ISSN: 2634-9221
European Journal of Applied Sciences; Vol. 14 No. 05 (2026) (42-47)
https://doi.org/10.14738/ejas.1405.12181

Replacement of Wheat Offal with Millet Bran Improved the Performance of Broiler Starters

Aliyu Sa'adu

Department of Agricultural Education, Faculty of Vocational and Technical Education, Shehu Shagari University of Education, Sokoto

Abstract: As a result of continuous increase in the prices of raw materials used in poultry feeds due to competition for some these raw materials between humans and Animals, and the need to find an alternative with a view to reduce the production cost and increase profit margin. This study evaluated the performance of broiler starter chickens fed diets containing graded levels of millet bran as a substitute for wheat offal over a four-week feeding period. A total of 235 broiler starter chicks were randomly assigned to three experimental diets. Diet 1, which contained wheat offal without millet bran, served as the control, while Diets 2 and 3 were formulated by replacing wheat offal with millet bran at 50% and 100%, respectively. The results showed that dietary replacement of wheat offal with millet bran had no significant effect ($P > 0.05$) on the measured performance parameters. Average feed intake was 1989.59 g, 1781.60 g, and 1978.51 g for birds fed Diets 1, 2, and 3, respectively. Similarly, weight gain values of 646.93 g, 660.91 g, and 622.93 g, feed conversion ratios of 3.19, 2.87, and 2.89, and mortality rates of 26.60%, 21.80%, and 15.40% were not significantly different ($P<0.05$) among the treatment groups. The findings indicated that millet bran can effectively replace wheat offal, even at complete substitution, in broiler starter diets without adversely affecting growth performance, feed efficiency, or bird survival. The use of millet bran therefore represents a practical alternative feed ingredient that could contribute to reducing feed costs while maintaining satisfactory production performance.

Keywords: Millet Bran, Wheat Offal Broiler Starter

INTRODUCTION

One of the challenges facing developing countries is the inability to adequately feed their ever-increasing population. In Nigeria, inadequate access to high-quality dietary protein remains an important nutritional concern, particularly among vulnerable groups. The Nigerian diet is predominantly based on carbohydrate-rich staples, while animal-source foods, which provide high-quality protein and essential amino acids, are consumed less frequently by many households (de Vries-ten et al., 2020) Egun & Atinmo (1993) and Cambell et al (2006) estimated the per capita protein consumption of Nigerians at about 48 to 60g against the World Health Organization's recommended 67g, out of which 25g should come from animal source (Ojegele et al., 2024).

According to Leclercq et al. (2024), one of the yard-sticks used in assessing the nutritional status of the society is its level of intake of animal protein. Daily animal protein intake in Nigeria remains considerably below the recommended level despite gradual improvements over the past decades. Recent estimates indicate that the average Nigerian consumes approximately 8–10 g of animal protein per person per day, which is substantially lower than the FAO/WHO recommended intake of about 20–25 g of animal protein required

to support healthy growth, development, and physiological functions within a balanced diet (FAO 2023).

The development of the poultry industry has been described as the fastest means of solving the problem of low animal protein intake in the country due to its short production cycle (Smirnov, 2019). But the industry has been facing so many challenges in Nigeria, one of which is the high cost of feed (Nnajieze, 2026). This has led to sub-optimal low performance of various categories of poultry species. Cost of feed accounts for about 75% of the total cost of poultry production in Nigeria (Afodu et al., 2022; Achoja, 2013) because feed ingredients used in poultry diets are also consumed by humans and other livestock species. For example, the price of wheat offal has been increasing (Effiong et al., 2024)

To stem the tide of continuous competition for feed resources, alternative feed stuffs should be sourced. Millet is heavily cultivated in Sokoto and its environs because it is the most common staple food of the people (Danchade et al., 2026). The processing of millet before its conversion to various edible forms results in the production of large quantity of its bran, which is comparable to wheat bran in terms of proximate composition. It contains 11.78% of C.P., 5.00% of C.F., 4.60% of E.E. and 6.97% of Ash. Wheat bran on the other hand, contained 17.00% of C.P., 3.50% of C.F. and 3.50% E.E(Li et al., 2024; Selvaraj et al., 2025). Since most other livestock farmers do not use millet bran for feeding their animals, and because almost every household produces millet bran during processing, its current price is by far lower than that of wheat offal. Therefore, replacing wheat offal with millet bran in the diet of broiler starters will provide an alternative that, if harnessed, could reduce the cost of feeds and increase the poultry farmer's profit in the millet-producing areas.

Experimental Location

The experiment was conducted at the Sokoto State Veterinary Centre, located along Aliyu Jodi Road, Sokoto Metropolis, Sokoto State, Nigeria. Sokoto State is situated in the Sudan Savanna ecological zone of northwestern Nigeria and lies between latitudes 12°15′ and 13°58′ N and longitudes 4°08′ and 6°54′ E (Sokoto State Government, 2025)..

Experimental Diets Formulation

Three diets were formulated: diet 1 which served as a control had wheat offal (W.O) alone as a source of fibre, while diets 2 and 3 had millet bran (M.B) at 50 and 100% replacing wheat bran, respectively. The feed ingredients were well ground and thoroughly mixed. The composition of the experimental diets is shown in Table 1.

