PERFORMANCE OF BROILER STARTER BIRDS FED SORGHUM WITH DIFFERENT ENERGY LEVELS AS REPLACEMENT FOR MAIZE

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Abstract
The effect of substituting maize with sorghum using different energy levels was studied on broiler birds. Broiler chicks were assigned to one of the following experimental diets. T1: maize based diet containing 2,900kcal ME/Kg (control). T2, T3 and T4: were all sorghum based diets 2,900, 3,000 and 3,100 ME kcal/kg respectively. Feed intake, weight gain and feed conversion ratio were measured and determined. The results showed that final weight, weight gain, feed conversion ratio (FCR) and cost of feed per kg gain were similar (P>0.05) among the treatment means. Feed intake differ significantly (P<0.05) among the treatments with T1 having higher feed intake than T3. T2 and T4 have similar (P>0.05) feed intake to both T1 and T3. Total cost of feed consumed (₦/b) differ significantly (p<0.05) with T3 (209.37) having the lowest compared to T1 and T4 (251.76 and 236.71). T2 (215.71) had similar total feed cost to T3 and T4. was statistically similar with T4 having (177.89/kg) compared to the other treatments (213.91, 208.80 and 200.53 for T1,T2 and T3 respectively). In conclusion T4 was the most economical as it had lower FCR and cost per kg gain.
Keywords: Sorghum, maize, energy, broiler, weight gain

INTRODUCTION

Cereals are the most widely available and cheap source of high energy feed ingredients for the African farmer. Energy sources constitute the largest component of poultry diets. Globally, Maize is the most common energy source used in poultry feeds, constituting about 40-60% in poultry rations *(*Dayakar-Rao *et al*., 2003*).* This is mainly because their energy source is starch, which is highly digestible and palatable. The metabolizable energy value of maize is generally considered the standard with which other energy sources are compared (Oluyemi and Roberts 2000). The global maize requirement for poultry was estimated at 3.5 million tones at 2003 and was projected to rise to 31 million tons by 2020 (Dayakar-Rao, *et al*, 2003). Where available, other cereals could contribute to provide the seemingly ever increasing demand by the poultry industry.

In Nigeria, Maize production has never been sufficient to meet the needs of the growing human population, because it is a staple food crop for majority of the population (Iken and Amusa, 2004). Thus there is a continuing shortage of maize for use as feed, necessitating the exploration of other energy sources for livestock. To reduce the overdependence on maize, a number of researchers are exploring the use of cereals such as sorghum and millet as alternative energy sources. Sorghum grain is an interesting energy ingredient in poultry diets due to its nutritional composition, which is very similar to corn. (Louis *et al*, 1991).

Sorghum is grown in large quantity in the northern guinea and dry sub humid zones of Nigeria, where it is the second important cereal crop after maize. Its annual production was estimated at 11,700 million metric tons during the 2010 growing season (FAO 2011). The inclusion of sorghum in poultry diets is gaining interest due to favorable nutritional content of the grain. Sorghum can be used in commercial poultry diets to replace maize as an energy source, because they contain similar metabolizable energy (ME) (Kcal/kg) values (3,672 and 3, 667 for yellow and white maize; and 3, 669 and 3, 550 for yellow and red sorghum, respectively) (Tukur, 2011). Previous studies conducted with broiler chickens showed that feeding sorghum yielded similar and sometimes better results in terms of growth performance and carcass characteristics compared to maize (Cramer *et al.*.' 2003; Nyamambi *et al.*, 2007). However, some varieties of sorghum have high tannin content, which lowers palatability and efficiency of feed utilization (Davies *et al., 2003,* Garcia and Dale, 2006*),* thus limiting its use in poultry feeds. Some varieties of sorghum can contain up to 6% tannin (Doka *et al., 2004;* Dicko *et al.,* 2015*),* which binds dietary protein making it unavailable for absorption. Owing to their astringent taste, tannins have negative effects on feed intake, palatability and digestibility of nutrients, with a consequent decrease in weight gain of birds (Hassan *et al.*, 2003; Makkar, 2003; Kim and Miller 2005). The objective of this research is to determine the performance of broiler birds fed with sorghum using different energy levels

MATERIALS AND METHOD

Location of the Study area

The study was conducted at the Poultry Unit, Livestock Teaching and Research Farm, Department of Animal Science, Federal University Dutsin-Ma. Dutsin-Ma lies on latitude 12°26'N and longitude 07°29'E (Abaje *et al.*, 2014).

