FUDMA Journal of Agriculture and Agricultural Technology
ISSN: 2504-9496
Vol. 10 No. 1, March 2024: Pp. 99-103

https://doi.org/10.33003/jaat.2024.1001.12

PERFORMANCE AND ECONOMIC BENEFIT OF BROILER CHICKENS FED PEARL MILLET BASED DIETS SUPPLEMENTED WITH SYNTHETIC METHIONINE

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ABSTRACT

The rising costs and inconsistent availability of conventional feed ingredients like maize in broiler chicken production have necessitated the exploration of alternative grains, such as pearl millet, which, when supplemented with synthetic methionine, could potentially enhance both performance and economic returns. This study which was conducted for a period of eight weeks assessed the effectiveness and economic viability of feeding broiler chickens diets containing pearl millet supplemented with synthetic methionine. Three hundred broiler chicks were randomly assigned to five dietary groups for both the starter and finisher phases, with each group containing sixty birds. The experiment followed a Completely Randomized Design (CRD) with three replications, each containing twenty birds. The diets for each group contained varying levels of DL methionine: 0.1%, 0.2%, 0.3%, 0.4%, and 0.5%, denoted as T1, T2, T3, T4, and T5 respectively. Although most performance metrics such as weight gain and feed intake did not exhibit significant differences among the groups, mortality rates showed a slight decrease with higher methionine inclusion. Economic analysis indicated that T1 had better Total Feed Cost (FC), and FC (₦/kg gain). The study concluded that pearl millet-based diets with synthetic methionine reduced mortality and proved cost-effective, offering a viable alternative for broiler chicken production.

Keywords: Broiler Chicken, Pearl Millet, Performance, Synthetic Methionine.

INTRODUCTION

Ensuring an adequate supply of animal protein for the growing population remains crucial. However, sourcing raw materials for poultry feed, particularly energy sources, poses challenges ((Adedeji *et al*., 2019; Singh *et al*., 2020). Nigeria's low animal protein consumption underscores the need for affordable poultry feed. Feed constitutes a significant portion of livestock production costs (Smith and Johnson, 2018). Maize, a primary energy source, faces supply challenges and high demand for various purposes (Singh *et al*., 2020). Alternative feed ingredients are being explored to mitigate the issues of high cost of feeds. Pearl millet, despite being less utilized compared to maize, presents an opportunity as a potential substitute. This study aimed to assess Pearl millet's suitability as a maize replacement in broiler diets.

Pearl millet thrives in arid conditions and offers nutritional advantages similar to other cereal grains (Balogun *et al*., 2020). Its protein content surpasses maize, with a balanced amino acid profile (Adedeji *et al*., 2019). Additionally, it contains higher oil content and offers better essential nutrient profiles compared to maize (Aduku *et al*., 2017). Studies suggest that broiler chickens fed pearl millet-based diets exhibit comparable or better growth performance than those fed maize-based diets (Akinyemi *et al*., 2015). Its potential as a cost-effective alternative to maize in broiler chickens diets warrants investigation. Alternative feed ingredients have gained attention due to the challenges associated with maize sourcing. Apart from Pearl millet, other options like sorghum have shown promise in poultry nutrition (Adedeji *et al*., 2018). In addition to addressing supply constraints, these alternatives offer potential cost savings and improved nutritional profiles for poultry diets (Singh *et al*., 2020). There is need therefore to find cost-effective and nutritionally viable alternatives to conventional feed ingredients in broiler chicken production due to rising costs and inconsistent availability of maize.

MATERIALS AND METHODS

Experimental site

The investigation was carried out at the poultry facility of Taraba State College of Agriculture, located in Jalingo, Nigeria. The area is located at approximately latitude 8.8961° N and longitude 11.3639° E

Experimental animals and management

Three hundred day-old Anak white broiler chicks were raised and distributed randomly into five dietary groups, with each group having three replicates.

