days feed restricted birds than the control and the one day feed restricted group. Mahmood *et al.* (2007) reported that feed restriction retarded the immune system of broilers. Kwakkel *et al.* (1991) and Mahmood *et al.* (2007) observed that severe feed restriction can impose stress on birds. The high mortality observed in R_2 group therefore may be attributed to stress due to feed restriction during the experimental period.

The interaction between main restriction and sub-restriction on the growth performance of pullets at grower phase are presented in Table 2. The result of this work showed that grower-restricted birds were better than the starter-restricted birds in feed intake, final weight, weight gain and protein intake. The result agrees with Kwakkel *et al.* (1991), who reported greater severity for pullets restricted in the starter phase than for those restricted in the grower phase as shown by the differences in the feed intake. Wells (1980) recommended "mid-term" food restriction as the most favourable feeding strategy for pullets having found a positive effect of rehabilitation on production after a period of feed restriction.

Conclusion

Based on the results of this study, it could be concluded that one day per week feed restriction enhances growth performance similar to *ad libitum* feeding. Feed restriction above one day per week, should only be applied at grower phase.

References

Hocking, P.M., Maxwell, M.H. and Mitchell, M.A. 1996. Relationships between the degree of food restriction and welfare indices in broiler breeder females. *British Poultry Science* 37, 263-278.

Huwitz, S. and Plavink, I. 1989. Severe feed restriction in pullets during early growing period: Performance and relationship among age, body, weight and egg at the onset of production. *Poultry Science* 68: 914-924.

Kim, S.H., Lee, S.J., Jang, B.G., Choi, C.H. and Ryu, K.S. 2004. Effects of restricted

feeding to pullet on weight and composition of body, laying performance, egg quality and endocrine in brown layers. Proceedings of XXII World's Poultry Congress, June 8-13, Istanbul, Turkey, pp: 387-387.

Kwakkel, R.P., de Koning, F.L.S.M., Verstegen, M.W.A. and Hof, G. 1991. Effect of method and phase of nutrient restriction during rearing on reproductive performance of light hybrid pullets and hens. *British Poultry Science.* 32:4, 747-761.

Lee, K. H. and Leeson, S. 2001. Performance of broilers fed limited quantities of feed or nutrients during seven to fourteen days of age. *Poult. Sci.*, 80: 446-454.

Mahmood, S., Mehmood, S., Ahmad, F., Masood, A. and Kausar, R. 2007. Effects of feed restriction during starter phase on subsequent growth performance, dressing percentage, relative organ weights and immune response of broilers. Pakistan *J. Vet., 27(3): 137-141.*

Newcombe, M., Fitz-coy, S. H. and Harter-Dennis, J. M. 1992. The effect of feed restriction and *Eimeriamaxima* infection with or without medication on growth and feed intake in broilers. *Poult. Sci.*, 71:1442-1449.

Ohatani, S. and S. Leeson, 2000. The effect of intermittent lighting on metabolizable energy intake and heat production of male broilers poult. Sci., 79: 167–171.

Sarica, M., Yamak, B. and Yamak, U.S. 2009. The Effects of Feed Restrictions in Rearing Period on Growing and Laying Performances of White and Brown Layer Hybrids in Different Adult Body Weights. *Asian Journal of Poultry Science, 3: 30-41.*

SAS Institute, Inc. 1999. JMP statistics and graphics Guide. SAS Institute, Inc., Cary, NC.

Scott, T. A. Silversides, F.G., Tietge, D. and Swift, M.L. 1999. Effect of feed form, formulation and restriction on the performance of laying hens. *Can J. Anim. Sci.* 79:171178.

Wells, R.G. 1980. Pullet feeding systems during rearing in relation to subsequent laying performance. "In recent Advances in Animal Nutrition". Ed. W. Haresign. Butterworths London, pp: 185-202.

Table 1: Main effects of main restriction and sub-restriction on the growth performance of egg-type Isa Brown

	Main restriction				Sub-restriction			
Parameters	R_0	R_1	R_2	SEM	r_0	r_1	r_2	SEM
Initial weight (g)	62.90	62.17	62.45	0.53	62.38	62.49	62.64	0.54
Final weight (g)	1528.61^{a}	1527.22^{a}	1389.58^{b}	18.02	1473.19	1485.42	1486.81	29.25
Weight gain (g/day)	11.02^{a}	11.02^{a}	9.98^{b}	0.14	10.61	10.70	10.71	0.22
Feed intake(g/day)	73.06^{a}	71.38^{b}	68.99^{c}	0.27	70.95	71.50	70.99	0.64
Feed Conversion Ratio	6.64^{b}	6.50^{b}	6.94^{a}	0.09	6.71	6.71	6.65	0.11
Protein intake (g)	12.52^{a}	12.24^{b}	11.83^{c}	0.05	12.16	12.26	12.17	0.11
Protein Efficiency Ratio	0.88^{ab}	0.90^{a}	0.84^{b}	0.01	0.87	0.87	0.88	0.01
Mortality (%)	0.00^{b}	0.00^{b}	5.56^{a}	0.81	1.11	1.11	3.33	1.53

$^{a, b, c}$ means in the same row not sharing common superscripts are significantly ($p<0.05$) different,
SEM:. Standard error of mean,

Table2: Effect of interaction between main restriction and sub-restriction on the growth performance of Isa Brown pullets at rearing phase

Main restr	R_0			R_1			R_2			
Sub-restr	R_0r_0	R_0r_1	R_0r_2	R_1r_0	R_1r_1	R_1r_2	R_2r_0	R_2r_1	R_2r_2	SEM
Parameters										
Initial weight(g)	62.90	62.90	62.90	61.84	62.02	62.64	62.41	62.55	62.39	0.96
Final weight(g)	1500.42^{ab}	1558.33^{a}	1527.08^{a}	1535.83^{a}	1510.42^{a}	1535.42^{a}	1383.33^{c}	1387.50^{c}	1397.92^{bc}	31.48
Weight gain (g/day)	10.81^{ab}	11.24^{a}	11.01^{a}	11.08^{a}	10.89^{a}	11.07^{a}	9.93^{c}	9.96^{c}	10.04^{bc}	0.24
Feed intake(g/day)	72.56^{abc}	73.64^{a}	72.98^{ab}	71.89^{bcd}	71.32^{cd}	70.94^{d}	68.39^{e}	69.53^{e}	69.06^{e}	0.37
FCR	6.73	6.55	6.64	6.48	6.58	6.42	6.92	7.01	6.89	0.16
Protein intake (g)	12.44^{abc}	12.62^{a}	12.51^{ab}	12.33^{bcd}	12.23^{cd}	12.17^{d}	11.72^{e}	11.92^{e}	11.84^{e}	0.06
PER	0.87	0.89	0.88	0.90	0.89	0.91	0.85	0.83	0.85	0.02
Mortality (%)	0.00^{b}	0.00^{b}	0.00^{b}	0.00^{b}	0.00^{b}	0.00^{b}	3.33^{ab}	3.33^{ab}	10.00^{a}	1.38

$^{a, b, c}$ means in the same row not sharing common superscripts are significantly ($p<0.05$) different,
SEM:. Standard error of mean, FCR – Feed Conversion Ratio, PER – Protein Efficiency Ratio