



GROWTH PERFORMANCE OF BROILER CHICKENS FED DIFFERENT VARIETIES OF SORGHUM AND FULL-FAT SOYA BEAN DIETS

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ABSTRACT

An experiment was conducted to evaluate the effects of different varieties of sorghum on the performance of broiler chickens fed five different experimental diets. Four sorghum varieties ex-vom (red sorghum), SK5912 (yellow sorghum), ex-kano (white sorghum) and ICSV400 (brown sorghum) were evaluated, while maize served as the control diet. Full fat soya bean was used as plant protein source. A total of three hundred (300) unsexed, Cobb 500 broiler chicks were used for the experiment. The birds were randomly allocated to five dietary treatments and each treatment was replicated four times in a completely randomized design (CRD) with fifteen (15) birds per replicate. Data were collected on daily feed intake, weekly weight gain and mortality. The data generated were subjected to analysis of variance. The results revealed no significant difference in performance parameters in overall daily feed intake (91.39, 85.09, 90.43, 89.74 and 84.22 g), and body weight changes with, 33.29 g on diet 1(control), followed by 29.41 g (diet 2), 29.53 g (3), 23.82 g (4) and 32.22 g in broiler chickens fed diets 5. Feed conversion ratio (FCR) was similar among the dietary treatments with values of 2.70, 2.83, 3.02, 4.05 and 2.98 on diets 1 to 5 respectively. The final body weight ranged from 1030 to 1310g on diets 4 and 1 respective. It can be concluded that all the four varieties of sorghum tested can be used in rearing of broiler chickens as there was no any negative effect on growth performance of the birds and no significant differences existed among the five experimental diets.

Keywords: Sorghum, Varieties, Maize, Soybean, Broiler, Performance.

INTRODUCTION

Poultry farming is the system of animal husbandry which raises domesticated birds such as chickens, ducks, turkeys and geese to produce meat or eggs for food. The primary purpose for keeping poultry in all parts of the country is for both dietary and economic reasons (Ogundipe and Sanni, 2002). Poultry production offers the highest potential for increasing the quality and quantity of animal protein intake in Nigeria, as it is a good source of high-quality protein and can reach a table size within 6 to 8 weeks of age due to its fast-growing rate and short generation interval. The low level of animal protein intake is as a result of high cost of the animal products which in turn is as a result of high cost of production. Poultry product has a wide acceptance with little or no limitations in terms of traditional and religious taboos as compared to pork (Afolabi and Oladimeji, 2003). Maize is a major source of dietary energy in poultry nutrition. Although it is produced throughout the world, there is stiff competition for maize among humans, livestock and the industries. The feed ingredient cost is increasing day by day and feed accounts for approximately 60-70 percent of total cost of production in poultry farming (Thakur, 2019) and of which protein and carbohydrate accounts for a larger part. Also, Yakubu (2006) reported that maize is the major source of energy in monogastric feeds accounting for over 40% of the total ration. Due to the competition and over dependence on maize, other sources of feed ingredients must be looked in to. Locally available ingredient that can stand as an alternative to maize in poultry production. Sorghum, is one of the alternatives of maize in the diet of chickens. Sorghum (*Sorghum bicolor* (L.) Monch) is a drought resistant cereal that is produced worldwide. It is the fifth most important crop after wheat, rice, corn, and barley (Bryden *et al.*, 2009). Sorghum grain is an interesting dietary energy ingredient in poultry diets due to its nutritional composition, which is similar to corn. Nigeria is among the major sorghum producing countries after U.S. and India, then Mexico, China, Sudan, Argentina, and Australia (Salissou, 2009). It is a typical cereal grain in semi-arid areas of the tropics and has a similar water requirement as other cereals. Sorghum is tolerant to



drought and it performs better than maize during drought and grows on areas unsuitable for maize. Crude protein content in sorghum grain ranges from 9 to 13 % DM and is slightly higher than that of maize, though much more variable, depending on growing conditions (Jacquie, 2014). This study will therefore, test the effect of four different sorghum varieties on growth performance of broiler chickens and its possibility in replacing maize.

