

## STUDY ON GROWTH PERFORMANCE AND CARCASS YIELD OF BROILER CHICKENS FED MILLET AND SORGHUM DIETS IN SUDAN SAVANNAH REGION OF NIGERIA

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### ABSTRACT

*The study was conducted to determine the performance and carcass yield of broiler chicken fed diets containing Millet (*Pennisetum pedicellatum*) replaced with Sorghum (*Sorghum bicolor*). Ninety (90) four weeks old broiler chickens (Anak Strain) were randomly allotted to five (5) diets in which Sorghum replaced Millet at 0, 25, 50, 75 and 100% levels designated as Treatment 1, 2, 3, 4 and 5 respectively. The treatments were allotted to chicks in a Completely Randomized Design (CRD). Each treatment was replicated 3 times with 6 birds per treatment. The experiment lasted within 4 weeks (finisher phase). The results of the performance of birds fed with diets showed that the feed consumption (136.67-156.94g) daily weight gain (77.03-86.98g) and final body weight (1862.02 – 2091.02g) were significantly ( $p < 0.05$ ) affected by the dietary treatments. There were significant differences ( $P < 0.05$ ) in the carcass weight (1070.33-1451.65g) and dressing percentage (65.99-69.10%). The feed cost (₦215.93-285.63) slightly decreased numerically in treatment 2 and 4 respectively. It was concluded that sorghum can replace millet in the diet of broiler chicken up to 75% without any adverse effect on the performance and carcass yield with concomitant reduction in the cost of production.*

**KEYWORDS:** millet, sorghum, growth, performance, carcass yield, feed cost.

### INTRODUCTION

The problem of animal protein and its scarcity in Nigeria and other developing nation has attained deplorable status which calls for urgent steps to avert the imminent protein malnutrition. Poultry production is the easiest way of achieving adequate protein supply for Nigerian populace due to their short generation interval and rapid growth rate (Bamgbose *et al.*, 2004). However, the high price of conventional feed ingredients in Nigeria has increased the feeding cost to about 80% of the cost of livestock production (Fanimu *et al.*, 2007). Cost and inadequate feed are the most important factors militating against poultry production in many of the less developed tropical countries (FAO, 2002).

In Nigeria, feed cost account for about 60 -70% of the total cost of producing broilers and eggs (Smith, 2001 and Kehinde, 2006). Maize is the chief source of energy in diets for monogastric animals, it may constitute up to 60% of the ration. The sub-optimal production of the pulses and cereals is resulting to competition between man and his livestock (Tegbe and Jegede, 1984). The increasing pressure on the use of maize by the human population and livestock feed companies has resulted in an escalating price of maize in Nigeria in recent years (Akinfala, 2002). There is therefore, an urgent need to explore cheaper alternative feed resources to reduce the high cost of feed which in turn will affect animal protein availability in Nigeria by using unconventional resources in diet of broiler chicks. Sorghum is the main food grains in Africa and part of India and China. It is more drought resistance than maize for which it is used as a replacement for millet. Whole sorghum grain can

be given to sheep and poultry, but are usually grinded for other animals. *Sorghum bicolor* enjoys some advantage over millet because it is relatively low in human consumption and industrial uses which make it a good alternative source of energy. The objective of the Study was to determine the combination level of Millet and Sorghum on the growth performance and carcass yield of broiler chicken.

### MATERIALS AND METHODS

#### Experimental Site

The experiment was conducted at teaching and research Farm of the. Department of Animal Science, Faculty of Agriculture, Kano University of Science and Technology, Wudil. It is located within Sudan savannah region of Nigeria. The farm is located on latitude 11° 37'N and longitude 8° 58'E at an altitude of 403m above the sea level. The annual rainfall ranges from 850mm-870mm, while minimum and maximum temperature ranges between 26° and 33°C. While the relative humidity of the region is always low and ranges between, 40- 51.3% (Olofin *et al.*, 2008).

