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B. M. Oruwari, J.P. Alawa,
U.I. Oji, O. J. Owen and O. S. George

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NIGERIA SOCIETY FOR ANIMAL PRODUCTION

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GROWTH PERFORMANCE AND ECONOMIC CHARACTERISTICS OF TURKEY POULTS FED MILLET-BASED DIETS AS A REPLACEMENT FOR MAIZE

A. A. Malik*, M. J. Ibrahim, Y. S. Kudu, O. P. Jibogun and R. A. Adebayo
Department of Animal Production, Federal University of Technology, Minna, Niger State
**Corresponding Author's e-mail: delemalik@yahoo.com*
Phone: 08030637763

ABSTRACT

A nine (9) weeks feeding trial was conducted on seventy two (72) day-old turkey poults to determine their growth performance and economic characteristics when fed three dietary treatments (T_1, T_2, and T_3) containing 0 %, 25 % and 50 % replacement of maize with millet respectively. Parameters studied included weekly feed intake, weekly body weight gain, feed conversion ratio and certain economic characteristics. The performance of turkey poults fed millet at 25 % replacement showed significant ($P<0.05$) differences from those of other treatments in terms of body weight gain and feed conversion ratio; T_2 had the highest body weight gain of 807.20g while T_1 and T_3 had 740.20g and 731.25g respectively. There were no significant ($P>0.05$) differences in terms of feed intake, feed conversion ratio and mortality across the treatments. Also, no significant ($P>0.05$) difference occurred in total cost of feed consumed per bird, but the treatments were significantly ($P<0.05$) different in terms of cost of feed per kg live weight gain and in the revenue generated per bird, as T_2 had the lowest cost of feed (₦287.26) per kg live weight gain followed by T_3 (₦308.99) and T_1 (₦314.42) respectively; revenue generated was highest in T_2 (₦401.36) and lowest in T_1 (₦349.35), with T_3 having ₦349.80. Therefore, it can be concluded that millet can be used to replace maize up to 50 % in the diets of turkey poults at the starter phase with good performance; but better results are obtained with 25 % replacement.

KEY WORDS: *Turkey poults, growth performance, economic characteristics.*

INTRODUCTION

Turkey production in Nigeria has largely remained at the smallholder level due to high cost of feed, inconsistency in feeding programmes, as well as lack of knowledge on the adequate levels of its nutrient requirements (Ojewola *et al.*, 2002). The tremendous increase in human population and high demand for animal feedstuffs, which caused rapid increase in cost of feed, has led to the search for alternative cheap energy sources for livestock animals by farmers. This is as a result of the fact that the increasing cost of feed has led to poor feeding of livestock, as feed cost is estimated to represent over 70% of the total cost of producing poultry intensively (Oguntowora, 1984).

Durunna *et al.* (2000) reported that maize is the major source of energy in poultry feeds and constitutes about 50 % of poultry diets. Unfortunately, the rapid growth of human population has intensified the competition between man and livestock for this cereal grain, resulting in high cost of feeds and consequently high prices of poultry products, leading to very low levels of protein intake in most developing countries (Abdulrashid and Agwunobi, 2009).

One important measure that can be taken to alleviate this situation is the use of alternative energy sources like millet and sorghum which are produced extensively in the semi-arid areas. Singh *et al.* (2000) exonerated millet from the anti-nutritional factors (phytate and tannins) found in sorghum, and that millet is superior to sorghum in protein content, protein efficiency and metabolizable energy. Hence, the main objective of this research study is to determine the most optimum dietary inclusion level of millet in the diets of turkey poults at the starter phase (as a replacement for maize) that will produce the best growth performance with the least cost.

MATERIALS AND METHODS

The Experimental Diets

Three isocaloric and isonitrogenous diets were formulated as treatment T_1, T_2 and T_3 representing 0 %, 25 % and 50 % replacement of maize with millet, with treatment T_1 being the control diet (Table 1). The feed ingredients used for this experiment were purchased from the Central Market, Minna, and from other commercial feed ingredients depots within Minna, Niger State.

