MON -67

Response of Broiler Chickens Fed Pellets to Period of Restriction

D.J. Omosebi[1], O.A. Adeyemi[1], O.M.Sogunle[1], O.M.O Idowu[2] and O. Bolarin[2]
Department of Animal Production and Health;[2]Department of Animal Nutrition, Federal University of Agriculture, Abeokuta, Ogun State
Corresponding author: D.J. Omosebi; E-mail: dharmielohlar@gmail.com.Phone +2348139559768

Abstract
One hundred and fifty day-old Marshal® broiler chicks were allotted into five treatments and subjected to restriction at 30% and pelletized feeding at seven days period each at the starter phase and subsequently fed *ad libitum.* The experiment lasted for 56 days. Data were collected on growth performance, cost benefit, abdominal fat and meat quality. Data were subjected to a one-way analysis of variance in a completely randomized design. The results show significantly highest ($p<0.05$) total feed intake in birds fed pellets and restricted in week 1 (4087.93g/b) compared to birds restricted in week 4 (3982.53g/b). Feed conversion ratio was not significantly ($p>0.05$) different. Birds restricted in week 4 showed a better feed cost savings compared to*ad libitum* feeding and other restricted groups. Ether extract content of the breast muscle and abdominal fat was lowest ($p<0.05$) in birds restricted in week 4. The study concluded that feeding pellets to broiler chickens improved weight gain and feed conversion. Feed restriction at 30% level in week 4 reduced feeding cost, abdominal fat and improved meat quality and feed conversion ratio.

Keywords: Broilers, feed restriction, pellets, meat quality, abdominal fat

Introduction

Broiler chickens are raised on concentrated energy diets to maximize growth rates and reduce the total number of days needed to reach market weight. Allowing birds an unlimited supply of food results in excess consumption of the bird's requirements for maintenance and production and the excess energy is converted into fat (Cuddington, 2004). Excessive fat has been described as an uneconomical and undesirable product that not only increases the occurrence of metabolic diseases and skeletal deformities, but also causes problems in feed efficiency, difficulties in meat processing, and rejection of meat by consumers due to the corollary between human consumption of certain fats and cardiovascular diseases. This has stimulated interest in developing management procedures to increase feed efficiency, reduce abdominal-fat deposition in broiler chickens and tend towards leaner carcasses (Cabel and Waldroup, 1990). Feed restriction programmes that have shown the potential to reduce the incidence of such problems can be used to modify birds' growth patterns by decreasing their maintenance requirements, which should improve feed efficiency (Urdaneta-Rincon and Leeson, 2002). The various forms in which feeds are processed and presented to birds are mash, crumbs and pellets. Pellets have shown enhanced performance in chickens which may be due to increased digestibility, decreased ingredient segregation and reduction of energy during prehension (Behnke, 1998).

This study however, was aimed at identifying the period of quantitative feed restriction in birds fed pellets that will bring about optimum broiler production in terms of meat quality and feed: gain.

Materials and methods

A total of one hundred and fifty (150) day-old Marshal® broiler chicks were purchased from a reputable hatchery and allotted to five treatments with three replicates of 10 birds each. On arrival, they were given water and then feed. A preliminary trial had been carried out prior to this study to determine the feed form (mash and pellets) and level of restriction (0%-30%) that can bring about lean carcass tissue in broiler chickens and improved feed conversion ratio. The results showed that birds fed pellets and restricted at 30% gave best results. For this experiment, all birds were subjected to 70% of *ad libitum*, pelletized feeding for 1 week period of restriction each (no restriction, day 1-7, day 8-14, day 14-21, day 21-28) respectively, then each treatment was subsequently fed *ad libitum* until the end of the experiment. The birds were fed a corn-soya based diet having 20.88% CP and 11.32 MJ/kg and then processed into pellets using a pellet mill calibrated to 2mm with water as a binding agent. The experiment lasted for 56 days.

The experimental layout was a one way ANOVA arrangement. Data was collected on feed intake, weekly body weight changes, feed conversion ratio, mortality and percentage feed cost savings/kg weight gain were recorded and calculated. Abdominal fat weights were expressed as a percentage of liveweight (Aderibigbe *et al*., 2013). pH measurement was determined by dipping a hand-held pH meter (ATC® 98108) into the breast portion and the values were read. Chicken meat obtained were analysed for crude protein, crude fibre, ether extract and ash according to the methods of AOAC (1995).

Data collected were subjected to a one-way analysis of variance using SAS, (2010); mean separation was done using Duncan's Multiple Range Test.

