



RESPONSE OF FINISHER BROILER CHICKENS TO DIETARY LEVELS OF BAUCHI RED SORGHUM VARIETY

Doma, U. D., Adamu, N., Jama'a, N. A. and Mubarakat, Y.

Department of Animal Production, Faculty of Agriculture and Agricultural Technology,
Abubakar Tafawa Balewa University, P. M. B. 0248, Bauchi, Nigeria,

Corresponding Author's E-mail: umardoma@yahoo.com Tel: 08130862894

ABSTRACT

This experiment was conducted to determine the response of finisher broiler chickens to dietary replacement levels of Bauchi Red Sorghum (BRS) for maize. Five experimental diets were formulated in which BRS replaced maize at 0, 25, 50, 75 and 100% levels, coded as diets A, B, C, D and E, respectively. Two hundred (200) broiler chickens weighing between 1147.50 and 1180.00g were allotted to the five diets in replicates of two containing 20 birds each in a Complete Randomized Design. Feed and water were served *ad libitum* and the study lasted for 21 days. Data for growth performance indices (feed intake, body weight gain, feed conversion ratio, feed efficiency, survivability) and cost benefit (feed cost, feed cost per kg gain and cost saving) were collected. Results showed that total weight gain was higher ($P < 0.05$) on diet E (1052.50g) which was similar to diet B (1027.50g), diet C (1014.00g) and diet D (1005.00g) than on diet A (995.00g). The daily weight gain also followed the same trend with significantly ($P < 0.05$) higher value on diet E (50.12g), which was similar to the values observed on diet B (48.93g), diet C (48.29g) and diet D (47.86g) while the lowest value of 46.43g was obtained on diet A (control diet). Similarly, feed conversion ratio was also better in broiler birds fed diets C and E (2.74) whereas the poorest feed conversion ratio of 2.97 was found on diet A. Feed cost (₦/kg) declined progressively from ₦500.00 on diet A to ₦380.00 for diet E. Similarly, feed cost per kg gain also decreased from ₦1474.49 on diet A to ₦1038.57 on diet E. Consequently, the highest percent cost saving was realized on diet E. It is therefore concluded that Bauchi red sorghum variety can completely replace maize in the diets of finisher broiler chickens with improved performance and better cost benefits.

Key words: Bauchi Red Sorghum, Cost Benefit, Finisher Broiler Chicken, Performance,

INTRODUCTION

Adequate nutrition and food security is a yard stick for assessing the quality and standard of living of any nation. A malnourished or hunger-ridden population may not have the mental ability to think, initiate and contribute positively to the advancement of the nation in which it lives. Poultry production remains one of the dynamic ways of attaining protein food security. Recent statistics have shown that the annual consumption of poultry meat in Nigeria stands at about 1.8 million metric tons. However, domestic production stands at 551,000 metric tons only, leaving a deficit of 529,000 metric tons (Nigerian Tribune, 2021). Despite this worrisome situation, the industry still serves as a source of employment for about 85 million Nigerians. If properly fixed, it may have the potential to provide more jobs to our teeming unemployed citizens. The key factor identified as responsible for this huge supply gap for poultry meat has been attributed to the increasing cost of available conventional feed resources, especially, energy and protein sources such as maize, soya bean and fish meal (Akure *et al.*, 2021). Consequently, the need to explore



alternative feed ingredients that are cheaper and readily available becomes necessary. Apart from price advantage, the choice of any candidate as alternative feed resource is determined by its nutritional content and absence of anti-nutritional factors, among others (Ferket and Gernat, 2006). Of all the ingredients used in poultry feed formulation, energy sources remain the ones with largest share of 45-55%. Maize has been the conventional energy source in poultry diets. However, due to its increasing prices and decline in production occasioned partly by climate change and high cost of fertilizer, the need for exploring other alternative non-conventional energy sources becomes necessary. One of these alternatives is Bauchi red sorghum variety.