MATERIALS AND METHODS

Area of the study

The research was conducted at the poultry section of the Teaching and Research Farm of Abubakar Tafawa Balewa University Bauchi, Bauchi State, Nigeria. The climate is characterized by two well defined rainy season (June-October) and dry season (November-May). The total mean rainfall in the state is 700-900mm for the Northern zone, 690-1031mm for Central zone and 900-1300mm for the Western zone. The mean temperature ranges between 19.15°C and 40°C. (BSADP, 2003).

Experimental Ingredients and the Experimental Diets

The feedstuffs used for the experiment like maize, red, yellow and white sorghum were purchased from Railway market in Bauchi town, while the brown sorghum (ICSV 400) was purchased from Misau local government area of Bauchi State. The remaining ingredients such as soya bean, groundnut cake, fish meal, wheat offal, bone meal, limestone, salt, methionine, lysine and vitamin-mineral premix were bought from Gidan waya, Muda Lawal market in Bauchi. Soya bean was boiled for about 30 minutes and sun-dried for 3 days to reduce the effect of anti-nutritional factors. The five cereals and the soya bean were milled to reduce the particle size before incorporating in to the diets. Five experimental diets were formulated with 23 crude protein, respectively. Diet 1 (control) was maize, while the other treatments were made of four varieties of sorghum, they include; ex-vom (red sorghum), SK5912 (yellow sorghum) ex-kano (white sorghum) and ICSV400 (brown sorghum) coded as diets 1, 2, 3, 4, and 5 respectively, for both phases. The four varieties of sorghum were each used as the sole energy source in the 4 diets with maize as the control.

Table 1: Ingredient Composition and Calculated Analysis (%) of Diets Containing Different Sorghum Varieties Fed to Broiler Chicks at Starter Phase (1-4 weeks)

Ingredients	Diets				
	1 Maize	2 Ex-Vom	3 SK5912	4 Ex-Kano	5 ICSV400
Energy sources	49.00	49.00	49.00	49.00	49.00
Soya bean	32.30	32.30	32.30	32.30	32.30
Wheat offal	10.00	10.00	10.00	10.00	10.00
Fish meal	5.00	5.00	5.00	5.00	5.00
Limestone	1.50	1.50	1.50	1.50	1.50
Bone meal	1.50	1.50	1.50	1.50	1.50
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10
Total	100	100	100	100	100
Calculated analysis					
ME kcal/kg	2889.90	2846.28	2846.28	2846.28	2846.28
Crude protein (%)	23.00	23.82	23.82	23.82	23.82
Crude fibre (%)	4.00	3.66	3.66	3.66	3.66
Ether extract (%)	7.22	7.01	7.01	7.01	7.01
Calcium (%)	1.23	1.24	1.24	1.24	1.24
Phosphorus (%)	0.80	0.68	0.68	0.68	0.68
Methionine (%)	0.50	0.51	0.51	0.51	0.51
Lysine (%)	1.30	1.24	1.24	1.24	1.24

ME: Metabolizable Energy



*Vit/Mineral premix supplied/kg of Diet: Vit. A, 12,500IU; Vit. D₃, 2,500IU; Vit. E, 30IU; Vit. K, 2.5mg; Riboflavin, 6mg; Niacin, 30mg; Pantothenic acid, 10mg; Vit. B, 2mg; Vit. B₁₂, 22mg; Biotin, 0.05mg; Folic acid, 1mg; Chlorine chloride, 0.3mg; Cobalt, 0.5mg, Copper, 10mg, Iodine, 1.5mg, Iron, 100mg, Manganese, 100mg; Selenium, 0.1mg; Zinc, 100mg and Antioxidant, 0.125mg.