Results and Discussion

Age at which restricted feed intake was initiated (Palo *et al*., 1995) and the duration (Ballay *et al*., 1992) have effects on whether restricted birds grow to catch up or equal the final weight of the control birds. The numerical reduction in final weight and weight gain during the period of feed restriction is a direct response to feed intake. The post restriction period showed that broilers restricted in week 1 gained more weight (1812.67g/b) than those on *ad libitum* feeding (1729.33g/b) followed by those restricted in week four. This could be due to the early access to *ad libitum* feeding after restriction. Feed intake varied across the treatments with birds restricted in week 1 consuming 46.8g more feed than those fed *ad libitum* and in turn gained 82.67g more weight than those fed *ad libitum*. This is in agreement with the study of Atteh (2003) and Ewa *et al*. (2006) who reported that feed restricted birds had a better performance than *ad libitum* fed birds. Reports by Plavnik and Hurwitz (1989) showed that using a severe feed restriction program at 6-7 days of age for a one week period indicated the birds were much reduced in weight compared to the control after two weeks but market age was equal and feed efficiency was improved.

Table 1: Effect of pelleted feeding and periods of feed restriction on performance of broiler chickens

	Periods of restriction (week)					
Parameters	0	1	2	3	4	SEM
Initial wt (g)	40.00	39.33	40.33	41.00	40.00	0.33
Final wt (g)	1769.33	1852.00	1734.67	1830.00	1834.00	42.21
Total feed int (g/b)	4041.13^{ab}	4087.93^{a}	4079.87^{ab}	4028.27^{ab}	3982.53^{b}	20.55
Total wt gain (g/b)	1729.33	1812.67	1694.33	1789.00	1794.00	42.21
FCR	2.34	2.26	2.41	2.26	2.22	0.04
Mortality (%)	0.00	0.00	0.00	0.00	0.00	0.00
Cost of feed intake/bird (₦)	464.73^{ab}	470.112^{a}	469.18^{a}	463.25^{ab}	457.99^{b}	21.43
Cost of feed/kg weight gain (₦)	268.99	259.74	277.27	259.63	255.67	17.89
% feed cost savings/kg gain	0.00	3.44	3.08	3.48	4.95	2.11

^{a,b,}: Means in the same row not sharing common superscript are significantly different ($p<0.05$) SEM: Standard error mean

Table 2 shows the effects of pelleted feed and period of feed restriction on meat pH and proximate composition of broiler chicken. Abdominal fat, a factor that downgrades carcass quality was influenced by period of feed restriction. Birds restricted in week 4 had lowest value of abdominal fat (0.69). This could be due to the fact that they used their fat reserves as energy and deposited more lean tissues. This is in agreement with the report of Novele *et al*. (2009). Hassanbadi and Moghaddam (2004) also concluded that carcass fat content of restricted birds was lower than that of *ad libitum* fed birds.

Table 2.: Effect of pelleted feeding and periods of feed restriction on meat pH and proximate composition of broiler chickens

	Periods of restriction (week)					
Parameters	0	1	2	3	4	SEM
Abdominal fat (%)	0.75^{b}	0.77^{b}	1.16^{a}	1.09^{a}	0.69^{c}	0.28
Ph	6.50	6.53	6.40	6.50	6.47	0.06
Dry matter (%)	73.11	74.61	75.27	66.86	76.28	2.36
Crude protein (%)	19.86	25.76	21.62	23.93	23.03	2.25
Ether extract (%)	6.00^{b}	12.50^{a}	6.00^{b}	4.50^{c}	4.00^{c}	0.84
Ash (%)	1.30^{ab}	2.70^{a}	1.80^{ab}	2.00^{ab}	0.70^{b}	0.26
Crude fibre (%)	4.60^{b}	3.35^{b}	9.30^{a}	3.40^{b}	9.80^{a}	0.80
Nitrogen free extract	41.35^{a}	30.30^{c}	36.55^{a}	33.03^{bc}	38.75^{ab}	1.22

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

To determine the acceptance of meat or food products, consumers consider several characteristics such as its sensory characteristics, its nutritional value and its impact on health (Muchenje *et al*., 2009). In this study, period of restriction had no effect on pH and crude protein. The experimental birds did not suffer transportation stress and were subjected to the same pre-slaughter management conditions. This could influence the uniformity of the pH values among treatments. This study contradicts the report of Sikder *et al*. (2012) who stated thatpH of broiler meat of *ad libitum* birds was significantly higher than restricted groups. Ether extract varied across treatments with birds restricted in week 4 having the lowest value. Reports by Zhan *et al*. (2007) also corroborated the present study. Sikder *et al*. (2012) also reported that meat from broilers obtained from feed-deprived groups exhibited most desirable characteristics in terms of lower fat and high protein. Ash and crude fibre values were inversely related. Crude fibre content was highest in birds restricted in week 4 followed by week 2. Other groups recorded similar results. Reports by Palo *et al*. (1995) indicate that carcass fat, crude protein, ash and dry matter were not affected by restricted feeding.