#### Experimental Diets

Five (5) diets were formulated using a Pearson Square Method with two energy sources replacing each other. In this experiment, sorghum replaced millet at 0, 25, 50, 75 and 100% dietary levels designated as treatment 1, 2, 3, 4 and 5 respectively. Each treatment was fed 18 birds in 3 replicates containing 6 birds. The Experiment lasted for 4 weeks, (finisher phase). The diets are isonitrogenous and isocaloric as shown in Table 2.

### Experimental animals and design

A total of ninety (90) four weeks old broiler chicks (ANAK STRAIN) were used in this study. The experiment was carried out at finisher phase. The chicks were immediately weighed using a digital weighing balance scale and randomly allotted to five treatment and 18 birds per treatment. The birds were fed diets in Completely Randomized Design (CRD). Each treatment was replicated 3 times and fed to 6 birds per replicate.

### Experimental Management.

The broiler chickens were raised in the deep litter house which was partitioned into pens measuring 1.50 m<sup>2</sup> to accommodate 6 birds per each pen. The pens were fully constructed with wood and wire mesh to protect them against predators and serves as security. The feeding trough and water troughs were properly placed in the pen avoid spillage. The chicks were immediately offered anti-stress in drinking water using Amino total and vaccinated with Gumboro at 2 weeks within the adjustment period. The birds were also vaccinated at 4 weeks against Newcastle diseases. The routine management operations were conducted on daily and weekly basis, such as feed offering, cleaning and removal of feces to avoid contamination and measurement of leftover of feed offered.

### Data Collection

Birds in each pen were weighed on weekly basis, The feed intake feed were determined by offering a known quantity of feeds and subtracting the left over weight in each replicate, The feed conversion ratio were determined by calculation according to daily feed consumed and weight gain of birds fed with treatments. At the end of 8 weeks, two birds were randomly selected, weighed, slaughtered and immersed in warm water at room temperature. Birds were defeathered, weighed, and eviscerated. The carcass and organs weights (Heart, liver, kidney, pancreas, and lungs) were measured and recorded using a 10 Kg portable weighing balance and digital weighing scale. All visceral organs and gut contents were measured and carefully recorded individually.

### Data Analysis

The data generated was subjected to Analysis of Variance (ANOVA) as described by Steel and Torrie (1980). Where significant difference exist between the means a Duncan Multiple Range Test (D.M.R.T) was used to separate them (Duncan 1955), in a general linear model of Statistical Analysis System package (SAS, 1998).

## RESULTS AND DISCUSSION

Table 1 shows the proximate compositions of sorghum and millet as described by A.O.A.C. (1980). The results revealed the percentage of

the dry matter content, moisture, crude protein, crude fibre, ether extract, ash and nitrogen free extract as well as metabolisable energy (kcal/kg) of sorghum and millet. The crude protein content of millet and sorghum obtained are 11.23% and 10.40% respectively. Similarly, the metabolisable energy of millet and sorghum are 3120.21Kcal/kg and 3264.02 Kcal/kg respectively. This agreed with the data reported by Olomu (2011). Table 2 shows the composition of broiler finisher diets containing sorghum replacing millet at 0, 25, 50, 75, and 100% designated as Treatment 1, 2, 3, 4 and 5. The diets are isonitrogenous containing and isocaloric.

The result of the performance of broiler chicken at finisher phase is presented in Table 3. The results showed that there were significant differences ( $P < 0.05$ ) in the daily feed intake (136.67-156.94g), daily weight gain (77.03-86.98g) and final body weight (1862.02-2019.02g). The higher feed consumption was obtained in treatment 2 (156.94g) and lower feed in treatment 4 (136.67g). Treatment 4 had the higher daily weight gain and final body weight having 86.98g and 20191g respectively. The lower value was obtained in treatment 1 and 2. The weight gain slightly decreased drastically at treatment 5. The feed conversion ratio was lower in treatment 4 (1.58) and higher in treatment 1, 2 and 5 having 1.81, 1.82 and 1.76. This agreed with report of Doma (1998) who reported that the lower the feed consumption the better the diets. The feed cost per kilogram body weight tend to decreased in treatment 4 (₦215.93) and slightly increased in treatment 5 (₦272.94). This agrees with the findings of Aina (1990), Ogbonna and Adebowale (1993) who reported that any reduction in the feed cost with steady increase in weight gain is significantly ( $p < 0.05$ ) economical in broiler production.