Experimental diets and data collection

The experimental diets were formulated with varying levels of methionine supplementation. Data were collected on performance metrics such as Daily Feed Intake (DFI), Daily Weight Gain (DWG) and mortality rates. Economic assessment was also performed. The composition of experimental diets during both the starter and finisher phases is outlined in Tables 1 and 2, respectively.

Table 1: Ingredients Composition of Broiler Starter Diets containing Pearl Millet with varying levels of methionine (1-4 Weeks)

Ingredients	T1	T2	T3	T4	T5
Methionine levels	0.1	0.2	0.3	0.4	0.5
Pearl Millet	47.10	46.96	46.82	46.69	46.57
Soya bean	33.60	33.64	33.68	33.71	33.73
Wheat offal	6.00	6.00	6.00	6.00	6.00
Methionine	0.10	0.20	0.30	0.40	0.50
Fish Meal	5.00	5.00	5.00	5.00	5.00
Palm Oil	4.00	4.00	4.00	4.00	4.00
Bone Meal	2.00	2.00	2.00	2.00	2.00
Lime Stone	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
Lysine	0.20	0.20	0.20	0.20	0.20
Total	100	100	100	100	100
Calculated Analysis					
Parameter	T1 (0.1%)	T2 (0.2%)	T3 (0.3%)	T4 (0.4%)	T5 (0.5%)
Crude Protein (%)	23.71	23.71	23.71	23.71	23.71
ME/kcal/kg	2950.22	2947.40	2944.58	2941.74	2938.88
Crude Fibre (%)	5.61	5.61	5.61	5.61	5.61
Calcium (%)	1.62	1.62	1.62	1.62	1.62
Phosphorous (%)	1.74	1.74	1.74	1.74	1.74
Lysine (%)	1.38	1.38	1.38	1.38	1.38
Methionine (%)	0.49	0.49	0.49	0.49	0.49

Table 2: Ingredients Composition of Broiler Finisher Diets containing Pearl Millet supplemented with varying levels of methionine (5-8 Weeks)

Ingredients	T1	T2	T3	T4	T5
Methionine levels	0.1	0.2	0.3	0.4	0.5
Pearl Millet	53.09	52.97	52.82	52.70	52.56
Soya bean	22.61	22.63	22.68	22.70	22.74
Wheat offal	10.00	10.00	10.00	10.00	10.00
Methionine	0.10	0.20	0.30	0.40	0.50
Fish Meal	5.00	5.00	5.00	5.00	5.00
Palm Oil	5.00	5.00	5.00	5.00	5.00
Bone Meal	2.00	2.00	2.00	2.00	2.00
Lime Stone	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
Lysine	0.20	0.20	0.20	0.20	0.20
Total	100	100	100	100	100

Calculated Analysis					
Crude Protein (%)	20.80	20.79	20.76	20.75	20.73
ME/kcal/kg	2913.00	2912.46	2909.66	2906.86	2903.98
Crude Fibre (%)	5.44	5.43	5.42	5.41	5.34
Calcium (%)	1.63	1.63	1.87	1.86	1.86
Phosphorous (%)	1.22	1.21	1.21	1.21	1.21
Lysine (%)	1.14	1.14	1.14	1.14	1.14
Methionine (%)	0.46	0.46	0.46	0.46	0.46

RESULTS AND DISCUSSION

The study's results on the growth performance of broiler chickens fed pearl millet-based diets supplemented with synthetic methionine are presented in Table 3. The growth parameters, including daily feed intake (DFI), daily weight gain (DWG) and feed conversion ratio (FCR) showed no significant differences among the treatment groups. These findings suggest that varying levels of methionine supplementation did not significantly influence the growth performance of the broiler chickens. This outcome aligns with the observations made by Akinyemi *et al.* (2015) and Dahiru *et al.* (2016), who also reported minimal impact of methionine supplementation on these parameters in broilers.

While the performance of broilers was largely unaffected by the methionine levels, the economic analysis provided in Table 4 offers additional insights. It was found that lower levels of methionine inclusion resulted in better cost benefits, as the feed cost per kilogram of weight gain was lower in the groups with minimal methionine supplementation. This economic advantage, however, must be balanced against the slightly higher mortality rates observed in the lower methionine groups, though mortality rates decreased with increased methionine levels.