Table 2: Ingredient Composition and Calculated Analysis (%) of Diets Containing Different Sorghum Varieties Fed to Broiler Chickens at Finisher Phase

Ingredients	Diets				
	1 Maize	2 Ex-Vom	3 SK5912	4 Ex-Kano	5 ICSV400
Energy sources	51.00	51.00	51.00	51.00	51.00
Soya bean	26.30	26.30	26.30	26.30	26.30
Wheat offal	15.00	15.00	15.00	15.00	15.00
Fish meal	3.00	3.00	3.00	3.00	3.00
Limestone	1.50	1.50	1.50	1.50	1.50
Bone meal	2.50	2.50	2.50	2.50	2.50
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10
Total	100	100	100	100	100
Calculated analysis					
ME kcal/kg	3083.08	3016.46	3016.46	3016.46	3016.46
Crude protein (%)	20.00	20.86	20.86	20.86	20.86
Crude fibre (%)	7.17	7.06	7.06	7.06	7.06
Ether extract (%)	4.23	3.87	3.87	3.87	3.87
Calcium (%)	1.46	1.45	1.45	1.45	1.45
Phosphorus (%)	0.90	0.82	0.82	0.82	0.82
Methionine (%)	0.44	0.45	0.45	0.45	0.45
Lysine (%)	1.11	1.05	1.05	1.05	1.05

ME: Metabolizable Energy

*Vit/Mineral premix supplied/kg of Diet: Vit. S, 8,500IU; Vit. E, 10mg; Vit. K₃, 1.5mg; Vit. B₁, 1.6mg; Vit. B₂, 4mg; Niacin, 20mg; Pantothenic acid, 5mg; Vit. B₆, 1.5mg; Vit. B₁₂, 0.01mg; Folic acid, 0.5mg; Biotin, 0.75mg; Chlorine chloride, 175mg; Cobalt, 0.2mg, Copper, 3mg, Iodine, 1mg, Iron, 20mg, Manganese, 40mg; Selenium, 0.2mg; Zinc, 30mg and Antioxidant, 1.25mg.

Experimental Design and Broiler Chickens Management

Three hundred (300) unsexed, Cobb 500 broiler chicks were used for the experiment. The poultry research house was washed and disinfected two weeks before bringing in the chicks. Suitable feeders and drinkers were provided together with clean water and starter mash. The chicks were brooded for 10 days on deep litter using commercial feed (broiler starter). Heat was provided using 200 watts electric bulbs and charcoal stoves. At the end of the one week period, the birds were randomly allotted to five dietary treatments and each treatment was replicated four times in a completely randomized design (CRD) with fifteen (15) birds per replicate. Initial weight of the birds in each pen was taken. Feed and water were supplied *ad libitum*. Daily records of feed intake were measured, while body weight changes were taken on weekly basis. Mortality was recorded as it occurred. Vaccinations against Gumboro and Newcastle diseases were carried out (1st and 2nd doses). Anti-stress was given on arrival and after each vaccination and weighing. Data generated were subjected to analysis of variance using MINITAB version 17.

RESULTS AND DISCUSSION

Growth Performance

The results as presented in Table 3 showed that, initial body weight (IBW) of the birds, 193.48 to 196.61 g, was similar across the different sorghum diets. This findings agreed to the result of Kawu



(2019) where he reported a non-significant difference on the initial body weight of broiler chickens fed Gayamba millet as replacement for red sorghum, and his values for initial body weight (198.11- 232.57 g) were slightly higher than the values obtained for the present research, the reason may be he took longer period of time brooding the chicks, compared to the period taking by the present research. At the starter phase, daily feed intake (DFI) 53.97 to 67.09 g values were not significantly affected and were comparable to the values of 66.21 to 67.46 g average daily feed intake reported by Al-mustapha (2021), in his research where he fed broiler chickens with yellow maize and yellow sorghum as energy sources, also daily weight gain (DWG) values of 17.65 to 30.43 g obtained and feed conversion ratio (FCR) 1.99 to 3.78 recorded were in line with his findings of not significant differences across the five diets. The values obtained at four weeks for the present research was however lower than 675.00-1032.50 g values of weight of broiler chickens at four weeks reported by Jama'a (2018), but higher than 407.50-570.50 g/bird reported by Oloyede *et al.* (2010). This however, may occurred as a result of different management by the different researchers. Similarly, no significant differences were found in final body weight and this outcome supported the findings of Jama'a (2018) where he reported a non-significant difference on final body weight of broiler chickens fed dietary levels of ICSV400 sorghum variety with graded levels of soya bean and GNC based meal. The values obtained for total weight gain (833.81 – 1114 g) of the broiler chickens were lower than values of 1571.58 – 1821.58 g reported by Al-mustapha (2021). Probably the differences on total weight gain and the final body weight in previous researches and present research may be as a result of the nature and quality of the feed ingredients, breed differences, age of the broiler chicken at the end of the experiment. At the overall phase of the research, it was found that all the parameters considered, the daily feed intake, daily weight gain, conversion ratio and feed efficiency were not significantly affected by the different sorghum varieties. The present study agreed with the earlier report of Issa *et al.* (2007), where they replaced maize with sorghum in the diets of broiler chicken and the results showed no significant difference in average daily feed intake, daily weight gain and feed conversion ratio when maize was completely replaced with sorghum in a 60 days experiment. However, the result of the present research is contrary to the findings of Torres *et al.* (2013) where they reported that BWG and feed intake were affected in broilers fed high sorghum-based diets. Overall number of mortalities ranges from 1 – 3, and it is below the 5% allowance for broiler chickens reported by Oluyemi and Roberts (2013), therefore, the cause of the mortality was not investigated.

