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EFFECT OF QUANTITATIVE FEED RESTRICTION ON THE PERFORMANCE, CARCASS, ORGAN WEIGHTS AND MEAT QUALITY OF BROILER FINISHER BIRDS.

BY

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ABSTRACT

A 35 day feeding trial involving one hundred and twenty (120), 5 - week old Anak broiler chicks in a completely randomised design(CRD) was carried out to evaluate the effect of quantitative feed restriction on the performance, carcass, organ weight and meat quality of broiler finisher birds. The birds were assigned to 4 treatment diets consisting of full feeding (control) T_1 (100%) and three feed restriction levels, T_2 (10%), T_3 (20%) and T_4 (30%). All the experimental birds were fed on commercial finisher diet (Extra Feed). Data on performance of the birds showed significant ($p<0.05$) differences in mean final live weight, weight gain, total feed intake but there were no significant differences ($p>0.05$) in feed conversion ratio among all the treatments. The dressed weight and dressing percentages of the carcass of broilers fed 100%, 90% and 80% diets were similar but significantly ($p<0.05$) different higher than that of carcass of broilers on 70% diets. The cut parts of the carcass showed significant ($p<0.05$) differences with the exception of the neck region. The organ weights of the broilers were similar in treatments 100%, 90% and 80% but differed significantly ($p<0.05$) from 70% treatment diet. Meat colour, tenderness, juiciness and flavour were also similar in 100%, 90% and 80% treatment diets but differed significantly ($p<0.05$) from birds on 70% diets. The results of the study suggest that 70% quantitative feed restriction of the ration did depress the performance and meat quality of broiler finisher broiler.

Keywords: Feed restriction, Performance, Meat quality and Broiler finisher.

INTRODUCTION

The high cost of poultry meat is due to the increasing cost of production (FAO, 1985). Feed accounts for about 70% of the total cost of producing poultry (Ranjhan, 1981). As such, the most reasonable step in reducing the cost of production would be to find alternative ways, which are cheap, adequate and readily available for feeding livestock. The main reason for controlling feed intake in broilers is to prevent wastage of feed. Oyenuga (1974) observed that the cost of production which takes the greatest proportion in livestock production is another factor that encourages feed restriction. Furthermore, a competition between man and poultry for energy(cereal grains) has created a problem of scarcity of these feed ingredients. The wastage of these cereal grains through feeding the birds (*ad libitum*) will not only be uneconomical but will also cause starvation in areas where this problem is more frequent. There is also wastage of feed as a result of feed left overnight and those scattered all over the litter, so this has brought about the need to restrict the quantity of feed in order to get the expected profit (Obijiofor and Uchendu, 2000). Level of feed restriction during production is clearly the main factor that determines the life weight at the end of rearing.

Quantitative feed restriction is a form of feeding where the normal feed requirements of the birds are not fed to the birds, rather a proportion of the daily feed requirement is withheld by some percentage. Feed restriction controls the level of feed intake and the rate of feathering (Lillie *et al*, 1976).

Feed restrictions have been suggested to result in a lower feed intake which brings about an improvement in feed efficiency (Farrell, 1973; Boron *et al*, 1982), slow growth rate (McCartney and Brown, 1977), reduction in live weight and delay in sexual maturity (Lillie *et al*, 1976). It is on the basis of these that this trial was set out to throw more light on the productive, carcass characteristics, organoleptic properties, and economic efficiency of feed restriction in broiler finisher.

MATERIALS AND METHODS

One hundred and twenty Anak broiler chicks were used for this study in a completely randomised design (CRD) experiment. The chicks were raised on deep litter for 4 weeks. The chicks were fed with broiler starter and all standard management practices were carried out.

At the end of the 5th week, the broiler birds were randomly assigned to four treatment groups and were placed in individual pen measuring 4m x 6m and 5m high in an open sided poultry house. Each treatment group comprised of 30 birds and was further replicated 3 times with ten birds per replicate.

