Agricultural Journal 1(2) : 77-80, 2006

Effect of the Replacement of Maize with Graded Levels of Sorghum Malt (*Sorghum bicolor*) on the Performance of Broilker Chicks

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Abstract: The effect of the replacement of maize with graded levels of Sorghum Malt (SM) on the performance of broiler chicks was investigated using 120 day old Ank broilers in a Completely Ramdonized Design (CRD) experiment. Diets were formulated to contain about 24% CP and 3000 kcals ME/kg diet. The basal diet (Trt 1) did not contain sorghum malt while diets 2, 3 and 4 contained 10% (Trt 2), 20% (Trt 3) and 30% (Trt 4) sorghum malt respectively. The chicks were randomly alloted to the dietary treatments giving 30 birds per treatment of three replicates. The chicks were inoculated against new Castle Disease, Fowl Pox and Gumboro disease at the appropriate times. Lighting and heat supply were provided by electric bulb, lanterns and stoves placed under hovers, feed and water supply were provided Iad-libitum. Daily feed consuption was measured by difference between quality supplied and the leftover in the through. Birds were weighed at the beginning of the experiment and subsequently at weekly intervals. On the 31st day of the 35-day trial period, triplicates samples of the chicks from each replicates were placed on metabolism cages for metabolism studies. Data collected from the growth study, nutrient balance study and economic analysis were subjected to the analysis of variance technique. The results indicated that significant differences ($p<0.05$) existed between treatments, 1, 2 and 3 on the one hand and treatment 4 on the other for most of the parameters evaluated. It is recommended that 20% sorghum malt can replace 24% maize in broiler starter diets without any adverse effect on bird performance.

Key words: Sorghum, anak briler, triplicates samples, metabolism studies

INTRODUCTION

Poultry production in Nigeria has witnessed a decline due primarily to the astronomical rise in the cost of poultry feeds. Major causes of the high cost of feeds are due to high cost of energy and protein foodstuffs. The consequence of the high cost of poultry feeds is the astronomic increase in the price of poultry products. Dietary energy constitutes up to 50% of a nutritionally balanced poultry ration. Cereal grains have hitherto constituted the major source of energy in poultry diets. The severe competition between man and animals for the available grains has forced animal nutritionists to search fort cheaper alternative sources of dietary energy[1]. Sorghum malt is one such desirable energy sources which has not been fully exploited. Sorghum malt is a by-product of the brewing industry,[2]. Recently sorghum had replaced barley consequent on the ban on the importation of the latter. Consequently the quantity of sorghum malt available for possible use in livestock feed is constantly increasing with the rising brewing capacity in the country. Sorghum malt is reported to compare favourably with maize in terms of major nutrients[3,2]. Various reports have also shown that sorghum malt has similar nutritional characteristics as brewer's dried grain, wheat offal and maize offal[2-5] reported that the replacement of maize with 20% sorghum malt did not affect feed intake, hen-day egg production and egg quality indices.

Egbe *et al*.,[6] that 20% sorghum mill waster can effectively repalce 20% maize in broiler chicken diets without any adverse effect on the birdss performance.

The present study was conducted to evalute the effect of replacing maize with graded levels of sorghum malt on the performance of broilers chick. Effective replacement of maize with sorghum malt will lead to the production of cheaper poultry feeds and hence poultry products.

MATERIALS AND METHODS

The experiment was conducted at the poultry unit of the teaching and Research Farm of Michael Okpara University of Agriculture, Umudike, Umuahia, Abia State, Nigeria. Umudike is located at latitude 5829' N and longitude 17˚32 'E in the forest region of Nigeria.

