



Performance of broiler chickens fed "masakwa" sorghum (*sorghum bicolor l.*) Variety based diets as replacement for maize

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Abstract

The numerous industrial uses of maize and decrease in production makes it an expensive energy source in feeding poultry. This study was conducted to evaluate the effects of "Masakwa" Sorghum variety (Sorghum bicolor L.) fed to broiler chickens to replace maize. Five diets were formulated in which Masakwa Sorghum Variety (MSV) replaced maize at 0, 25, 50, 75 and 100% levels coded as diets 1, 2, 3, 4 and 5, respectively. One hundred and fifty (150) day old broiler chicks (Anak, 2000) were brooded and randomly allotted into the five dietary treatments with three replicates per treatment in a completely randomized design. Feeds and water were provided adlibitum and the experiment lasted for eight (8) weeks. The performance of the broilers showed no significant difference ($P > 0.05$) in weight gain, feed intake, total weight gain and feed conversion ratio in both starter, finisher and overall performance of the broiler chickens. The study revealed that "Masakwa" sorghum can totally replace maize in the diets of broiler chickens without any detrimental effect on the performance.

Keywords: Performance, Broiler Chickens, *Sorghum bicolor*, Maize

Introduction

The decrease in production due to climatic change coupled with the numerous industrial uses of maize make it an expensive energy ingredient for poultry feeding, thus necessitating, the need for research into cheaper alternatives. Poultry industry is one of the major employer of Nigerian Labour Force in the agricultural sector and one of the fastest growing in the Industry. (Torhemen, 2022; Eko *et al* 2020). Olomu (2011) reported the Metabolizable Energy (ME) and Crude Protein (CP) of maize to be 3510Kcal kg ME and 8.0% respectively while Sorghum was 2808,Kcal ME and 12.00 % Crude Protein (Topps and Oliver, 1993).The ever escalating cost of maize is as a result of increased competition for its usage by man and other livestock species (Egbunike and Achiobong, 2002)and its adequate production to meet the needs of man and his livestock (Babatunde *et al.*, 1990).These reasons made it very critical to look inward and consider

other sources like "Masakwa" sorghum (*Sorghum bicolor L.*)variety (MSV)which are relatively cheap in their area of cultivation and can compete well with maize.

Sorghum is comparable to maize in nutrient composition but contain some anti-nutritional factors like tanning, which give it some agronomic advantages but lowers the nutritional value of the grain to non-ruminants (Jacob *et al.*, 1996). Another disadvantage of tannin to monogastric is the reduction of dry matter and protein digestibility (Gualtieri and Rapaccini, 1990). Sorghum was reported to contain about 0.2-2.0% tannin and when used to replaced maize it adversely affects growth and feed efficiency in broilers (Douglas *et al.*, 1990). On the other hand, Lucbert and Castaing (1986) reported that nutritional value of Sorghum with tannin levels less than 10g/ kg is comparable to maize in broiler feeding. Sorghum is very much

superior to maize in protein content and fat (Olumu,2011). This study was carried out to investigate the effects of "Masakwa" Sorghum variety in the diets of broiler chickens.

Material and Methods

The experiment was carried out at the Poultry Unit of the Adamawa State University Teaching and Research Farm, Mubi, Adamawa State, Nigeia. Mubi is a town situated in Northern Guinea Savannah between latitudes 10.00°N and longitudes 13.30°E and about 305metres above sea level. Rainfall commences in April and ends in late October. The dry season starts in November and ends in March. Annual rainfall is between 900mm and 1050mm per annum. The relative humidity is low, 20 to 30% between January and March and starts to increase by April to attain a peak of about 80% in August and September when it starts to decline from October following the cessation of the rains. The average minimum temperature is about 12°C in December and January and maximum of 40°C in April (Adebayo and Tukur, 1999).

Experimental Birds and their Management

A total of 150 day-old broiler chicks (Anak, 2000) were randomly allotted to 5 experimental diets. These were sub-divided into three (3) replicates of ten(10)birds each, the chicks were housed on deep litter pens, clean fresh water and feeds were served daily *ad libitum* for a period of eight weeks. Medication schedule and routine vaccination were strictly observed. Heat for the proper brooding were provided by the use of kerosene heated stoves placed under the hoovers, the brooding period was for the first two weeks of age and fed with the commercial feeds.

Experimental Diets

Five Isonitrogenous experimental diets for both broiler starter (23% crude protein) and broiler finisher (20% crude protein) phases were formulated."Masakwa" Sorghum Variety (*Sorghum bicolor L.*) was incorporated to replace maize at 0, 25,50,75,and 100% levels in the broiler starter and

finisher diets respectively. The ingredient composition of the starter and finisher diets with the calculated analysis are shown below in Tables 1 and 2.

