SAVANNAH JOURNAL OF AGRICULTURE
ISSN 1597 - 9377

Volume 12(2); December, 2017

GROWTH PERFORMANCE AND CARCASSCHARACTERISTICS OF BROILER CHICKENS FED DIETARY LEVELS OF SORGHUM SK- 5912 (*Sorghum bicolor* L. Moench) VARIETY

[1]Lakurbe, O. A., [2]Doma, U.D., [2]Bello, K.M.,[2]Abubakar, M., 1Sadiq, M. S.,[1]Tijjani, H.U., [1]Dikko, I.M.

[1]Department of Animal Science, Faculty of Agriculture, Federal University Kashere, Gombe State, Nigeria,
[2]Department of Animal Production, Faculty of Agriculture, Abubakar TafawaBalewa University, Bauchi, Nigeria.

ABSTRACT

An experiment was conducted to evaluate the performance and financial benefit of broiler chickens fed dietary levels of sorghum SK-5912 variety. Five diets were formulated in which sorghum SK-5912 replace maize at 0(control), 25, 50, 75 and 100% levels coded as diets 1, 2, 3, 4 and 5 respectively. Three hundred Marshal broiler chicks were randomly allotted in to the dietary treatments with four replications in a completely randomized design. Feed and water were supplied *ad libitum* and experiment lasted for a period of eight weeks. Results revealed that growth performance was not significantly influenced by the dietary levels of sorghum SK-5912 variety at all the phases. Most of the carcass and gut parameters measured were not affected except large intestine weight ($P<0.001$) that was affected. The study therefore reveals that using sorghum SK-5912 in place of maize has no adverse effects on the performance, carcass yield and internal organ characteristics of broiler chickens. It can be concluded that sorghum SK-5912 variety is a suitable source of energy for broiler production.

Keywords: Broiler, Carcass yield, Dietary treatment, Performance, Sorghum SK-5912.

INTRODUCTION

The high cost of livestock feed especially poultry feed is a major constraint to the development of livestock industry in Nigeria. This is due tothe high cost of conventional feedstuffs as a result of low production level and competition between man and livestock for the available ones, (Olomu, 2011).The major source of dietary energy for poultry is maize and its relative high cost and scarcity presently being experienced in the country as a result of low level production due to effects of climate change and shortage of inputs such as fertilizer is an issue that require urgent attention. Several attempts at reducing this high cost of feed continue with the search for useful alternatives of comparatively lower prices to conventional ones. The possible alternative to maize in Nigeria is sorghum which is readily available in the Northern part of the country.

The sorghum SK-5912 is yellow in colour, high yielding, drought resistant, tolerant to striga and has relatively low tannin content. The variety SK-5912 had poor taste when prepared as Tuwo, the traditional stiff porridge, unacceptable black colour and poor overnight keeping quality (ICRISAT, 2003).Although, sorghum SK-5912 variety have reportedly been utilized in turkey diets and results showed that it can conveniently replace maize (Etuk, *et al*., 2015), but there are paucity of information on its utilization inpoultry chickens. Furthermore, its attractive yellow colour could be an indication of the presence of phyto-nutrients, such as carotenoids, which are important precursors of retinol (Vitamin A), thereby providing us with a good alternative to maize.This study therefore, was conceived to investigate the growth performance and guts characteristics of broiler chickens fed sorghum (SK-5912) based diets.

MATERIALS AND METHODS

A total of three hundred experimental birds were randomly allotted to five experimental diets that were replicated four times in a completely randomized design of fifteen birds per replicate. Feed and water were supplied to them *ad libitum* during the experiment which lasted for eight weeks.

Five experimental diets for both starter and finisher phases were formulated in which sorghum SK-5912 replaced maize at 0, 25, 50, 75 and 100% levels of inclusion coded as diets 1, 2, 3, 4 and 5 respectively (Tables 1 and 2). Samples of sorghum and feed were analyzed to determine their proximate composition according to AOAC (2006). Daily records of feed intake were taken while body weights were recorded weekly. Records of mortality were also taken. Routine vaccinations and medications were carried out accordingly. At the end of the experimental period, 2 birds per replicate were randomly selected, fasted for 12 hours before slaughter. The live weights and weights of carcass and weights and lengths of some internal organs were measured using sensitive scale and meter rule.

