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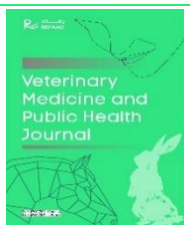

Carcass and Gut Characteristics of Broiler Chickens Fed Diets Containing "Masakwa" Sorghum (Sorghum Bicolor L.) Variety as Replacement for Maize

Yalwandamai, Y.I.[1*], Nyifi, A.S.[2], Torhemen, L.N.[3], Torhemen, M.[4], Abel-Achimugu, J.[5], Mundi, H.L.[5], Odiba, J.[1], and Edidiong, F.D.[1]

[1] Department of Animal Science, Federal University, Kashere, Nigeria
[2] Department of Animal Production and Health, Federal University, Wukari, Nigeria
[3] Department of Animal Nutrition, Joseph Sarwuan Tarka University, Makurdi
[4] Department of Animal Husbandry, Akperan Orshi Polytechnic, Yandev, Nigeria
[5] Department of Animal Science, Federal University, Lafia, Nigeria
[*]Corresponding Author: Yalwandamai, Y.I (yalwandamai1980@gmail.com)

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Abstract:

Objectives: The aim of the study was to investigate the effects of "Masakwa" sorghum in place of maize as energy sources in broiler diets on gut and carcass characteristics of broiler chicken.

Methods: Five (5) 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-day old broiler chicks were brooded and randomly allotted into the five dietary treatments with three replicates per treatment in a completely randomized design. Feed and water were provided ad libitum and the experiment lasted 8 weeks, On the last day of the experiment 3 birds were slaughtered from each replicate, bled, eviscerated and dressed. Data obtained were subjected to statistical analysis using the methods outlined by Steel and Torrie(1980) Samples of the experimental feeds were analysed for their proximate composition using the methods of AOAC (2000).

Results: The dressing percentage ranged from 68.15 – 85.07% and were significantly different Prime cuts showed that drumstick ($P < 0.05$) and wing ($P < 0.01$) were affected by the dietary levels. The values ranged from 4.79 – 10.63 % and 3.19 – 9.39% However, live weight, dressed weight, breast, back, neck and other organs such as head, liver, intestine, caeca, lungs and heart indicate no significant difference ($P > 0.05$)). The intestiunal length fell within the values of 4.58 – 5.78% and the weight of the heart was 0.44 – 0.58%.

Conclusions: The study revealed that using "Masakwa" Sorghum Variety (MSV) to replace maize had no adverse effect on the carcass and Gut characteristics of broiler chicken. Sorghum can replace maize completely in broiler diets for optimum carcass yield and quality as well as normal gut morphology.

Keywords: *Carcass; Gut Characteristics; Broiler Chickens; Sorghum bicolor.*

1 Introduction

Human population growth, urbanization and income improvement are responsible for the increased demands for foods of animal origin (Adeoye *et al* 2017 & Adebayo *et al* 2018,) people are becoming conscious of scientific dieting. (Ocheja *et al,* 2020) Animal products provide about five (5) percent of daily energy supply in Nigeria, which is considerably lower than the West African average of 9.5 percent (Steinfeld, 2003). Food and Agriculture Organization (FAO,2011) reported that poultry meat and eggs are still considered luxury foods for many Nigerians in rural areas; poultry consumption is reserved for special occasions, meat and eggs typically come from households flocks. FAO (2010) reported that throughout the year, Nigerian demand for poultry meat peak in December, around Christmas and New Year and in Apri for Easter and during Muslims Sallah celebrations Given the importance of poultry to the Nigerian Agricultural system and Economy Torhemen *et a*l, (2022) called for a more efficient poultry production.