Statistical Analysis

The data obtained from both the starter and finisher phases were subjected to Analysis of Variance Technique (ANOVA) as outlined by Steel and Torrie (1980).

Results and Discussion

The result of growth performance of Starter and Finisher phases are presented in Table 3. The daily feed intake at the Starter phase was almost similar across the treatments diets which signify no Statistical effects ($P > 0.05$) and agreed with the work of Adamu (2005) and Yunusa *et al.* (2015) who replaced maize with Yellow Sorghum while the others conducted the experiment with "Gero" Millet,"Dauro"millet,Red Sorghum and White sorghum varieties. It is equally in line with the study of Elangovan *et al.* (2005) who fed reconstituted high tannin Red sorghum based diets to broiler chicks and found no significant difference across the dietary treatments, these result is in conformity with the findings of Pour-Reza and Edriss (1997) who reported that dietary maize portion of broiler diets can be replaced with Low-tannin sorghum without detrimental effect on feed intake.

The result of feed intake at the Finisher phase was equally not significantly effective ($P > 0.05$); this contradict the report of Kwari *et al.* (2012) who observed that daily feed intake was significantly high ($P < 0.05$) and better on sorghum based diets than the control (100% maize) diets during both phases of growth (Starter and Finisher), although the increase was noticeable only above 25% replacement level in the Finisher phase. In overall performance, the feed intake (104.16 to 111.13 g) did not differ significantly ($P > 0.05$) across the dietary treatments. Similarly, Yunusa *et al.* (2015) reported that the overall performance were not affected by the dietary treatments. The result was

equally in conformity with the report of other workers (Medugu *et al.*, 2010) who reported non-significant($P>0.05$) differences among all

treatments groups. The results of the daily weight gain revealed no significant ($P> 0.05$) difference among the treatments in all the phases of growth

Table 1: Composition of the Experimental Broiler Starter diets (1-4 weeks)

Ingredients(%)	0	25	50	75	100
Maize	50.24	37.68	25.12	12.56	0.00
Sorghum	0.00	12.56	25.12	37.68	50.24
Soya bean meal	32.56	32.56	32.56	32.56	32.56
Wheat offal	10.00	10.00	10.00	10.00	10.00
Fish meal	4.00	4.00	4.00	4.00	4.00
Bone meal	2.50	2.50	2.50	2.50	2.50
Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00
Calculated Analysis					
Crude protein %	23.00	23.13	23.25	23.38	23.51
ME(Kcal/kg)	2905.76	2888.93	2872.08	2855.27	2838.44
Ether Extract %	3.68	3.56	3.41	3.30	3.18
Crude fibre %	4.01	4.01	4.01	4.01	4.01
Calcium %	1.27	1.27	1.27	1.26	1.28
Phosphorus %	0.69	0.72	0.75	0.78	0.81

ME=Metabolizable Energy

Mineral premix contains per 1.25kg of the following: Vitamin A 15,000 I.U.,Vitamin D3 3,500,00I.U.,Vitamin E 30,000 L.U.,Vitamin K,3,000mg,Thiamin B;3,000g,Riboflavin B2;8,000mg,Pyridoxine B6 4,000mg,Niacin,4,000mg,Vitamin Bi2,20mg; Calpan 10,000mg;Folic acid 1,000mg;Biotin,30mg;Antioxidant,125g;choline chlorine,500mg;Management,968 Zinc;808,Iron,408;copper,6g,Iodine;1.48 Selenium,300mg;Cobalt,240mg.

Table 2: Composition of the Experimental Broiler Finisher (5-8 weeks)

Ingredients(%)	0	25	50	75	100
Maize	50.24	38.05	25.37	12.69	00.00
Sorghum	00.00	12.69	25.37	38.05	50.74
Soya bean	28.06	28.06	28.06	28.06	28.06
Wheat offal	15.00	15.00	15.00	15.00	15.00
Fish meal	2.00	2.00	2.00	2.00	2.00
Bone meal	1.00	1.00	1.00	1.00	1.00
Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00
Calculated Analysis					
Crude protein %	20.14	20.26	20.39	20.59	20.65
ME(Kcal/kg)	28636.72	2819.97	2803.23	2736.49	2769.74
Ether Extract %	3.61	3.49	3.36	3.23	3.11
Crude fibre %	5.12	5.12	5.12	5.12	5.12
Calcium %	1.27	1.27	1.27	1.27	1.27
Phosphorus %	0.69	0.72	0.72	0.72	0.78