Data on daily feed intake, weight gain, initial weights, final weights, feed conversion ratio, mortality, live weights, weights of carcass and weights and lengths of internal organs were subjected to Analysis of Variance (ANOVA) technique as described by Steel and Torrie (1980). Differences between treatment means were separated using Duncan's Multiple Range Test (Duncan, 1955).

Table 1: Ingredients and chemical composition (%) of dietary levels of sorghum SK-5912 variety fed to broilers at the starter phase

	Diets				
Ingredients	1	2	3	4	5
Maize	48.55	36.41	24.28	12.14	0.00
Sorghum (SK-5912)	0.00	12.14	24.28	36.41	48.55
Soya bean	33.65	33.65	33.65	33.65	33.65
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	3.00	3.00	3.00	3.00	3.00
+ Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Methionine	0.20	0.20	0.20	0.20	0.20
Lysine	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00
Proximate Analysis					
Crude protein (%)	23.00	23.00	23.00	23.00	23.00
ME (kcal/kg)	2950.00	2900.00	2900.00	2900.00	2850.00
Crude fibre (%)	4.00	4.00	4.00	3.80	3.80
Ether Extracts (%)	4.18	4.43	4.61	4.78	4.93
Calcium (%)	1.44	1.45	1.45	1.46	1.46
Phosphorus (%)	0.74	0.77	0.80	0.82	0.86
Methionine (%)	0.37	0.36	0.35	0.34	0.33
Lysine (%)	1.20	1.21	1.23	1.24	1.25

+Premix: A bio-organics nutrient supplement containing Vit. A 12,500,000 I.U; Vit.D3 2,500,000 I.U; Vit. E 40,000mg; Biotin 80mg; Vit. B1 3,000mg; Vit.B2 5,500mg; Niacin 55,000mg; Vit.K3 2,000mg; Calcium Pantothenate 11,5000mg; Vit. B6 5,000mg; Vit. B 12 25mg; Folic acid 1,000mg; Cholin Chloride 500,000mg; Cobalt 300mg; Copper 8,500mg; Iodine 1,500mg; Iron 100,000mg; Manganese 120,000mg; Selenium 120mg; Zinc 80,000mg; Anti-oxidant 120,000mg.

Table 2: Ingredients and chemical composition (%) of dietary levels of sorghum SK5912 variety fed to broilers at the finisher phase

	Diets				
Ingredients	1	2	3	4	5
Maize	53.04	39.78	26.52	13.26	0.00
Sorghum(SK-5912)	0.00	13.26	26.52	39.78	53.04
Boiled soya bean	26.16	26.16	26.16	26.16	26.16
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	3.00	3.00	3.00	3.00	3.00
+ Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Methionine	0.20	0.20	0.20	0.20	0.20
Lysine	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00
Proximate Analysis					
Crude protein (%)	20.00	20.00	20.00	20.00	20.00
ME (kcal./kg)	3000.00	2950.00	2950.00	2900.00	2900.00
Crude fibre (%)	4.24	4.16	4.08	4.00	3.92
Ether Extracts (%)	3.21	3.42	3.57	4.01	4.23
Calcium (%)	1.32	1.32	1.32	1.33	1.33
Phosphorus (%)	0.77	0.80	0.83	0.86	0.89
Methionine (%)	0.49	0.49	0.48	0.47	0.46
Lysine (%)	1.09	1.11	1.12	1.13	1.15

+Premix: A bio-organics nutrient supplement containing Vit. A 12,500,000 I.U; Vit.D3 2,500,000 I.U; Vit. E 40,000mg; Biotin 80mg; Vit. B1 3,000mg; Vit.B2 5,500mg; Niacin 55,000mg; Vit.K3 2,000mg; Calcium Pantothenate 11,5000mg; Vit. B6 5,000mg; Vit. B 12 25mg; Folic acid 1,000mg; Cholin Chloride 500,000mg; Cobalt 300mg; Copper 8,500mg; Iodine 1,500mg; Iron 100,000mg; Manganese 120,000mg; Selenium 120mg; Zinc 80,000mg; Anti-oxidant 120,000mg.