The Experimental Animals and their Management

The experimental design used in the research work was a Completely Randomized Design (CRD) model. Seventy two (72) day-old turkey poults obtained from Animal Care Centre, along Okada road, Minna, were used for this research study. They were purchased from Topmost Chicks, Ibadan, Oyo State. Before the arrival of the birds, the pens were thoroughly washed and disinfected. Hours to arrival, all equipments were put in place (feeders, drinkers, bulbs, heat source etc) and heated to a suitable temperature. On arrival, the birds were weighed and allocated randomly into three dietary treatment groups of twenty four (24) birds per treatment and two replicates per diet consisting of twelve birds per replicate.

The birds were fed *ad libitum* with the experimental diets for nine weeks. Routine management operations such as daily removal of left-over uneaten feed, washing of drinkers, provision of clean drinking water and cleaning of the environment were carried out. A standard vaccination programme was followed strictly, and medications such as antibiotics, coccidiostats and anti-stress were administered appropriately.

Parameters Determined

The following parameters were determined using the procedures of Adesida *et al.* (2010) as follows:

(i) Average daily feed intake: This was obtained by subtracting the quantity of the left-over uneaten feed from the quantity of feed supplied to the birds per day.

(ii) Weekly body weight gain: This was measured by subtracting the body weight of the birds the preceding week from the body weight of the birds the following week.

(iii) Feed conversion ratio (FCR): This was obtained by dividing the average feed intake per bird per week by the body weight gained per bird per week for each treatment.

$$FCR = \frac{\text{Average feed intake per bird per week (g)}}{\text{Average body weight gain per bird per week (g)}}$$

(iv) Total cost of feed consumed per bird (in ₦): This was the cost per kg of feed (₦/kg) multiplied by the total feed intake per bird (kg).

(v) Cost of feed per kg live weight gain (in ₦): This was obtained by dividing the total cost of feed consumed per bird by the total body weight gain (kg).

(vi) Revenue generated per bird in ₦ (RG): This was obtained using the formula:

RG = (Weight of bird × Price /kg live weight) − (Cost of feed/kg × Total feed intake)

Chemical Analysis

The experimental diets were analyzed for moisture, crude protein, crude fibre, ether extract, ash and nitrogen free extracts using the procedures of AOAC (2000).

Statistical Analysis

The data obtained from this research study was subjected to a one-way analysis of variance (ANOVA) according to the Completely Randomized Design (CRD) model using the SPSS Package (Statistical Package for the Social Sciences, Version 2000). Where treatment means were significant, they were separated using the Duncan Multiple Range Test using the procedures of Steel and Torrie (1980).

RESULTS AND DISCUSSION

The results obtained from this research study are presented in Table 2.

Feed intake was not significantly ($p>0.05$) different among the different treatment groups but total body weight gain was significantly ($p<0.05$) higher for birds on 25 % replacement of maize (807g) than those on 50 % replacement (731g) as well as those on the control diet (740g). This is contrary to the result obtained by Tornekar *et al.* (2009) when pearl millet was used to replace maize in the diets of broiler chicks from 0-42 days old. The authors found that birds on 50 % replacement grew significantly ($p<0.01$) faster than birds on 25 % and 0 % replacement. Also, from the results obtained above, feed conversion ratio (FCR) was significant ($p<0.05$) among the treatment groups, with T_2 (2.53) being significantly better than T_1 (2.75) and T_3 (2.74). Whereas, in the research work by the same authors above, FCR was significantly ($p<0.01$) superior in T_1, followed by T_2 and T_3 respectively. Hence, they concluded that pearl millet (Bajra) can replace between 25-50 % maize in broiler ration without affecting their performance; while Davies *et al.* (2003) also found that the performance and carcass yield of broilers fed diets containing up to 50 % pearl millet were equivalent or better than those of broilers fed typical corn-soybean diets.