There are different varieties and cultivars of red sorghum, one of which is the Bauchi red sorghum (BRS). *In vivo* feed evaluation has been identified as the most valuable technique in evaluating the nutrient utilization and safety of any feed or feed ingredient (Zaefarian *et al.*, 2021). Previous experiments (Mohammed and Talha, 2016; Farahat *et al.*, 2020 and Daramola *et al.*, 2021) have revealed that sorghum can completely replace maize in broiler chicken diets without compromising performance and carcass yield. However, there is limited literature on the use of BRS as energy source in broiler chicken diets. The aim of this study is therefore to ascertain the replacement value of Bauchi red sorghum variety for maize in the diets of finisher broiler chickens.

MATERIALS AND METHODS

The Study Area

The study was conducted at the Poultry Unit of the Teaching and Research Farm, Abubakar Tafawa Balewa University, Bauchi, Bauchi State. The area is situated within the geographical coordinates of 10° 18' 37.2" N and 9° 50' 38.0" E. It is 616 metres above sea level with an average annual rainfall of about 1009 mm. Its ambient temperature falls between 13 - 17° C (December – January) and 36 – 37° C (March – April) (Geodatos, 2019). Maize milling waste was purchased from local maize millers that process maize grain into maize flour for human consumption in Bauchi town.

Treatments and Experimental Design

Five experimental diets were formulated in which *Bauchi red* sorghum variety replaced maize at 0, 25, 50, 75 and 100% levels designated as diets A, B, C, D and E respectively (Table 1). Full fat soya bean was the main plant protein source. Other feed ingredients used include; fish meal, wheat offal, limestone, bone meal, vitamin/mineral premixes, lysine, methionine and salt. The diets had a mean crude protein content of 20% CP (finisher phase).

Experimental Birds and their Management

Two hundred (200) three weeks-old broiler chickens weighing between 1147.50 and 1180g were allotted to the five diets in replicates of 2 containing 20 birds each in a Completely Randomized Design. Feed and water were supplied *ad libitum* and the experiment lasted for a period of 21 days.

Data Collection and Analysis

Data was collected for daily feed intake (DFI), daily weight gain (DWG), feed conversion ratio (FCR), feed efficiency (FE), survivability, feed cost per kg, feed cost per kg gain and cost saving among others. Data pertaining to growth performance were subjected to One Way Analysis of Variance (ANOVA) using IBM SPSS statistics 25 for windows (SPSS, 2017). Where significant effect of diet was observed, the means were separated using the Duncan Multiple Range Test of the same software at 5% ($P < 0.05$) level of significance.

Table 1: Composition of Experimental Diets fed to Broiler Chicks at the Finisher Phase (4-6 weeks)

Parameters	Diets				
	A(0%)	B(25%)	C(50%)	D(75%)	E(100%)
Maize	50.93	38.20	25.46	12.73	0.00
Bauchi Red Sorghum	0.00	12.73	25.46	38.20	50.93
Full fat soya bean	26.07	26.07	26.07	26.07	26.07
Wheat offal	15.00	15.00	15.00	15.00	15.00
Fish meal	4.00	4.00	4.00	4.00	4.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Limestone	1.00	1.00	1.00	1.00	1.00
Premix (finisher)	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Methionine	0.30	0.30	0.30	0.30	0.30
Lysine	0.20	0.20	0.20	0.20	0.20
Total	100.00	100.00	100.00	100.00	100.00
Calculated Analysis					
ME (kcal/kg)	3118.51	3103.02	3091.31	3080.76	3066.75
Crude Protein (%)	20.00	20.08	20.08	20.08	20.08
Crude Fibre (%)	3.64	3.67	3.67	3.67	3.67
Ether Extract (%)	7.91	7.99	8.00	8.00	7.98
Calcium (%)	1.82	1.82	1.82	1.82	1.82
Phosphorus (%)	0.91	0.91	0.91	0.91	0.91

ME = Metabolizable Energy.