Conclusions and Recommendations

From the study, it is evident that feeding of pellets to broiler chickens is advantageous in terms of improved weight gain and feed conversion ratio. But restriction should be carried out to reduce cost of production and fat accumulation in broiler production. It can then be concluded that farmers/ scientists/researchers can feed broilers pellets and restrict feed at 30% without any adverse effect on growth performance and for improved meat quality of the broiler chickens.

References

Aderibigbe, O.B., Sogunle, O.M., Egbeyale, L.T., Abiola, S.S., Ladokun, O.A. and Ajayi, O.L. (2013).Pelletized feed of different particle sizes: effects on performance, carcass characteristics and intestinal morphology of two strains of broiler chicken. *Pertanika Journal of Tropical Agricultural Science,*36(2): 127 - 144

AOAC(1995). Official methods of Analysis. 16th edition. Association of Official Analytical Chemists,Arlington, Virginia, USA.

Atteh J.O. (2003).Romancing the chicken. 68th Inaugural Lecture, June 2003. Library and Communications Committee, University of Ilorin 2003.Unillorin Press, Ilorin, Nigeria.

Ballay, M., Dunnington, E.A., Gross, B.W and Siegel, P.B. (1992). Restricted feeding and broiler performance: age at initiation and length of restriction. *Poultry Science,* 71: 440-447.

Behnke, K.C. (1998). Why pellet?. In: proceedings of kansas state university/ american feed industry association pellet conference; Manhattan, Kansas, USA.

Cabel, M.C. and Waldroup, P.W. (1990). Effect of different nutrient-restriction programs early in life on broiler performance and abdominal fat content.*Poultry Science,* 69:652-660.

Cuddington, S. (2004). High energy diets affect broiler chicken welfare. http:/www.facs.sk.ca/pdf/animal_care_award/articles_2004/cuddington_chickens.pdf. Retrieved 28/04/13

Ewa, V.U.N., Nwakpu, P.E. and Otuma, M. (2006). Effect of feed restriction on growth performance and economy of production of broiler chicks.*Animal Research International,* 3(3):513-515.

Hassanabadi, A. and Moghaddam, H.N. (2004). Effect of early feed restriction on performance characteristics and serum thyroxin of broiler chickens.*International Journal of Poultry Science,*5: 1156-1159.

Muchenje, V., Dzama, K., Chimonyo, M., Strydom, P.E., Hugo, A. and Raats, J.G. (2009). Some biochemical aspects pertaining to beef eating quality and consumer health: A review. *Food Chemistry,* 112: 279-289.

Novele, D.J., Ng'Ambi, J.W., Norris, D and Mbajiorgu. C.A. (2009). Effect of different feed restriction regimes during the starter stage on productivity and carcass characteristics of male and female Ross 308 broiler chickens. *International Journal of Poultry Science,* 8(1): 35-39.

Palo, P.E, Sell, J.L, Piquer, F.J, Vilaseca, L and Soto-Salanova, M.F. (1995). Effect of early nutrient restriction on broiler chicken, performance and development of the gastrointestinal tract. *Poultry Science,*74: 88 – 101.

Plavnik, I and Hurwitz, S. 1989. Effect of dietary protein, energy and feed pelleting on the response of chicks to early feed restriction. *Poultry Science* 68:1118-1125.

SAS Institute. (2010). SAS User's guide. Statistics. SAS Institute Inc., Cary, N. C.

Sikder, S.K., Majumder, S.C., Das, S.K. and Chatterjee, J.K. (2012). Effect of feed restriction on carcass yield and quality characteristics of broiler chicken. *International Journal of Bio-Resource and Stress Management,* 3(2):183

Urdaneta-Rincon, M. and Leeson, S. (2002). Quantitative and qualitative feed restriction on growth characteristics of male broiler chickens. *Poultry Science,*81:679-688.

Zhan, X.A., Wang, M., Ren, H., Zhao, R.Q., Li, J.X. and Tan, Z.L. (2007).Effect of early feed restriction on metabolic programming and compensatory growth in broiler chickens.*Poultry Science,*86: 654-660.