There were no significant ($p>0.05$) differences in mortality and total cost of feed consumed per bird across the treatments, but significant ($p<0.05$) differences existed in cost of feed per kg live weight gain and revenue generated per bird; with T_2 having the lowest cost per kg live weight gain (₦287/kg) and the highest revenue generated per bird (₦401).

CONCLUSION

The result of this research work shows that turkey poults fed millet at 25 % replacement for maize performed better (P<0.05) than those of other treatments in terms of body weight gain, feed conversion ratio, cost of feed per kg live weight gain and revenue generated per bird. Hence, it can be concluded that though millet can be used to replace up to 50 % maize in the diet of turkey poults at the starter phase, but better results are obtained with 25 % replacement.

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Table 1: Composition of the experimental diets

Ingredients (%)	T_1 (Control diet)	T_2 (25 % replacement)	T_3 (50 % replacement)
Maize	42.00	31.50	21.00
Millet	0.00	10.50	21.00
Groundnut cake	45.00	43.60	43.00
Wheat offal	3.30	4.00	4.00
Fish meal	5.00	5.00	5.00
Palm oil	0.20	0.90	1.50
Lysine	0.50	0.50	0.50
Methionine	0.50	0.50	0.50
Bone meal	3.00	3.00	3.00
Common salt	0.25	0.25	0.25
*Premix	0.25	0.25	0.25
Total	100.00	100.00	100.00
Calculated composition			
Crude protein	28.75	28.50	28.52
Metabolizable energy (Kcal/kg)	2786	2769	2756
Analyzed composition			
Dry matter	97.40	95.20	93.40
Crude protein	28.40	28.35	28.88
Crude fibre	6.00	4.00	3.00
Ash	8.00	10.00	8.50
Ether extract	18.50	17.00	15.50
Nitrogen free extracts	33.80	35.85	37.52

*Each 2.5kg premix contained: Vit. A-10,000IU; Vit.D_3-2,000,000 IU; Vit. K-2.250mg; Thiamine-1,750mg; Riboflavin-5,000mg; Pyridooxine-2,750mg; Niacin-27,500mg; Vit.B_{12}-15mg; Pantothenic acid-7,500mg; Folic Acid-7,500mg; Biotin-50mg; chloride-400g. Magnesium-80g; Zinc-50g; Iron- 20g; copper-5g; Iodine-1.5g, selenium-200g and cobalt-200mg.

Table 2: Growth performance and economic characteristics of turkey poults fed millet as a replacement for maize at the starter phase

Parameters	Diet T_1 (Control Diet)	Diet T_2 (25 % Replacement)	Diet T_3 (50 % Replacement)	SEM	LS
Initial body weight (g/bird)	35.94	36.98	36.46	0.27	NS
Final body weight (g/bird)	776.14^b	844.18^a	767.71^b	16.70	*
Total body weight gain (g/bird)	740.20^b	807.20^a	731.25^b	16.52	*
Daily body weight gain (g/bird)	11.75^b	12.81^a	11.61^b	0.26	*
Total feed intake (g/bird)	2033.10	2036.36	1998.95	18.69	NS
Feed conversion ratio (FCR)	2.75^a	2.53^b	2.74^a	0.05	*
Mortality (%)	8.30	4.15	16.65	3.35	NS
Cost per kg of feed (₦/kg)	114.48	113.82	113.05	–	–
Total cost of feed consumed per bird (₦)	232.75	231.78	225.98	2.36	NS
Cost of feed per kg live weight gain (₦/kg)	314.42^a	287.26^b	308.99^a	5.45	*
Revenue generated per bird (₦)	349.35^b	401.36^a	349.80^b	11.51	*

*Means with different superscripts were significantly ($p<0.05$) different

NS = not significant

THE GROWTH PERFORMANCE AND SLAUGHTER CHARACTERISTICS OF GUINEAFOWLS (*Numidea meleagris galeata*) FED MALTED NEGRO COFFEE (*Senna occidentalis*) SEED MEAL

Y.S. Kudu, B.A. Ayanwale, A. Aremu, M.J. Ibrahim, A.A. Malik and Y.K. Salau.
Department of Animal Production, Federal University of Technology Minna
E-mail: yaskudus@yahoo.ca.