Table 4 shows the results of the carcass analysis which indicated that there were significant differences ( $P < 0.05$ ) in the final live weight, carcass weight and dressing percentage. Higher final live weight was obtained in treatment 4 (2091.01g) and lower weight in treatment 2(1860.33g). While, the higher carcass weight was found in treatment 4 (1451.65g) and the lower carcass weight was realized in treatment 1 (1070.33g). However, treatment 4 had higher dressing percentage (69.10%) and treatment 1 had lower dressing percentage (65.99%). This agreed with report of (Ishola, 2000) who reported the normal range of dressing percentage for 60-70% for birds. Similarly, there were significant difference ( $P < 0.05$ ) in heart and pancreas weights. However, there were no significant differences ( $P > 0.05$ ) in liver, pancreas and kidney weights.

The gut weights showed no significant difference ( $P > 0.05$ ) among the treatments. The gizzard weight was higher in treatment 1 (53.33g) and lower in treatment 4 (42.33g). However, there was higher fat deposition in the abdominal cavity in treatment 4 (104.22g) and lower in treatment 5 (99.48g). This showed some increased in the fat

deposition in the abdominal cavity of birds with an increased in the level of replacement of millet with sorghum up to treatment 4. This agreed with report of Hill and Dansky (1954), who reported that an increase in feed consumption leads to better muscle deposition and production of leaner carcass.

**Table 1: Proximate Composition of Millet (*Pennisetum pedisellatum*) and Sorghum (*Sorghum bicolor*)**

Parameters	Sorghum	Millet
Dry matter (%)	96.34	95.88
Moisture (%)	4.10	5.06
Crude protein (%)	10.40	11.23
Ether extract (%)	3.40	5.21
Crude fibre (%)	2.50	2.00
Ash (%)	3.80	5.60
Nitrogen Free Extract (%)	75.80	70.90
M. E. kcal/kg	3264.02	3120.21

M.E =Metabolizable Energy

**Table 2: Composition of broiler finisher diets containing Millet replaced with Sorghum**

Ingredients	Treatments				
	1 0%	2 25%	3 50%	4 100%	5
Millet	67.52	50.64	33.76	16.88	0.00
Sorghum	0.00	16.88	33.76	50.64	67.52
Soyabean cake	18.48	18.48	18.48	18.48	18.48
Fish meal	5.00	5.00	5.00	5.00	5.00
Wheat offal	5.00	5.00	5.00	5.00	5.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Salt	0.30	0.30	0.30	0.30	0.30
Lysine	0.20	0.20	0.20	0.20	0.20
Methionine	0.25	0.25	0.25	0.25	0.25
vitamin premix	0.25	0.25	0.25	0.25	0.25
	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
<b>Calculated analysis</b>					
Crude protein (%)	20.00	20.00	20.00	20.00	20.00
M.E Kcal/kg	3004	3001	3014	3030	3034
Crude fibre (%)	5.50	5.86	5.81	5.71	5.61
Either Extract (%)	6.52	6.59	6.47	6.50	6.60
Ash (%)	3.93	3.17	3.18	3.92	3.71
Lysine (%)	1.00	1.00	1.10	1.12	1.10
Methionine (%)	0.40	0.48	0.50	0.49	0.52

M.E. = Metabolizable Energy

\*Vitamin-mineral Premix---- Composition of vitamin premix 1 Kg is as follows:- vitamin A 8000 iu; Vitamin D<sub>3</sub> 1600iu; Vitamin E 5 iu, Vitamin K 0.200 mg; B vitamins, Thiamine B<sub>1</sub> 0.5mg; Riboflavin B<sub>2</sub> 4mg; pyridoxine B<sub>6</sub> 0.015 mg; Niacin 0.015mg; B<sub>12</sub> 0.01mg; Pantothenic acid 0.5 mg; folic acid 0.5mg and Biotin 0.020 mg; Choline chloride 0.02 mg; Anti-oxidant 0.125g and Minerals (Mn, zn, Fe, cu, I, Si, Co) 0.156g.