RESULTS AND DISCUSSION

Growth Performance

Results for growth performance of finisher broiler chickens fed Bauchi Red Sorghum (BRS) diets are presented in Table 2. There was significant ($P < 0.05$) effect of diet on total weight gain, daily weight gain, feed conversion ratio and feed efficiency among diets. Initial weight of birds, which did not significantly differ, ranged from 1147.50g (diet B) to 1180.00g (diet E), final weight varied between 2125.00g and 2220.00g on diets A and E respectively. Total weight gain was higher ($P < 0.05$) in broiler birds fed diet E which did not differ ($P > 0.05$) from those on diets D (1005.00g), C (1014.00g) and B (1027.50g). Birds fed diet A (995.00g) had the lowest mean value which compared favourably with those on diets B, C and D. This indicates that BRS did not contain a significant level of tannins which could negatively affect weight gain. According to Etuk *et al.* (2012) and Hidayat *et al.* (2021), tannins limit the utilization of red and darker sorghum varieties by poultry. Total feed intake was not significantly affected and ranged between 2775.00g (diet C) and 2975.00g (diet B) while daily feed intake spanned from 132.14 to 141.67g on diets C and B respectively. These findings agree with the report of Manyelo *et al.* (2019) who obtained no significant effect when low-tannin sorghum replaced maize in the diets of Ross 308 broiler chickens from 1 – 42 days. However, the findings are in contrast with Olorunsola and Jegede

(2023) who reported that finisher broiler chickens fed red and white sorghum-based diets produced inferior growth performance compared with those on maize diets. This could be attributed to difference in the tannin levels of various sorghum varieties.

Daily weight gain (DWG) was higher ($P < 0.05$) in broiler birds fed diet E (50.12g) and similar to those on diets D (47.86g), C (48.29g) and B (48.93g) while those on diet A (46.43g) had lower mean DWG but comparable with the values on diets B, C and D. Feed conversion ratio was better in broiler birds fed diet E (2.74) than in other diets (2.74 – 2.97), which were similar. Survivability of birds did not differ significantly among treatments and ranged from 98.87 to 100%.

Cost benefit analysis of replacing BRS for maize in finisher broiler chicken diets is presented in Table 3. Feed cost per kg decrease progressively with increased dietary replacement of BRS for maize. It was lowest on diet E (₦380.00) and highest on diet A (₦500.00). Similarly, Feed cost per kg gain was lowest on diet E (1038.57) and highest on diet A (₦1474.49). The highest cost saving was made on diet E (₦29.56). This agrees with the report of Olufemi *et al.* (2021) using white and red sorghum as replacement for maize in starter and finisher broiler chickens.

Table 2: Growth Performance of Finisher Broiler Chickens Fed Dietary Replacement of *Bauchi Red Sorghum* for Maize (4-6 weeks)

Parameters	DIETS					SEM
	A	B	C	D	E	
Initial weight (g)	1150.00	1147.50	1158.00	1180.00	1167.50	10.30
Final weight (g)	2125.00	2175.00	2172.50	2170.00	2220.00	25.91
Total weight gain (g)	995.00 ^b	1027.50 ^{ab}	1014.00 ^{ab}	1005.00 ^{ab}	1052.50 ^a	13.51
Total feed intake (g)	2892.50	2975.00	2775.00	2820.00	2875.00	52.50
Daily feed intake (g)	137.74	141.67	132.14	134.29	136.91	2.50
Daily weight gain (g)	46.43 ^b	48.93 ^{ab}	48.29 ^{ab}	47.86 ^{ab}	50.12 ^a	0.77
Feed Conversion ratio	2.97 ^c	2.90 ^{bc}	2.74 ^a	2.81 ^{bc}	2.74 ^a	0.04
Feed efficiency	0.34 ^c	0.35 ^{bc}	0.37 ^{ab}	0.36 ^{abc}	0.37 ^a	0.00
Survivability (%)	98.87	100.00	98.87	100.00	100.00	0.72

^{abc} = Mean within the same row bearing different superscripts are significantly different SEM = Standard Error of Means.

Table 3: Cost Benefit of Finisher Broiler Chickens Fed Dietary Replacement of *Bauchi Red Sorghum* for Maize (4-6 weeks)

Parameters	A	B	C	D	E
Total feed intake (kg)	2.89	2.97	2.77	2.82	2.87
Feed cost (₦/kg)	500.00	470.00	440.00	400.00	380.00
Total feed cost (₦)	1445.00	1395.90	1218.80	1128.00	1090.50
Total weight gain (kg)	0.98	1.03	1.01	1.01	1.05
Feed cost per kg gain (₦)	1474.49	1355.24	1206.73	1116.83	1038.57
Cost saving (₦)	-	119.25	267.76	357.66	435.82
Cost saving (%)	-	8.09	18.16	24.26	29.56



CONCLUSION AND RECOMMENDATION

Based on the findings of this study, it was concluded that the sorghum variety, Bauchi red sorghum can completely replace maize in the diets of finisher broiler chickens with improved performance and reduced feed cost.