The most important component of poultry production is the feed which constitute about 60-80% of the whole cost of poultry production (Oladimeji *et al.*, 2017; Daghir, 1985; Oruselbio and Smile, 2001; Talha & Yaqoub 2008), maize which form the major source of energy in poultry diet is very expensive as a result of low production and intense competition for its usage by man and other livestock species (Eko *et al* 2020; Ajaje *et al*; 2002,Afolayan *et al*., 2002). This necessitate an alternative for maize in which Masakwa Sorghum Variety (MSV) is handy. Adamu *et al*. (2012) reported that sorghum is a suitable replacement for maize in broiler diets with good performance. This may be as a result of the similarity in total caloric value and nutritional composition of maize and sorghum. The chemical composition of maize is reported to be dry matter 91.25, crude protein 10.20, crude fibre 1.32, Ether extract 4.72 and Nitrogen free extract 73.65 while Sorghum was reported as 78.00, 12.00, 3.30, 2.20 and 67.04% (Topps and Oliver,1993) respectively. The study was conceived to evaluate carcass and guts characteristics of broiler chickens fed diets containing graded levels of Masakwa Sorghum variety.

2 Materials and Method

2.1 Study Area

The Study was conducted at the Poultry Unit of the Adamawa State University Teaching and Research Farm, Mubi, Adamawa State, Nigeria. Mubi is a town situated in Northern Guinea Savannah between latitudes 10.00 N and longitudes 13.30 E and about 305 metres 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 extremely low about 20-30% 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 a maximum of 40° C in April (Adebayo & Tukur,1999).

2.2 Experimental Birds and their Management

A total of150 day-old broiler chicks (Anak, 2000) were randomly allotted to 5 experimental diets. They were sub-divided into three (3) replicates of ten (10) birds, the chicks were housed on deep litter pens, clean fresh water and feeds were served 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.

Five Isonitrogeneous experimental diets for both broiler starter (23% crude protein) and broiler finisher (20% crude protein) phases of growth were formulated."Masakwa" Sorghum Variety (MSV) (*Sorghum bicolor L.Moech*) 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 as well as calculated analysis are shown in Tables 1 and 2.

Table 1: Composition of the Experimental Broiler Starter diets (1-4 weeks) Replacement Level of maize with "Masakwa Sorghum %

Ingredients (%)	0	Replacement Level of maize wits (Diets %)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 I.U, Vitamin K,3,000mg, Thiamin B; 3,000g, Riboflavin B2; 8,000mg, Pyridoxine B6 4,000mg, Niacin, 4,000mg, Vitamin B12, 20mg; Calpan 10,000mg;Folic acid 1,000mg; Biotin,30mg; Antioxidant,125g; choiine 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) Replacement Level of maize with"Masakwa Sorghum %

Ingredients (%)	Replacemen 0	(Diets %)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 D23,500.00 I.U, Vitamin E 30,000.00 I.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.

2.3 Statistical analysis

The data obtained from both experiments were subjected to analysis of variance technique as outlined by Steel and Torrie (1980).

3 Results and Discussion

The result showed that broiler chickens fed "Masakwa" Sorghum based diets were heavier and yielded higher carcass than birds on the control diet. This observation is in conformity with the report of Etuk *et al.* (2002) but at variance with the findings of Adamu *et al.* (2012)who reported no significant difference (P>0.05) in the carcass yield of broiler chickens fed graded levels of yellow sorghum as replacement for maize, the dressing percentage differed significantly among the experimental diets which ranged from 68.15 to 85.07% (P<0.05). Wing weight percentage indicated higher significant difference (P <0.01) it ranged from 3.19 to 9.29% across the dietary treatments and drumstick showed significant difference(P <0.05)which ranged from 4.77 to 10.68%, this result contradicts that of Kwari *et al.,*(2012)who reported that these parameters showed no significant difference (P>0.05) in an experiment on Replacement value of Low Tannin Sorghum (Sorghum bicolor) for Maize in Broiler Chickens Diets. Thigh cut percentage is higher in diet 5 (12.77%) this may be attributed to the higher protein level of "Masakwa"Sorghum. The weight indicated no significant difference (P> 0.05) which agreed with the result obtained by Medugu *et al.,* (2010) in an experiment conducted on Carcass and Blood Components of Broiler Chickens Fed Sorghum or Millet as replacement for maize in semi-arid zone of Nigeria.