**Table 3: Performance of Broiler chickens fed diets containing millet replaced with sorghum at finisher Phase (4-8weeks)**

Parameters	Treatments					SEM
	1 (0%)	2 (25%)	3 (50%)	4 (75%)	5 (100%)	
Initial body weight (g)	501.92	501.87	501.94	501.61	501.89	25.57
Final body Weight (g)	1890.23 <sup>c</sup>	1862.02 <sup>c</sup>	1912.30 <sup>b</sup>	2091.02 <sup>a</sup>	1942.12 <sup>b</sup>	0.86
Daily Feed Intake (g)	143.93 <sup>b</sup>	156.94 <sup>a</sup>	144.07 <sup>c</sup>	136.67 <sup>b</sup>	152.48 <sup>ab</sup>	5.23
Daily Weight Gain (g)	77.03 <sup>c</sup>	86.57 <sup>a</sup>	85.90 <sup>b</sup>	86.98 <sup>a</sup>	85.16 <sup>b</sup>	0.18
Feed cost N/Kg gain	260.51	285.63	249.59	215.93	272.94	42.34
Feed conversion ratio	1.81	1.82	1.67	1.58	1.79	1.02
Mortality rate (%)	0.16	0.16	0.00	0.00	0.32	0.32

\* abc = means with different superscript on the same row are significantly different ( $P > 0.05$ )

SEM = Standard error of mean

**Table 4: Carcass characteristics of Broiler chickens fed millet diets replaced with sorghum.**

Parameters	Treatments					SEM
	1	2	3	4	5	
Final live Weight (g)	1889.23 <sup>c</sup>	1860.33 <sup>c</sup>	1901.10 <sup>b</sup>	2091.01 <sup>a</sup>	1901.66 <sup>b</sup>	28.69
Carcass weight (g)	1070.33 <sup>c</sup>	1382.00 <sup>b</sup>	1360.66 <sup>b</sup>	1451.65 <sup>a</sup>	1310.00 <sup>b</sup>	46.83
Dressing percentage (%)	65.99 <sup>c</sup>	66.52 <sup>c</sup>	68.13 <sup>ab</sup>	69.10 <sup>a</sup>	67.10 <sup>b</sup>	2.86
Hearts (g)	5.33 <sup>a</sup>	5.00 <sup>a</sup>	196.16 <sup>b</sup>	4.00 <sup>a</sup>	4.66 <sup>a</sup>	0.07
Liver (g)	41.33	42.66	43.00	45.00	21.33	9.74
Pancreas (g)	2.00 <sup>a</sup>	2.33 <sup>a</sup>	3.66 <sup>b</sup>	3.33 <sup>ab</sup>	4.66 <sup>c</sup>	0.81
Kidney (g)	1.33	3.00	2.00	2.33	2.66	1.16
Crop (g)	7.33	5.00	8.00	6.66	6.33	3.42
Proventriculus (g)	7.33	5.66	6.66	12.33	12.33	1.18
Gizzard (g)	53.33	56.66	46.00	42.33	46.00	7.09
Small Intestine Length (Cm)	248.66	285.33	231.33	246.66	246.66	62.46
Small Intestine Weight (g)	45.33	48.66	50.00	44.00	54.00	23.25
Large Intestine Weight (CM)	27.00	21.66	23.33	24.00	22.33	10.43
Abdominal fat (g)	101.03	98.54	98.96	104.21	99.48	23.69

\* abc= means with different superscript on the same row are significantly different (P>0.05)

SEM = Standard error of mean

### CONCLUSION

It was concluded that Sorghum can replace Millet in the diets of broiler chickens up to 75% without any adverse effect on the performance and carcass yield with reduction in the feed cost.

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### Recommendation

Based on this study, it is therefore recommended that sorghum can replace millet in the diet of broiler chickens up to 75% without any depression in growth performance, carcass yield and reduction in the feed cost.

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