ACKNOWLEDGEMENT

The authors are grateful to the management of Tertiary Education Trust Fund (Tetfund), Nigeria for funding this research project.

REFERENCES

- Akure, C. O., Sekoni, A. A., Abeke, F. O., Vantsawa, P. A., Babasanya, B., Olukotun, O. and Ayodele, J. T. (2021). Growth performance and nutrient digestibility of broiler finishers fed processed *Mucuna pruriens* seed meal. *Nigerian Journal of Animal Production*, **48**(3): 86 – 92.
- Daramola, S.T., Sekoni, A.A., Omage, J.J., Duru, S. and Odegbile, O.E. (2021). Effects of feeding four varieties of Sorghum supplemented with Maxigrain® enzyme on haematology and carcass characteristics of broiler finishers. *Nigerian Journal of Animal Science*, **23**(1): 35-45.
- Etuk, E.B., Ifeduba, A.V., Okata, U.E., Chiaka, I., Okoli, I.C., Okeudo, N.J. *et al.* (2012). Nutrient composition and feeding value of sorghum for livestock and poultry; a review, *Journal of Animal Science Advances*. **2**(6): 510-524.
- Farahat, M., Badawi, M., Hussein, A. and Attia, G. (2020). Effect of Replacing Dietary Corn by Sorghum on the Growth Performance, Shank Skin Pigmentation, Carcass Traits, Caecal Microflora and Nutrient Digestibility of Broiler Chickens. *International Journal of Poultry Science*, **19**: 424-431.
- Ferket, P. and Gernat, A. (2006). Factors That Affect Feed Intake of Meat Birds: A Review. *International Journal of Poultry Science*. **5**(10): 905-911.
- Geodatos (2019). Geographic coordinates of Bauchi, Nigeria. From <https://www.geodatos.net/en/coordinates/nigeria/bauchi>. Last accessed 6/07/2024.
- Hidayat C, Irawan A, Jayanegara A, Sholikin MM, Prihambodo TR, Yanza YR, Wina E, Sadarman S, Krisnan R, Isbandi I. Effect of dietary tannins on the performance, lymphoid organ weight, and amino acid ileal digestibility of broiler chickens: A meta-analysis. *Veterinary World*, **14**(6):1405-1411
- Mohammed, E.A. and Talha, E.A. (2016). The effect of replacement of maize for sorghum on broiler performance and some carcass characteristics. *Journal of Agricultural and Veterinary Science*. **17**(2): 47-55.
- Manyelo, T.G., Ng'ambi, J.W., Norris, D. and Mabelebele, M. (2019). Influence of low-tannin sorghum on performance and bone morphometries of male Ross 308 broilers aged 1 - 42 days. *South African Journal of Animal Science*, **49**(3):477-484.
- Nigerian Tribune (2021). Nigeria in shortfall of 529,000 metric tons of poultry meat. Retrieved 25th February 2023 from: <https://tribuneonlineng.com/nigeria-in-shortfall-of-529000-metric-tons-of-poultry-meat-minister/>



- Olorunsola, R. and Jegede. V. A. (2023). Growth Performance and Energy Metabolisability of Finisher Broiler Chickens Fed Red and White Sorghum-Based Diets Supplemented with Methionine. *Alexandria Journal of Agricultural Sciences*, **68**(2):93-100.
- Olufemi, O, E., Iyabo, C. A. and Marrof, M. A. (2021). Replacement value of maize with other cereals on performance and cost benefit of broiler chickens. *American International Journal of Agricultural Studies*, **4**(1): 36 – 46.
- SPSS (2017). Statistical Package for Social Sciences. IBM corporation released August, 2017. IBM SPSS, statistics for windows, version 25.0. Armonk, New York.
- Zaefarian, F., Cowieson, A. J., Pontoppidan, K. and Abdollahi, M. R. (2021). Trends in feed evaluation for poultry with emphasis on in vitro techniques. *Animal Nutrition*, **7**: 268 -281.