ABSTRACT
The study was carried out to determine the growth and carcass characteristics of wild guinea fowl (Numida meleagris galeata) fed graded levels of malted Negro coffee (Senna occidentalis) seed meal. One hundred and ninety day old guinea fowl keets were randomly allotted to four different dietary treatment groups of 45 birds each. Each treatment group was further replicated three times with 15 birds per replicate. The treatments were designed as T1, T2, T3, and T4 representing 0, 6.5, 13.50 and 19.5 % Malted *Senna occidentalis* Meal *(MSOM) at the starter phase (0-10 weeks) and 0, 5.5, 11.0 and 16.5 % at the finisher phase (11-20 weeks) respectively. At the end of the 20th weeks, two birds each from each replicate were slaughtered to measure their slaughter characteristics. The results of the experiment revealed that only the final live weight, showed a significant difference ($p<0.05$) between treatment groups. No significant difference ($p>0.05$) was observed in the slaughter weight, de-feathered weight, eviscerated weight and the dressed weight. Therefore, MSOM can be included up to 11.0 % level in the diet of guinea fowl without any detrimental effect on the growth and slaughter characteristics.*

INTRODUCTION

The ever increasing demand for animal protein for the present and future population of people living in the developing countries has been an issue of concern to governments, nutritionists, and individuals in recent years. The protein consumption level in Nigeria is about 27 g less than the minimum requirement of 35g recommended by the National Research Council of the United States of America (NRC, 1998). Going by the current Nigerian population of over 140 million (NPC, 2006), to meet the recommended 35 g of animal protein- per person per day, an average meat supply of 4.9 million Kilograms per day will be required. Lack of adequate ingredients and high cost of poultry birds has created the need for research into alternative feed ingredients that have high nutritive value and are readily available. However, most plant legumes such as Negro coffee (*Senna occidentalis*), contain

antinutritional factors (ANF) like trypsin inhibitors, cyanides, phytic acids and tannins that limit their use in monogastric diets. Presently, negro coffee is not in use as a source of protein in poultry production. (Kudu *et al.*, 2010). The guinea fowl is widely distributed in the tropical guinea savanna area of Africa. In Nigeria, millions of eggs of this indigenous bird are wasted away during the annual bush burning. It is my considered opinion that these eggs can be collected from the wild, hatched and turned into a useful source of protein as well as income for the local farmers.

MATERIALS AND METHODS

The eggs were collected from the wild , and incubated according to the method adopted by Kudu *et al.* (2010). The malting of the seeds were done using the method of Kakati *et al.* (2010). After malting ,the seeds were sun dried and milled into Senna occidentalis seed Meal (MSOM).Some of the malted seeds were analyzed to determine the levels of anti-nutritional factors still present using the method of Latta and Eskin (1980) to analyze for phytic levels, while a modified method of AOAC (2000) adopted by Onwuka (2005) to analyze for tannin, trypsin inhibitors and saponin was used (Table 1).The proximate analysis of the feed was done using AOAC (2000) analytical methods (Table 3). Eight diets were formulated during the starter phase and the finisher phase. In the starter phase, diet 1 (T_1) was designed as the control with 0% MSOM (Malted *Senna occidentalis* Meal), diet 2 (T_2) contained 6.5% MSOM, diet 3 (T_3) contained 13.0% MSOM and diet 4 (T_4) contained 19.5% MSOM respectively. While in the finisher phase, diet 1 (T_1) contained 0% MSOM, diet 2 (T_2) contained 5.5% MSOM, diet 3 (T_3) contained 11.0% and diet 4 (T_4) contained 16.5% respectively. The dietary composition of the experimental diets for both the starter and the finisher phases are shown in Table 2.