RESULTS & DISCUSSION

The chemical composition of sorghum SK-5912 obtained in the present study is presented in Table 3. The result showed that sorghum SK-5912 had a crude protein content of 10.96 %, crude fibre content of 2.71%, ether extract content of 3.12% and NFE content of 77.58%. The values obtained were slightly higher to the values reported for sorghum by Olomu (2011), who observed that sorghum had a crude protein of 9.50%, crude fibre content of 2.70%, ether extract content of 2.50% and NFE content of 76.60%, and these slight differences could be as a result of differences in varieties, area of production and/or agronomic practices. The tannin level for sorghum SK-5912 is low (4.42mg/kg) but slightly higher than 2.32% reported by Pour-Reza *etal*. (1997). The ingredients and chemical composition of the experimental diets are shown in Tables 1 and 2, indicated that the diets are adequate and meet the requirement for broilers production under tropical environment (NRC,1994; Olomu,2011 andOluyemi and Roberts, 2013).

The growth performance of broiler chickens fed sorghum SK-5912 based diets is presented in Table 4. At the starter phase daily feed intake (50.20-54.00g) was not significantly affected by the treatment diets. Daily weight gain (24.01-27.55g) and feed conversion ratio (1.84-2.17) were also not significantly (P>0.05) influenced. More so, values obtained at the finisher phase for daily feed intake (117.51-122.77g), daily weight gain (40.35-49.49g) and feed conversion ratio (2.47-3.01) showed no significant difference among the treatment diets. This result is in agreement with Olomu, (2011), who reported that low tannin yellow sorghum can replace maize without any adverse effect on performance. The overall performance showed daily feed intake (80.44-83.38g), daily weight gain (31.73-36.83g), as well as feed conversion ratio (2.27-2.64) were similar across the treatment diets. This result also is in conformity with the findings of Pour-Reza *etal*. (1997) who stated that, all dietary maize can be replaced with low tannin sorghum without adverse effects on live weight gain, feed intake and feed conversion ratio.

In addition, it was observed that throughout the experiment results on daily weight gain, feed intake as well as feed conversion ratio were not significantly affected, which suggest that sorghum SK-5912 had no negative effect on performance and birds can utilize it efficiently. This finding is supported by Kwari *et al*. (2014) who reported that maize and sorghum or their combinations can be used as energy sources in broiler chicken diets without adverse effects on the health of the birds.

The results of carcass yield and gut characteristics of birds fed sorghum SK-5912 based diets is presented in Table 6. Significant difference (P<0.001) was observed among treatments for percent large intestine weight (0.16 to 0.33%). The highest value (0.33) was recorded in birds fed diet 5 (100% sorghum SK-5912), while the lowest value of 0.16% was in diets 1 (control) and 2, this result is in contrast with the findings of Yunusa, *et al.* (2014) who reported that the relative weight of intestine were not significantly affected by variation in dietary energy sources. The results showed that there was no significant (P>0.05) difference among the treatment means in live weight and dressing percentage, the highest live weight was diet 1 (1.82 kg) while diet 5 had the lowest value (1.71 kg) and the best dressing percent was diet 5 (73.49) and least diet 2 (70.20) and this is in conformity with the findings of Adamu, *et al*. (2012) who reported that replacing maize with yellow sorghum resulted in increased dressing percentage due to higher protein content of sorghum SK-5912 variety compared to maize, and values obtained were slightly above the values reported by Salami *et al*. (2004) for well finished broilers, 65-70%, which indicates that the diets used were adequate to support good performance of broiler chickens. Similarly, there was no significant (P>0.05) difference in percent gizzard weight, lungs weight, heart weight and kidney weight. Although, the reasons for these were not clear, but it could be attributed to the corresponding increase in fibre content of the diets as a result of inclusion of sorghum SK-5912 which could be responsible for the hypertrophy of these organs in response to the diets fed.

