RESPONSE OF BROILER CHICKENS TO DIETARY LEVELS OF SORGHUM MILLING RESIDUE

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ABSTRACT
The study was aimed at investigating the response of broiler chickens to varying dietary levels of sorghum milling residue (SMR) as a cost-effective alternative in poultry feed. Five experimental diets (A to E) were formulated with SMR at levels of 0, 10, 15, 20, and 25%. Performance characteristics namely; daily feed intake, daily weight gain, feed conversion ratio, and cost-benefit analysis were evaluated over a 63-day feeding period. The results indicated that there were no significant differences (p >0.05) in productive performance, mortality rates, and feed intake among the different dietary groups during the starter and finisher phases. However, there were notable differences in the feed conversion ratio during the finisher phase, with diet D (20% SMR) showing the most favorable ratio. Cost-benefit analysis revealed potential economic advantages, with diet D demonstrating the lowest feed cost per kilogram of weight gain, indicating cost savings compared to other diets. The percentage of cost savings further emphasized the economic benefits of incorporating SMR into broiler chicken diets. In conclusion, the study suggests that sorghum milling residue can be a viable and cost-effective substitute in broiler chicken diets, particularly at the 20% inclusion level. Further research and field trials are recommended to validate these findings and optimize the use of sorghum milling residue in commercial poultry production.
Key words**: Broiler chickens, sorghum, residue, milling, response**

INTRODUCTION

The high cost of energy and protein ingredients, constituting the major components of poultry feeds, necessitates the exploration of alternative, cost-effective sources. Sorghum, characterized by its affordability, has been traditionally a staple in compounded feed, constituting a substantial portion of poultry diets (Ajaja *et al*., 2022). Sorghum milling residue, a byproduct of sorghum processing, represents an underutilized resource that has the potential to contribute significantly to the nutritional composition of broiler chicken diets (Daramola *et al*., 2021). Recent research endeavours have focused on investigating the efficacy of sorghum milling residue at varying inclusion levels to reduce feed costs in broiler production (Tending *et al*., 2014; Muhammed and Talha, 2016; Daramola *et al*., 2021). These studies have provided insights into the feasibility of incorporating sorghum milling residue without compromising the performance and growth of broiler chickens. However, there remains a need for further investigations to comprehensively understand the optimal dietary levels of sorghum milling residue and its impact on broiler performance. Poultry production represents a vital component of the global livestock industry, providing a significant source of protein for human consumption (Muhammed and Talha, 2016). The efficiency of poultry farming is heavily influenced by the quality and cost-effectiveness of the feed provided to broiler chickens. As feed constitutes a substantial portion of production expenses, optimizing feed formulations becomes crucial for sustainable and economically viable poultry production (Ajaja *et al*., 2022)..

MATERIALS AND METHODS

The study was conducted at the Poultry Farm Unit, Adamu Tafawa Balewa College of Education, Kangere, Bauchi State. Bauchi State is located between Latitude 9°31' to 12°30' North, Longitude 8°50' to 11° East (Ajaja *et al*., 2022). The major ingredients for diet formulation were sorghum, soya beans, fish meal, sorghum milling residue (SMR), wheat offal, limestone, bone meal, lysine, methionine, and salt (table 1). Five diets (A, B, C, D, E) were formulated with SMR incorporated at levels of 0, 10, 15, 20, and 25% for both starter and finisher phases. Three hundred day-old broiler chicks were procured from a reputable hatchery. Chicks were brooded for 2 weeks and then allotted to five (5) diets in replicates of 4, resulting in 15 birds per replicate in a completely randomized design. Birds were fed *ad libitum* and the study lasted for a period of 63 days. Data were collected on daily

feed intake, daily weight gain, and feed conversion ratio. Data generated were subjected to analysis of variance (ANOVA). Duncan Multiple Range Test (DMRT) used for post hoc analysis.

Table 1: Ingredients and composition of sorghum milking residue diets fed to broilers chicks at the statement phase (1 – 4 weeks)

Ingredient	D1 (0%)	D2 (10%)	D3 (15%)	D4 (20%)	D5 (25%)
Sorghum	45.30	40.77	38.50	56.24	33.98
Sorghum milling residue	0	4.53	6.80	9.06	11.32
Full fat soya bean	33.20	33.20	33.20	33.20	33.20
Wheat offal	10.00	10.00	10.00	10.00	10.00
Fish meal	5.00	5.00	5.00	5.00	5.00
Palm oil	2.00	2.00	2.00	2.00	2.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Limestone	1.50	1.50	1.50	1.50	1.50
Common salt	0.25	0.25	0.25	0.25	0.25
Premix starter	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**	**100**	**100**	**100**	**100**
ME (Kcalkg)	2835.64	2894.14	2824	2819.44	2811.87
Crude protein	23.00	23.00	23.00	23.00	23.00
Crude fibre	4.40	4.78	4.97	5.15	5.34
Ether Extract	7.91	7.90	7.78	7.89	7.88
Calcium	1.80	1.79	1.78	1.77	1.76
Phosphorus	0.82	0.81	0.80	0.79	1.78

Calculated analysis (%); ME = Metabolizable Energy.