RESULTS AND DISCUSSION

Table 1 shows the effect of malting on some of the anti-nutritional factors present in the malted seed, with tannin and trypsin inhibitors having the highest level of reduction, Similar results was obtained by Yakubu (2008). Table 2 shows the composition of experimental diets of guinea fowl containing malted *Senna occidentalis* meal at starter and grower phases respectively. Table 3 shows the initial weight, final live weight, slaughtered weight, de-feathered weight, eviscerated weight and dressed weight. It was observed that there was significant difference ($p<0.05$) in the final live weight with T_2 having the highest value and T_4 having the lowest value but there were no significant difference ($p>0.05$) in the other parameters measured. The average eviscerated weight which was 71.90% and the average dressed weight which was 66.84% was in agreement with (Ayeni, 1983) who stated that Guinea fowl on slaughtering has an eviscerated yield of over 80% and a yield of edible carcass of between 50-80%. Similar results have been reported by Kudu (1998). The result of the final live weight showed a significant difference ($p<0.05$) between treatment groups, while the result of other parameters such as: the slaughtered weight, de-feathered weight, eviscerated weight, and dressed weight were not significantly different ($p>0.05$) between the dietary treatment.

CONCLUSION

Based on the results obtained from the experiments, it was observed that the guinea fowls showed no significant ($P>0.05$) response to most of the parameters at different levels of dietary inclusion of Malted *Senna occidentalis* meal (MSOM) except for the final live weight where significant difference ($P<0.05$) was observed.

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Table 1: Anti-nutritional factors of raw and malted *Senna occidentalis* seeds

Anti-Nutritional Factor	Raw	Malted	%Reduction
Phytic acid (mg/100g)	503.10	289.43	42.47
Tannin (g/kg)	25.64	40.50	84.20
Cyanide (mg/100g)	18.07	8.84	48.99
Trypsin inhibitor (g/kg)	36.85	9.39	74.51

Table 2: Composition of experimental diets of guinea fowl containing malted *Senna occidentalis* meal at starter and finisher phases.

	Level of malted *Senna occidentalis* meal (%)							
	Starter phase				Finisher phase			
Ingredients	T_1	T_2	T_3	T_4	T_1	T_2	T_3	T_4
Maize	44.70	40.31	36.11	31.93	55.13	52.02	48.47	44.46
GNC	41.70	39.64	37.33	35.02	31.30	28.88	26.93	25.44
MSOM	0.00	6.50	13.00	19.50	0.00	5.50	11.00	16.50
Maize bran	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Fish meal	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Bone meal	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Palm oil	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Lysine	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Methionine	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Calculated analyses								
Energy (Kcal/Kg)	2995	2945	2968	2972	3010	3039	3060	3075
Crude protein (%)	26.01	26.00	26.00	26.00	22.16	21.99	21.99	22.18

MSOM= Malted *Senna occidentalis* Meal; GNC= Groundnut Cake; T_1= 0%MSOM inclusion at starter and finisher phases; T_2= 6.5% & 5.5%MSOM inclusion at starter and finisher phases; T_3=13.0% & 11.0%MSOM inclusion at starter and finisher phases; T_4= 19.5% & 16.5%MSOM inclusion at starter and finisher phases.

Table 3: Performance and carcass characteristics of guinea fowls fed graded levels of malted *Senna occidentalis* meal (finisher phase)

Parameters	T1	T2	T3	T4	SEM
Initial body weight (g)	33.03	33.02	33.01	33.03	0.01
Final live weight (Kg)	1.12^b	1.22^a	1.20^a	1.10^b	20.59
Slaughtered weight (%)	91.10	89.75	89.58	86.36	0.89
De-feathered weight (%)	84.59	84.28	84.49	80.91	1.57
Eviscerated weight (%)	73.36	71.25	72.33	70.68	1.38
Dressed weight (%)	68.21	65.86	67.51	65.80	1.34

a,b : Means denoted by different superscript along the same row are significantly different(P>.05) .