Table 3: Chemical composition of sorghum SK-5912

Nutrients	**Values**
Moisture content (%)	3.44
Crude protein (%)	10.96
Ether extracts (%)	3.12
Crude fibre (%)	2.71
Ash (%)	2.19
NFE (%)	77.58
Tannins (mg/kg)	4.43
Phytic acid (mg/kg)	326.89
Hydrocyanic acid (%)	3.41

Table 4: Performance of broiler chickens fed sorghum SK-5912 based diets

	Diets					
Parameters	1	2	3	4	5	SEM
Starter phase(1-4 wks)						
Daily Feed Intake (g)	54.00	52.44	50.20	51.31	50.58	1.21^{NS}
Daily Weight Gain (g)	26.89	24.18	27.55	25.60	24.01	1.03^{NS}
Feed Conversion Ratio	2.02	2.17	1.84	2.01	2.12	0.07^{NS}
Mortality (Number)	2.00	3.00	2.00	2.00	1.00	-
Finisher phase (5-8 wks)						
Daily feed intake (g)	120.07	122.77	120.76	117.51	119.17	1.96^{NS}
Daily weight gain (g)	49.49	41.34	40.35	43.46	42.04	3.27^{NS}
Feed conversion ratio	2.47	3.00	3.01	2.74	2.97	0.20^{NS}
Mortality (Number)	2.00	0.00	0.00	0.00	2.00	-
Overall performance(1-8 wks)						
Daily feed intake (g)	83.07	83.38	81.24	80.44	80.76	1.28^{NS}
Daily weight gain (g)	36.83	31.73	33.19	33.46	31.94	1.32^{NS}
Feed conversion ratio	2.27	2.64	2.46	2.42	2.56	0.10^{NS}
Mortality (Number)	4.00	3.00	2.00	2.00	3.00	-

NS= Not significant; SEM= Standard error of means

Table 5: Carcass and gut characteristics (% body weight) of broiler chickens fed sorghum SK-5912 based diets

	Diets				
Parameters	1	2	3	4	5	SEM
Live weight (kg)	1.84	1.79	1.79	1.79	1.71	0.06 ^{NS}
Plucked weight (kg)	1.67	1.61	1.65	1.63	1.55	0.07 ^{NS}
Eviscerated weight (kg)	1.43	1.40	1.29	1.43	1.43	0.08 ^{NS}
Carcass weight (kg)	1.32	1.26	1.28	1.31	1.26	0.06 ^{NS}
Dressing percentage	71.89	70.20	71.69	73.00	73.49	1.48 ^{NS}
Lungs weight (%)	0.60	0.55	0.54	0.52	0.55	0.06^{NS}
Heart weight (%)	0.50	0.55	0.54	0.52	0.55	0.06 ^{NS}
Liver weight (%)	2.08	1.79	1.95	1.69	1.84	0.18 ^{NS}
Kidney weight (%)	0.28	0.26	0.25	0.26	0.21	0.03 ^{NS}
Abdominal fat weight (%)	1.39	1.32	1.14	1.22	1.08	0.15 ^{NS}
Gizzard weight (%)	2.56	2.56	2.45	2.27	2.43	0.18 ^{NS}
Small intestine weight (%)	3.10	2.87	2.53	2.41	2.39	0.26 ^{NS}
Small intestine length (cm)	171.88	157.50	167.88	148.00	160.75	7.93 ^{NS}
Large intestine weight (%)	0.16	0.16	0.20	0.18	0.33	0.17***
Large intestine length (cm)	9.40	10.14	9.58	8.40	7.77	1.21 ^{NS}
Caecal weight (%)	0.40	0.49	0.53	0.50	0.46	0.04 ^{NS}
Caecal length (cm)	17.19	16.25	16.75	16.69	15.88	0.64 ^{NS}
Pancreas weight (%)	0.31	0.26	0.32	0.25	0.28	0.03 ^{NS}
Spleen weight (%)	0.18	0.17	0.13	0.19	0.13	0.03 ^{NS}

^{abc}Means bearing different superscripts within the same row differ (***=P<0.001), NS=Not Significant, SEM=Standard Error of Mean.

CONCLUSION

The study revealed that growth performance and carcass characteristics of broiler chickens were not adversely affected by the inclusion of sorghum SK-5912. It can be concluded that sorghum SK-5912 can effectively be used to replace up to 100% of maize in the diets of broiler chickens. The low tannin content and availability makes it a sustainable alternative energy source for raising broiler chickens.

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