Table 1: Composition of experimental diets

Ingredients (%)	Diet 1	Diet 2	Diet 3
Maize	56.00	56.00	54.52
Groundnut cake	31.52	31.52	31.00
Millet bran	0.00	2.50	5.00
Wheat offal	5.00	2.50	0.00
Blood meal	2.50	2.50	3.50
Bone meal	2.50	2.50	3.00

Lime stone	2.50	1.50	2.00
Premix	0.25	0.25	0.25
Methionine	0.25	0.25	0.25
Lysine	0.25	0.25	0.25
Salt	0.25	0.25	0.25
Total	100	100	100
Calculated nutrient composition of experimental diets			
ME kcal/kg	2919.39	2940.14	2924.68
CP (%)	23.13	23.05	23.4
C.F (%)	3.15	3.18	3.18
EE (%)	4.35	4.33	4.23
Ca (%)	1.48	1.48	1.84
P (%)	0.33	0.24	0.22
Methionine (%)	0.54	0.54	0.54
Lysine (%)	0.38	0.40	0.37

Experimental Birds and Management

A total of 234-day-old boiler chicks of the *Ross 308* strain were randomly allocated to three the three diets making up the treatments, each replicated three times such that each replicate had 26 birds. The birds were allotted in to the treatments in a Completely Randomized Design. Before the arrival of the chicks, the poultry house was thoroughly washed and disinfected, and allowed to dry up before wood shavings were spread to serve as litter. The open side of the house was completely covered to provide protection for the birds against extreme low temperatures. 100-watt bulbs were used as a source of heat and light in each pen. Routine vaccination and medication for boilers were carried out in accordance with the recommendation of Oluyemi and Roberts (2000). Feed and water were given to the birds at *ad-libitum*.

Data Collection

Feed intake was recorded daily and the birds were weighed weekly to determine the weight gain. Feed consumption and body weight gain records were used to calculate feed conversion ratio using the formula: $FCR = \frac{FI}{WG}$ where FI = feed intake and WG = weight gain.

Data Analysis

Data collected during the experiment were subjected to analysis of variance (ANOVA), and least significant difference (LSD) was used to compare the treatment means. Analysis was carried out using the SPSS computer package (SPSS, 1999).

RESULTS AND DISCUSSION

The feed intake of broiler starters fed millet bran in place of wheat offal is presented in table 2.

Table 2: Feed intake of broiler starters fed diets containing millet bran in place of wheat offal.

Parameters	Diet 1	Diet 2	Diet 3	SE
Total feed intake (g)	45814.63	44130.37	43943.63	2885.52
Total feed intake (g/b)	1989.59	1781.60	1978.51	205.48
Feed intake (g/b/d)	284.28	271.21	282.64	23.70

Statistical analysis revealed that there was no significant difference (P<0.05) in broilers fed the control diet containing wheat offal and those fed millet bran at 50% and 100% levels replacing wheat offal. This is an indication that millet bran has nutrients enough to promote feed intake as wheat offal. It also means that feeding millet bran even as only source of fibre does not depress feed intake in broilers at their tender age. Similarly, Okon and Kennedy (2008) reported non significant difference (P<0.05) in the feed intake of rabbits when wheat offal was replaced by millet bran in their diets. However, Inuwa and Yakubu (2021) reported a significant difference (P>0.05) in the feed intake of broiler starters when Maize offal was used to replace wheat offal in their diet; this could probably be due to the difference in the nutrient composition of millet and Maize brans.

The growth performance of broiler starters fed millet bran in place of wheat offal is presented in table 3.

Table 3: Growth performance of broiler starters fed diets containing millet bran in place of wheat offal

Parameters	Diet 1	Diet 2	Diet 3	SE
Initial body weight (g/b)	72.33	75.64	72.43	3.72
Final body weight (g/b)	719.26	736.55	695.36	3.72
Body weight gain (g/b)	646.93	660.91	622.93	33.41
Feed conversion ratio	3.19	2.87	2.89	0.34
Mortality (%)	26.60	21.80	15.40	0.38

Non significant difference (P<0.05) was observed across all treatments in terms initial weight. Final weight, Body weight gain and Feed conversion ratio, could be due to the fact that the nutrient composition of the experimental diets and the initial body weights of the birds were not significantly different. It is also an indication that the replacement of wheat offal with millet bran at both 50 and 100 percent level can support growth as does wheat offal (Ajide et al., 2023). Similar feed conversion ratio across the dietary treatments suggested that the birds were able to effectively convert feeds to gain, it could be observed that starters fed 50% millet bran and those fed 100% bran had numerically better feed conversion ratios compared to those fed wheat offal, therefore, Millet bran could possibly be better digested and utilized by starters than wheat offal. Similarly, broiler starters fed wheat offal also consumed numerically more feed compared to those fed millet bran. In contrast, Ekeocha et al. (2024) reported a significant difference (P < 0.05) in the weight gain of broiler chickens fed different dietary fibre sources. Birds receiving diets containing wheat offal recorded significantly higher weight gain than those fed rice bran or brewer's dried grain. This variation may be attributed to differences in the nutritional composition

and quality of the fibre sources, with wheat offal likely providing better nutrient availability than rice bran and brewer's dried grain. Furthermore, mortality did not differ significantly among the dietary treatments ($P > 0.05$). Nevertheless, relatively high mortality rates of 26.6%, 21.8%, and 15.4% were recorded in birds fed Diets 1, 2, and 3, respectively. Although these differences were not statistically significant, the numerically higher mortality observed in broilers fed the diet containing 100% wheat offal may have been influenced by the quality of the wheat offal used in the study. In the study area, wheat offal is commonly obtained from stored stocks that may have undergone prolonged storage, predisposing the material to deterioration and fungal contamination. Such deterioration can reduce feed quality and palatability and may adversely affect bird health and survival. In contrast, millet bran is generally obtained fresh shortly after milling, thereby minimizing the risk of spoilage and mould infestation.

CONCLUSION

It could be concluded that millet bran can substitute for wheat offal in broiler starter diets without affecting the performance parameters.

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