The four broiler finisher treatment diets had 20% C.P. and 3000Kcal ME/kg diet. The four treatment diets consists of full feeding (control) T_1 (100%) and three feed levels restricted to T_2 (90%), T_3 (80%) and T_4 (70%) by weight of the mean daily feed intake of the broilers at 100% (T_1), according to the procedure of Abor Acres, (1985) and Ubosi, (1998). From 5 to 10 weeks of age, the daily feed requirement of a broiler bird per day is 155gm and this was taken as the control quantity. Then, 90%, 80% and 70% respectively of this daily requirement per bird was derived for the different treatments and multiplied by the number of birds in a replicate and the numbers of replicates in a treatment group. Then at the end of each day, the left over feed in the feeder was subtracted from the quantity given to calculate the quantity actually consumed by the birds. The feeding allowances were revised weekly using the previous weeks mean feed consumption/bird by the control group. Mean body weights, feed intake and feed conversion ratio were recorded.

All the experimental birds wee fed commercial finisher diet (Extra™ feed). Weight of birds were taken weekly. The composition of the diet is given in Table 1. The study lasted for 35 days. Mean body weight, feed intake and feed conversion ratio were calculated

Table 1: Proximate composition of commercial broiler finisher diet.

Nutrient Composition	Percentage
Protein	20.00
Fat	5.00
Fibre	5.50
Calcium	1.00
Phosphorus	0.4
Lysine	1.0
Methionine + Cystine	7.0
Metabolisable Energy (Kcal/kg)	3000.00

At the end of the 10th week of the trial, 3 birds were randomly selected for carcass and organ weight characteristics. The birds were starved of feed for 10 hours but water was given *ad-libitum*. Individual live weights were recorded. The birds were slaughtered by externally severing the carotid arteries and jugular veins. The birds were defeathered and eviscerated. The dressing percentages of the carcass were determined. The internal organs (gizzard, heart and liver) were removed and weighed. The dressed carcasses were wrapped in a cellophane material according to the different treatments and were conventionally stored in the freezer for one week prior to organoleptic quality evaluation. At the end of the storage period, the carcasses were removed from the freezer and thawed. The carcasses were broiled in an oven for palatability taste that involved a taste panel of ten judges using the Hedonic ratings.

Data collected from this experiment were subjected to analysis of variance (Steel and Torrie, 1980) and where significant effects were observed, means were separated using Duncan's New Multiple range Test (Obi, 1990).

RESULTS AND DISCUSSION

The results of quantitative feed restriction on the performance of broilers are shown in Table 2.

Table 2: Effect of quantitative feed restriction on the performance of broiler finisher chicken

Parameters	Treatment Diets				
	T_1(100%)	T_2(90%)	T_3(80%)	T_4(70%)	SEM
Av. Initial weight (kg)	0.50	0.60	0.60	0.60	0.03^{ns}
Final weight (kg)	2.30^{a}	2.10^{a}	2.00^{b}	1.80^{c}	0.10*
Av. weight gain (kg)	1.80^{a}	1.50^{ab}	1.40^{b}	1.20^{b}	0.12*
Av. total feed intake (kg)	5.50^{a}	4.90^{a}	4.40^{b}	3.80^{b}	0.30*
Feed conversion ratio	3.10	3.20	3.10	3.10	0.03^{ns}

Means within the same row having different superscripts are significantly different ($p<0.05$)

Average feed intake and body weight gain of the birds significantly decreased ($p<0.05$) with severity of quantitative feed restrictions. The feed intake of the groups were 5.50, 4.90, 4.40, 3.80kg and body weight gain were 1.80, 1.50, 1.40 and 1.20 kg for T_1, T_2, T_3 and T_4 respectively. These results are in agreement with findings of Snetsinger (1994) who had reported decreases in body weight of broilers with increase in severity of feed restrictions. Decrease in the body weight gain of broilers on restricted feeding is a function of plane of nutrition (Snetsinger, 1994; World Poultry, 2001). This results in inadequate intake of nutrients particularly proteins and energy required to sustain rapid growth and development of broiler birds (Esonu *et al*, 2002).

Also, the significant differences ($P<0.05$) in the average total feed intake of the birds in the treatment diets, 5.50, 4.90, 4.40 and 3.80kg for T_1, T_2, T_3 and T_4 respectively are in agreement with the findings of Sainsbury (1980) and Ibe (1989) who reported that over- restriction of feed may decrease feed intake and retard growth. There were no significant differences ($P>0.05$) in feed conversion ratios of all treatment diets, 3.10, 3.20, 3.10 and 3.10 for T_1, T_2, T_3 and T_4. This agrees with the findings of Snetsinger (1994) who reported that feed restrictions results in an improvement in feed conversion of broilers.