Table 3: Growth Performance of Broiler Chickens Fed Different Sorghum Varieties and Full Fat Soya Bean Based Diets

Parameters	Diets					SEM
	1 Maize	2 Ex-Vom	3 SK5920	4 Ex-Kano	5 ICSV400	
Productive performance						
IBW(g)	195.54	196.61	193.48	196.19	194.19	3.51 ^{NS}
4 th week wt (g)	804.10	766.54	726.04	752.69	547.14	75.08 ^{NS}
Final wt (g)	1310	1210	1180	1030	1200	0.10 ^{NS}
TWG(g)	1114	1013.39	986.52	833.81	1005.81	-
Starter phase						
DFI(g)	65.78	53.97	67.09	66.98	66.64	7.12 ^{NS}
DWG(g)	30.43	27.14	26.63	27.83	17.65	1.83 ^{NS}
FCR	2.16	1.99	2.52	2.41	3.78	0.18 ^{NS}
FE	0.46	0.50	0.40	0.42	0.26	0.03 ^{NS}
Mortality (Number)	2.00	2.00	2.00	1.00	1.00	-
Finisher phase						
DFI(g)	117.00	116.21	113.77	112.49	101.79	6.35 ^{NS}
DWG(g)	36.14	31.68	32.43	19.81	46.63	1.88 ^{NS}
FCR	3.24	3.67	3.51	5.68	2.18	0.44 ^{NS}
FE	0.31	0.27	0.29	0.18	0.46	0.01 ^{NS}
Mortality (Number)	1.00	1.00	0.00	1.00	0.00	-
Overall phase						
DFI (g)	91.39	85.09	90.43	89.74	84.22	3.14 ^{NS}
DWG (g)	33.29	29.41	29.53	23.82	32.14	1.21 ^{NS}
FCR	2.70	2.83	3.02	4.05	2.98	0.19 ^{NS}
FE	0.39	0.39	0.35	0.30	0.36	0.30 ^{NS}
Mortality (Number)	3.00	3.00	2.00	2.00	1.00	-

2 = Red sorghum, 3 = Yellow sorghum, 4 = White sorghum, 5 = Brown sorghum, NS = Not Significant, IBW – Initial body weight, DFI = Daily feed intake, DWG = Daily weight gain, FCR = Feed conversion ratio, FE = Feed efficiency, FBW = Final body weight, TWG= Total weight gain.

CONCLUSION AND RECOMMENDATION

It can be concluded that all the four varieties of sorghum tested (ex-vom/red, SK5912/yellow, ex-kano/white and ICSV400/brown) can be used in feeding broiler chickens in combination with full fat soya bean as protein source with no detrimental effects on growth performance of broiler chickens. Poultry farmers are therefore, advised to make use of any of the four sorghum varieties in growing broiler chicken, however, preference will be based on availability and cost. Additional studies should be conducted with other species of poultry to evaluate the effects of the different sorghum varieties.

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