One hundred and twenty. Anak broiler chicks were used for the experiment. The chicks were bought from a local dealer in Owerri Imo State. All the chicks were

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Table 1: Composition of experimental diets (%dm)

	Treatment numbers		Nos	
Ingredients	T10%	$T2_{10}$%	$T3_{20}$%	$T4_{30}$%
Maize	44.50	34.50	24.50	14.50
Fish meal	5.00	6.00	7.00	8.00
Soya bean meal	22.00	22.00	22.00	22.00
Spent grain	15.00	14.00	13.00	12.00
Sorghum malt	0.00	10.00	20.00	30.00
Palm kernel cake	10.00	10.00	10.00	10.00
Bone meal	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25
Vitamin mineral premix	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculate nutrient composition:				
Crude protein (%)	23.90	23.90	23.80	23.70
ME (Kcal Kg^{-1}.diet)	2980.25	2984.25	2984.25	2879.45

Vitamine/Mineral premix contains 1Kg feed: Vit. A, 10,000IU.; Vit. D; 20.000IU;
Vit. E.; 3.6 I.U; Vit. K., 10.8 mg; riboflavine, 5mg; pantothenic Acid, 5 mg; nicotinic acid, 20 mg; chlorine, 300 mg; folic acid, 2.0 mg; Methionine 0.3 mg; Mn. 56 mg; Iodine, 1.0 mg; Fe, 20 mg; Cu, 10 mg; Zn, 50 mg, Co, 1.25 mg

brooded commonly for the first six days. On the 7th day they were randomly allotted to four dietary treatments in which maize (TI) was sequentially replaced with 10, 20 and 30% sorghum malt constituting treatments 2, 3 and 4, respectively. The diets were formulated to be iso-caloric and iso-nitrogenous (Table 1). Their birds were assigned to one treatment which was replicated three times in a completely randomized design experiment.

The chicks were reared on the floor in pens measuring 2 x 4 m. lighting and heat were provided using electric bulbs, lanterns and stoves placed under hovers. Feeds and water were provided *ad libitum*. Daily feed consumption was determined by difference before providing new feed for the day.

Birds were routinely inoculated against New Castle Disease, Fowl pox and Gumboro disease. Coccidiostat was administered to the chicks in drinking water at 21 day for 3 days. The birds were weighed at the beginning of the experiment and there after at weekly intervals. On the 31st of the 35-day experimental period, triplicate samples of the chicks per replicate were housed separately in metabolism cages for the determination of apparent dry matter digestibility and protein intake. Data collected from the study included a average daily fed intake, daily feed conversion ratio, protein efficiency ratio, apparent dry matter digestibility, daily protein intake and cost analysis. Data collected were subjected to the analysis of variance techniques as outlined by Steel and Torrie[7].

Where differences existed, means were separated using the Duncan's New Multiple range test (1955) as outlined by Steel and Torrie[7].

RESULTS AND DISCUSSION

The result of the experiment is presented in Table 2. Average daily feed intake was atavistically similar for birds on dietary treatments 1-3 (0-20%SM) but differed significantly ($p<0.05$) for birds on treatment 4 (30%SM), which had the lowest feed intake.

The proximate analysis of the various dietary treatments (Table 3) showed that the crude fibre level of the diets increased with increasing level of inclusion of the sorghum malt. The lower feed intake f birds on treatment 4 could be due to the increasing fibre level and dustiness of the feed as the level of SM increased in the diets. It is probable that at the 30% level of the inclusion of sorghum malt the tolerable limit of the chick for fibre had exceeded the threshold hence the decline in feed intake. Observations made on the birds as feed was offered showed that birds on treatment 4 (30% SM) ate less of their feed and were selective of the constituents of their feed due to higher dust level. It was also observed that the droppings of the birds on other treatments. Olomu and Offiong[8] had reported that the crude fibre level in the chick diet was very critical in determining their level of feed intake.

Fibre levels significantly affected the feed intake in broiler chicks. Rexen[9] attributed the phenomenon of watery droppings of chicks to high crude fibre in the diet above the tolerable limit and the possible presence of non starch polysaccharides which when present in gastro-intestinal tract of mono-gastric animals leads to increase in water content of faecs.