Experimental Materials and Animals

Ninety-six day old broiler chicks were sourced and kept for one week to acclimatize before randomly allotted to four treatment groups of 24 birds each. Each treatment was replicated thrice with 8 birds per replicate in a completely randomized design (CRD) the treatments were as follows: Diet 1 is maize based mash diet with the ME value of 2900 kcal/kg (T1) which is the control. Diet 2 is sorghum based mash diet with 2,900 kcal ME/kg (T2). Diet 3 is also sorghum based diet with 3000 kcal ME/kg (T3), and Diet 4 is sorghum with 3100 kcal ME/kg (T4). Birds in each replicate were weighed at the beginning of the experiment and subsequently on weekly basis to determine the weight gain of bird. Feed intake was also recorded daily. Feed conversion ratio, total feed cost and feed cost per kg gain were determined. Mortality was recorded. Routine management practices such as medication and vaccination were rightly observed. The birds were given feed and water *ad libitum*. The experiment lasted for four weeks. The composition of the experimental diets is shown in table 1 below. Data generated was subjected to analysis of variance in a completely randomized design using several linear program of the stat view statistical package (SAS, 2002).

Table 1: Composition of the starter experimental diet

Ingredients	T1 (2900kcalMe /kg)	T2 (2900kcalMe /kg)	T3 (3000kcalMe /kg)	T4 (3100kcalMe/kg)
Maize	57	-	-	-
Sorghum	-	55	54	53
Soybean meal	38.8	38.8	38.8	38.8
Limestone	0.5	0.5	0.5	0.5
Bone meal	3	3	3	3
Salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Methionine	0.2	0.2	0.2	0.2
Palm oil	-	2	3	4
Total	100	100	100	100

RESULTS AND DISCUSSION

The proximate composition of the experimental diets is shown in table 2. Performance of broiler chicks fed with maize and sorghum-based diets containing varying energy levels is shown in table 3. Initial body weight did not differ between the treatments. Final weight and weight gain were similar ($P>0.05$) among the treatment means. Feed intake differ significantly ($P<0.05$) among the treatments with T1 having higher feed intake than T3. T2 and T4 have similar ($P>0.05$) feed intake to both T1 and T3. The feed intake observed in this study (1754.92-2016.39g/bird) was higher than that (1264-1415g/bird) observed by Bako J. M. (2018). Feed Conversion Ratio (FCR) was similar ($P>0.05$) amongst the treatments. (sorghum with the highest energy level have (1.44) compared to the other treatments (1.71, 1.80, and 1.68 for T1,T2 and T3, respectively)). The FCR value recorded for the maize and sorghum diets with the same energy density (T1 and T2) were statistically similar. The FCR recorded in this study is similar to the report of Bako J. M. (2018) because the birds in this research gained higher in body weight.

Table 2: Proximate Composition of the Starter phase of the Experimental Diet

Parameters	T1 (2900kcalMe /kg)	T2 (2900kcalMe /kg)	T3 (3000kcalMe /kg)	T4 (3100kcalMe/kg)
Dry matter (%)	86.17	88.38	87.66	87.12
Ash (%)	7.54	3.24	4.07	4.48
Ether extract (%)	16.41	6.27	8.18	10.16
Crude fiber (%)	5.23	6.71	4.64	5.10
Crude protein (%)	27.74	30.91	33.11	30.18
Nitrogen free extract (%)	29.25	41.25	37.66	36.85

Table 3: Performance of broiler birds fed with sorghum using different energy levels at the starter phase

Parameters	Maize control (2900Kcal ME)	Sorghum control(2900 Kcal ME)	Sorghum (3000Kcal ME)	Sorghum (3100Kcal ME)	SEM
Initial weight (kg/b)	0.104	0.104	0.104	0.104	0.000
Final weight (kg/b)	1.288	1.150	1.149	1.538	0.161
Total weight gain (kg/b)	1.18	1.046	1.045	1.434	0.161
Total feed intake (kg/b)	2016.39^{a}	1868.38^{ab}	1754.92^{b}	1922.08^{ab}	64.85
Feed conversion ratio	1.713	1.809	1.681	1.444	0.154
Total feed cost (₦/bird)	251.76^{a}	215.71^{bc}	209.37^{c}	236.71^{ab}	7.834
Feed cost per kg gain (₦)	213.91	208.80	200.53	177.89	18.650

Mean with different superscripts along rows are significantly different (p> 0.05) SEM -Standard error of mean

Total cost of feed consumed (₦/bird) differ significantly (p<0.05) with T3 (209.37) having the lowest compared to T1 and T4 (251.76 and 236.71). T2 (215.71) had similar total feed cost to T3 and T4. Cost of feed per kg gain was statistically similar with T4 having (177.89/kg) compared to the other treatments (213.91, 208.80 and 200.53 for T1,T2 and T3 respectively).which make T4 the best and recommended treatment for it is more economical and efficient to farmer.

Conclusion and Recommendation

From the results of this study, feeding sorghum using different energy levels as replacement for maize resulted in similar performance. Sorghum can therefore replace maize in the diet of broiler starter especially with palm oil inclusion.

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