Table 3: Effect of quantitative feed restriction on carcass yield and organ weights

Parameters	Treatment Diets				
	T_1 (100%)	T_2 (90%)	T_3 (80%)	T_4 (70%)	SEM
Live weight (kg)	2.27	2.12	1.95	1.80	0.1^{ns}
Dressed weight (kg)	2.00^a	1.80^a	1.40^a	0.60^b	0.30*
Dressing Percentage	88.11^a	84.91^a	71.80^a	33.33^b	12.58*
Cut Parts			0.53^{ab}	0.39^b	0.08*
Drum Stick (kg)	0.70^a	0.66^a	0.26	0.25	0.15*
Neck (kg)	0.28	0.28	0.70^a	0.25^b	0.21*
Thighs (Kg)	0.78a	0.70^a	0.69^a	0.43^b	0.15*
Breast Muscle (kg)	0.76^a	0.71^a			
Organ Weights					
Gizzard (kg)	0.58^a	0.60^a	0.55^a	0.26^b	0.08*
Liver (kg)	0.26	0.26	0.26	0.38	0.76^{ns}
Heart (kg)	0.90	0.90	0.90	0.70	0.10^{ns}
Intestines (kg)	0.78	0.76	0.72	0.72	0.10^{ns}

Means within the same row bearing different superscripts are significantly different ($p<0.05$).
* - Significant. ^{ns} Not significant

The dressing percentage of the broilers showed a decreasing trend as levels of restriction increased. The decrease became significant ($P<0.05$) only at the highest level of restriction (88.11, 84.91, 71.80 and 33.33% for T_1, T_2, T_3 and T_4).

The least value (33.33%)was observed in broilers whose feed intake was restricted to 70%of the control (T_1) diet. This observation agrees with the findings of Sainsbury (1980) in chickens.

The cut parts of the carcass showed significant($P<0.05$) depression as level of restriction increased with the exception of the neck. For the drumstick, the figures were 0.70, 0.66,0.53 and 0.35kg for T_1, T_2, T_3 and T_4 respectively. This agrees with the findings of Buckett (1977) who observed that feed restrictions lead to marked changes in the sizes and shape of various organs, since organ weight is an index of nutrient retained by birds.

There were no significant differences ($P>0.05$) in the organ weights of broilers with severity of feed restrictions except in the gizzard where T_4 significantly depressed the weight. This observation is in contrast with the findings of McCartney and Brown (1977) who observed that feed restrictions lead to marked changes in the size and shape of various organs.

Table 4: Effect of quantitative feed restriction on organoleptic properties of broiler chicken

Parameters	Treatment Diets				
	T_1 (100%)	T_2 (90%)	T_3 (80%)	T_4 (70%)	SEM
Colour	3^b	3^b	3^b	5a	0.1
Juiciness	5^a	5^a	5^a	3^b	0.5
Tenderness	5^a	3^b	3^b	1^b	0.7
Flavour	5^a	5^a	5^a	3^b	0.5
Overall acceptability	5^a	5^a	5^a	1b	1.0

abc Means within the same row having different superscriptare significantly different ($p<0.05$).

Hedonic Scale

Flavour:	1 = Undesirable;	5 = Excellent
Tenderness:	1 = Tough;	5 = Very Tender
Colour:	1 = Too light;	5 = Too dark
Juiciness:	1 = Very Dry;	5 = Very juicy
Overall acceptability	1 = Very much disliked;	5 = Very much liked.

The colour and flavour of broilers on 100%, 90% and 80% treatments diets were significantly different (P<0.05) from that of broilers on 70% diets. The meat from broilers on 70% diets showed dark colour. Poor nutrition and unavailability of enough daily nutrients may be the major cause of this colour change (Ikhiomioya *et al*, 2000).
There was no significant difference (P>0.05) in juiciness of the meat of broiler on 100%, 90% and 80% treatment of diet but they differed significantly (P<0.05) from the juiciness of meat from broilers on 70% diets. Plane of nutrition is a factor, which affects meat juiciness (Lawrie, 1991). No significant differences (P>0.05) were observed in tenderness of the meat of broilers in all the treatment diets. Severity of quantitative feed restriction did not affect the tenderness of broiler meat. In the overall acceptability of the meat, broilers on 100%, 90% and 80% were favoured and meat from broilers on 70% diets was unacceptable.

CONCLUSION

The results obtained from this study indicate that quantitative feed restriction up to 70% of the control ration did affect performance and meat quality of broiler finisher chicken.

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