ME= Metabolizable Energy

Mineral premix contains per 1.25kg of the following: Vitamin A 15,000,000 I.U.,Vitamin D2acid 1,000mg; Biotin,30mg;Antioxidant,125g; choline chlorine,500mg; Management,968 Zinc;808, Iron, 408; copper, 6g,Iodine; 1.48 Selenium, 300mg; Cobalt,240mg.

with proportion of 22.12 to 23.18g, 39.93 to 48.57g and 32.19 to 34.97g in both Starter, Finisher and overall phases respectively. This is contrary to the findings of Yunusa *et al.* (2015) who reported that daily weight gain was highly ($P < 0.01$) influenced by the dietary treatments at all phases of their experiment. Ibitoye *et al.* (2012) equally observed no Significant difference ($P > 0.05$) among treatments for body weight gain when diets containing different sources of energy were fed to broilers. It is not in conformity with the finding of Adamu (2005) who reported that the daily weight

gain was significantly influenced by the dietary treatment in an experiment that replaced Yellow sorghum for maize. The poor weight gain observed in some experiments reported on white sorghum based diets may be due to nutrient digestibility as a result of high level of tannin. This is supported by Cao *et al.*(1998),who stated that digestible nutrients were less for soft sorghum (White sorghum)than for medium (Red or Yellow) and hard (Cream) sorghum. The result of the study agrees with that of Kwari *et al.*,(2014) who fed different energy sources and their combination to

broilers and found no significant difference across the dietary treatments. This imply that "Masakwa" broiler chickens without adverse effects on performance.

The non-significant difference ($P > 0.05$) reported in feed conversion ratio indicates that the diets were well utilized by the birds. This was in contrast to the report of Yunusa *et al.* (2015) who observed significant difference ($P < 0.05$) in both the Starter and

sorghum variety can replace maize in the diets o

overall performance across the dietary treatments which they attributed to the higher fibre levels of the sorghum-based diets. The study also contradicts the findings of Kwari *et al.* (2012) who reported a significant difference of conversion ratio in an experiment that replace maized with low tannin sorghum.

Table 3: Performance of Broiler Chickens fed graded levels of "Masakwa" Sorghum based diets at Starter (1-28 days) and Finisher at (29-56 days)

Parameters (Starter)	0	25	50	75	100	
Initial Weight(g)	169.00	161.17	160.00	160.17	160.17	17.35 NS
Final weight(g)	810.00	806.67	758.33	800.00	786.67	21.75 NS
Total weight(g)	649.00	645.00	598.33	639.83	626.50	22.99 NS
Daily feed intake (g)	43.64	43.87	45.44	45.25	44.13	0.72 NS
Daily weight (g)	23.18	23.03	22.37	22.25	22.12	0.82 NS
FCR	1.88	1.91	1.73	1.99	1.97	0.24 NS
Mortality (number)	0	0	0	0	0	-
Finisher Phase (29-56 days)						
Initial weight(g)	810.00	806.67	758.33	800.00	786.67	21.72 NS
Final weight (g)	1963.30	1924.80	2118.30	1903.30	1970.00	21.49 NS
Total weight (g)	1153.30	1118.10	1360.00	1103.30	1183.30	81.52 NS
Daily feed intake (g)	164.37	164.44	165.83	166.84	164.80	2.89 NS
Daily weight(g)	41.19	39.93	48.57	39.44	43.13	1.04 NS
FCR	3.99	4.12	3.42	4.23	3.82	0.49 NS
Mortality (number)	1	0	2	2	1	0.03 NS
Overall Performance (1-56 days)						
Initial weight(g)	169.00	161.17	160.00	160.17	160.17	5.49 NS
Final weight(g)	1963.30	1924.80	2118.30	1903.30	1970.00	67.13 NS
Total weight(g)	1802.30	1763.10	1958.30	1743.20	1809.80	67.98 NS
Daily feed intake(g)	111.13	104.16	105.49	106.05	105.13	1.20 NS
Daily weight(g)	32.19	32.49	34.97	32.12	32.76	3.29 NS
FCR	2.95	3.03	2.69	3.13	2.91	0.17 NS
Mortality (number)	1	0	2	2	1	0.03 NS

NS = Not Significant $P > 0.05$
SEM=Standard Error of the Mean
FCR=Feed Conversion Ratio

Conclusion

Based on the results, it can be concluded that maize can be replaced completely with the "Masakwa" sorghum variety without any detrimental effects on the performance of the broiler chickens.

Recommendations

Masakwa sorghum variety is recommended as a good replacement for maize in the diets of broiler chicken for optimum performance

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