Table 2: Ingredient and composition of sorghum milling residue diet fed to broiler chicks at the finisher phase (5 – 8 weeks)

Ingredient	D1 (0%)	D2 (10%)	D3 (15%)	D4 (20%)	D5 (25%)
Sorghum	53.50	48.97	46.70	44.44	42.18
Sorghum milling residue	0.00	4.53	6.80	9.06	11.32
Full fat soya been	27.00	27.00	27.00	27.00	27.00
Wheat offal	10.00	10.00	10.00	10.00	10.00
Fish meal	3.00	3.00	3.00	3.00	3.00
Palm oil	2.00	2.00	2.00	2.00	2.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Limestone	1.50	1.50	1.50	1.50	1.50
Salt	0.25	0.25	0.25	0.25	0.25
Premix [finisher]	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	100	100	100	100
Calculation Analysis (%)					
ME{Kcal/kg}	2954.39	2947.22	2940.99	2933.08	2928.76
Crude protein	20.00	20.00	20.00	20.00	20.00
Crude fiber	4.34	4.72	4.91	5.09	5.28
Ether extract	6.95	6.94	6.93	6.93	6.92
Calcium	1.68	1.67	1.66	1.63	1.64
Phosphorous	O.75	0.54	0.73	0.73	0.72

ME = metabolizable Energy

RESULTS AND DISCUSSION

Table 3 above presents the performance of broiler chickens fed varying levels of sorghum milling residue (SMR) in their diets. Broilers chickens in Diet 1 exhibited an initial weight gain of 85.65g, while those in Diet 5 (D5) had the highest at 85.11g. The differences were not statistically significant. Diet 2 had the highest body weight gain at 1196.15 g, while D5 had the lowest at 129.27g. No statistically significant differences were observed. Broilers in D1 achieved the highest final weight (2770.00g), while D3 had the lowest (2461.38g). D1 showed the highest total weight gain (1602.40g), and D5 had the lowest (1620.31g). Daily feed intake, daily weight gain, and feed conversion ratio did not show significant differences among the diets during the starter phase. Daily feed intake varied, with D1 having the highest (164.11g) and D2 the lowest (150.71g). Daily weight gain showed no significant differences among the diets. The results agreed with the findings of Daramola *et al*. (2021) and Muhammed and Talha (2016) who obtained similar results in their studies.

Table 3. Performance of broiler chickens fed dietary levels of sorghum milling residue

Productive performance

Parameter	D1	D2	D3	D4	D5	SEM
Initial weight gain (g)	85.65	82.07	83.17	82.00	85.11	1.85
Body weight gain at 4wk (kg)	1167.66	1196.15	1186.67	1185.42	129.27	36.73
Final weight (g)	2770.00	2657.81	2461.38	2591.94	2829.58	120.54
Total weight gain (g)	1602.40	1461.66	1272.70	1406.51	1620.31	119.94
Starter phase (1-4wks)						
Daily feed intake (g)	70.89	68.20	70.21	68.82	70.89	24.65
Daily weight gain (g)	38.64	39.79	39.48	39.40	40.15	1.28
Feed conversion ratio	1.83	1.72	1.78	1.74	1.76	0.04
Mortality (number)	4	5	5	3	4	
Finisher phase (5 -8 wks)						
Daily feed intake (g)	164.11	150.71	162.90	160.33	162.65	2.31
Daily weight gain (g)	57.23	52.20	45.45	50.23	52.20	1.28
Feed conversion ration	2.90^{ab}	3.07^{ab}	3.72^{b}	3.31^{ab}	2.81^{a}	0.26
Mortality (number)	3	5	4	4	6	

ab: means bearing different superscripts within the same row differ; * = P<0.05; NS =SEM= standard error of the means.

From the Table 4, the total feed cost reflects the combined effect of feed intake and cost per kilogram. Total weight gain demonstrates variation across the dietary groups, with higher levels of sorghum milling residue generally associated with higher weight gains. The results obtained in this study were in agreement with findings of Ajaja *et al*. (2022) and Tending et al. (2014) who worked on the cost-effectiveness of sorghum milling residue as a feed ingredient. The results were however in disparity with the findings of Muhammed and Talha (2016) and Daramola *et al*. (2021) in their studies on the relationship between feed costs and performance parameters of broiler chickens fed on sorghum milling residues.

Table 4. Cost benefit of broiler chicks feed dietary levels of sorghum milling residue

Parameters	D1	D2	D3	D4	D5
Total feed in take (kg)	6.58	6.35	6.54	6.42	6.54
Feed cost intake (₦/kg)	110.46	109.08	107.79	106.49	105.70
Total feed cost (₦)	726.83	692.66	705.00	683.67	691.28
Total weight gain (kg)	1.60	1.46	1.27	1.41	1.62
Feed cost (l kg gain)	454.27	477.42	555.12	484.87	426.72

CONCLUSION and Recommendations

From the study conducted it can be concluded that sorghum milling residue can be a viable and cost-effective substitute in broiler chicken diets, particularly at the 20% inclusion level. Further research

and field trials are recommended to validate these findings and optimize the use of sorghum milling residue in commercial poultry production.

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