Wu and Wall[10] and Kubiczek *et al.*[11] had found that tannins which are non starch polysaccharides are found in many varieties of sorghum. The sorghum malt used in this study may be one of such variety. Average daily gain[12], feed conversion ratio, operative protein efficiency ratio apparent dry matter digestibility and apparent nitrogen digestibility were statistically similar for birds on treatments 1-3 (0-30%SM) but differed significantly ($p<0.05$) from birds on treatment 4 (30%SM). Birds on treatment 4 (30%SM) showed poorer performance in those parameters than birds in other treatment groups. The process of producing sorghum malt involves fermentation and drying. Fermentation results in increased protein content of the malted sorghum over the unfermented grain[11]. The better performance of birds on treatment 1-3 (0-20%SM) over birds on treatment 4 (30%SM) may be related to this as well as the tolerable fibre level and better utilization of the dietary protein. The higher feed intake, better feed conversion ratio and apparent nitrogen digestibility with resultant higher operative protein efficiency ratio would also have led to the better growth performance of birds on treatments 1-3. While protein intake did not differ significantly ($p>0.05$) among the treatments, the decreased protein digestibility at the highest level of sorghum malt inclusion led to decreased

Table 2: Effect of graded levels of sorghum malt on the performance of broiler chicks

Parameter	T_1	T_2	T_3	T_4	X	S.E.M
Initial wt. (g)	98.40	98.50	98.50	98.10		
Final wt. (g)	979.60[a]	991.50[a]	982.2[a]	885.5[b]	959.7	4.26
Av. Daily gain (gld)	31.50[a]	31.90[a]	31.60[a]	28.10[b]	30.50	0.20
Av. Daily feed intake (g)	74.0[a]	74.01[a]	73.90[a]	67.80[b]	72.43	0.12
Protein intake (g/d)	13.60	13.50	13.40	13.60	13.53	NS
FCR (feed intake)	2.35[b]	2.32[b]	2.34[b]	2.41[a]	2.36	0.02
ADG						
PER (ADGgm)	2.32[a]	2.36[a]	2.36[a]	2.07[b]	2.28	0.42
Protein consumer (gm)						
Apparent N-dig. (%)	79.40[a]	78.36[a]	78.42[a]	70.21[b]	76.60	1.74
Apparent DM digestibility (%)	74.76[a]	73.43[a]	73.25[a]	70.34[b]	72.95	1.65
Feed cost/Kg. Diet (N)	33.73[a]	30.12[ab]	26.93[b]	23.50[c]	28.73	2.54
Feed cost/Kg gain (N)	79.27[a]	69.90[b]	63.02[c]	56.64[d]	67.21	0.36
(FCR X Cost/Kg gain)						

I S.E.M. = Standard error of the mean

a, b….c, d = Means on the row same row with different superscripts are significantly different ($p<0.05$)

Table 3: Determined proximate composition of the dietary treatment and sorghum malt

	Dietary treatment				
Fraction	1	2	3	4	Sorghum malt
Crude protein	23.4	23.70	23.60	23.50	13.60
Crude fibre	5.36	6.4	7.12	8.62	10.40
Ether extract	4.86	5.24	5.80	6.80	7.88
NFE	52.71	52.32	52.54	50.09	62.08
Ash	8.62	8.88	8.94	9.72	5.31

dietary protein utilization and hence reduced performance in treatment 4. Similar results were obtained by Ajala *et al.*[13] on broiler chicks and Olugun *et al.* [14] on rats. Also as pointed out by Wu and Wall[10,14] some varieties of sorghum contain tannin which binds lysine, thus lowering nutritive value of the malted sorghum in spite of the analyzed crude protein intake. This factor may be further influenced by the fibre level of the diet to complicate the course of protein utilization of the diet. Feed cost per kg diet an feed cost per kg gain declined significantly ($p<0.05$) with increasing levels of sorghum malt in the diets. These findings in feed cost analysis are related to the higher cost of maize compared to the cheaper sorghum malt. It is recommended that based on the similarities in performance of chicks on 20% sorghum malt with those on 0, 10 and 20%, sorghum malt can replace 24.5% maize in broiler starter diets without any adverse effect on bird performance. Egbe *et al.*[6] using sorghum mill waste and Ajala *et al.*[13] using sorghum dust had recommended 20% of their sorghum product as ideal for broiler starter diets to replace maize. As sorghum mill waste, sorghum dust and sorghum malt have similar chemical composition and are produced by same processing technique from the same sorghum grain, the authors recommend that the name "sorghum malt" produced from sorghum bicolor be applied to the by-product for uniform nomenclature in research and commerce.

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