Breast, back and neck showed no significant difference (P>0.05)and indicated that MSV did not adversely affects the components in the study, It is in conformity with Douglas *et al.,* (1990)who fed selected grain Sorghum Variety and Yellow Corn.

Other visceral organs, proportion of intestine (4.85 to 6.02%), intestinal length (cm) (157.96 to 192.58), Caecal proportion of (0.45 to 0.90%) and Caecal length (cm)(20.39 to 47.25). The Gizzard and lungs percentages (2.56 to 2.74%) and (0.46to 0.76%) respectively were all not statistically different (P>0.05) among the dietary treatments. The result is in agreement with the work of Yunusa *et al*. (2014) who evaluated carcass and gut characteristics of broiler chickens fed different energy sources.

The result equally agree with the findings of Illiya (2008) who observed no significant difference across the dietary treatment for dressing percentage, head and shanks weight, lung weight, liver weight, heart weight, small and large intestine weights, caecal and pancreas weight of broiler chickens fed graded levels of germinated red "Jigari" sorghum as replacement for maize. The non-significant difference of gizzard and lungs is in conformity with that of Adamu *et al*., (2012) and Yunusa *et al.,* (2014). For the well finished broilers dressing percentage 68.15 to 85.07% indicates that diets used were adequately efficient to support good performance of broiler chickens.

Table 3: Carcass Yield, Organs and Prime Cuts of Broiler Chickens Fed Dietary Levels of "Masakwa"Sorghum

Parameters	Diets					SEM
	Masakwa"Sorghum 1(0%)	2(25%)	3(50%)	4(75%)	5(100%)	
Live weight (%)	2116.70	2316.70	2008.30	2200.00	21116.70	176.97 *
Dressed weight(g)	1.442.53	1,970.82	1,611.26	1,813.90	1782.26	2.38 NS
Dressing (%)	68.15b	85.07a	80.23a	82.45a	84.20a	3.08*
Wing (%)	3.19b	3.56a	4.06a	6.57a	9.29a	1.40**
Thigh (%)	5.73	5.77	8.95	10.89	12.77	2.51 NS
Drumstick (%)	4.77a	5.89b	7.45b	7.96b	710.68°	1.44 *
Breast (%)	19.29	20.42	20.76	22.86	23.27	3.88 NS
Back (%)	13.74	14.75	15.63	15.37	6.19	0.78 NS
Neck (%)	3.78	4.36	4.39	5.37	6.19	0.78 NS
Head (%)	2.32	2.39	2.66	2.48	2.35	0.14 NS
Heart (%)	0.44	0.49	0.49	0.58	0.19	0.07NS
Liver (%)	1.43	1.95	1.99	2.02	2.42	0.36NS
Intestine (%)	4.85	5.54	5.61	5.78	6.02	0.66 NS
Intestinal length (cm)	157.96	170.76	182.18	182.92	192.58	3.35 NS
Caecal(%)	0.45	050	0.58	0.66	0.90	0.13 NS
Caecal length (cm)	20.39	20.65	27.60	34.50	47.25	8.01 NS
Gizzard (%)	2.56	2.61	2.66	2.71	2.74	0.5NS
Lungs (%)	0.46	0.51	0.51	0.60	0.76	0.33NS **<

a,b,c=Means in the same row bearing different super scripts differ significant (P <0.05,** <0.01)NS =Not significant difference (P> 0.05).

4 Conclusion

In conclusion, "Masakwa" Sorghum Variety is a suitable energy source in broiler diets and can completely replace maize with no adverse effect on Carcass yield and gut mophorlogy Masakwa sorghum variety can be used to replace maize up to 100% for uptimun carcass yield and gut characteristics.

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