Importantly, although methionine supplementation was the variable factor, the role of pearl millet as the base diet should not be overlooked. Pearl millet provided a consistent foundation across all treatment groups, ensuring that the observed effects were due to methionine supplementation rather than variations in the basal diet. This consistency is crucial for interpreting the results, as it underscores that the performance differences, or lack thereof, are attributable to methionine rather than the pearl millet itself.

Furthermore, while methionine supplementation did not significantly enhance growth performance, it did offer economic benefits at lower inclusion levels. These findings are consistent with studies by Ani *et al*. (2021) and Singh *et al*. (2020) but contrast with the results reported by Oluremi *et al.* (2019) and Onimisi *et al*. (2018), who noted significant improvements in growth performance with higher methionine levels. The focus on methionine in this study should be interpreted within the context of the consistent use of pearl millet as the basal diet, which provided the primary nutritional support for the broiler chickens.

Table 3: Performance of Broiler Chickens fed Pearl Millet Supplemented with Graded Levels of Synthetic Methionine

Parameters (%) **Methionine levels**	**T1** **0.1**	**T2** **0.2**	**T3** **0.3**	**T4** **0.4**	**T5** **0.5**	**SEM**
Initial weight (g)	91.93	92.50	93.17	94.50	93.00	1.30
Final weight (g)	533.07	546.57	556.83	568.83	593.67	1.36
Feed intake (g/bird)	1050.16	1190.02	1087.64	1114.67	1138.89	2.92
Daily feed intake (g)	37.51	42.50	38.84	39.81	40.68	0.69
Daily weight gain (g)	19.03	19.52	19.88	20.31	21.20	1.36
Feed conversion ratio	1.97	2.18	1.95	1.96	1.92	0.04
Mortality (Number)	5	3	4	2	1	-

Finisher Phase (5 – 8 Weeks)

Parameters (%) Methionine levels	T1 0.1	T2 0.2	T3 0.3	T4 0.4	T5 0.5	SEM
Initial weight (g)	533.07	546.57	556.83	568.83	593.67	1.36
Final weight (g)	1803.33	1816.67	1830.00	1845.00	1876.67	2.05
Daily weight gain (g)	64.40	64.88	65.35	65.89	67.00	3.96
Feed intake (g/bird)	2951.80	3034.30	3057.90	3760.60	3109.00	2.31
Daily feed intake (g)	105.42	108.37	109.21	134.31	111.04	3.70
Feed conversion ratio	2.51	2.58	2.59	3.18	2.61	0.09
Mortality (Number)	3	3	2	1	1	-

Pooled (1 – 8 Weeks)

Parameters (%) Methionine levels	T1 0.1	T2 0.2	T3 0.3	T4 0.4	T5 0.5	SEM
Initial weight (g)	91.93	92.50	93.17	94.50	93.00	1.30
Final weight (g)	1803.33	1816.67	1830.00	1845.00	1876.67	2.05
Total weight gain (g)	1711.40	1724.17	1736.83	1750.50	1783.67	2.59
Daily feed intake (g)	71.47	75.44	74.03	87.06	75.86	1.39
Daily weight gain (g)	30.56	30.79	31.01	31.26	31.85	1.99
Feed conversion ratio	2.34	2.45	2.39	2.79	2.38	0.05
Mortality (Number)	8	6	6	3	2	-

NS = Not significant (P>0.05)
SEM = Standard Error of Means

Table 4: Financial Benefits of Using Pearl Millet Supplemented with Methionine for Broiler Chickens Production

Parameters (%) **Methionine levels**	**T1** **0.1**	**T2** **0.2**	**T3** **0.3**	**T4** **0.4**	**T5** **0.5**
Total feed intake (Kg)	5.20	5.20	5.33	5.21	5.08
Feed cost (₦/Kg)	260.12	262.40	265.30	270.55	287.30
Total feed cost (₦)	1361.57	1365.99	1458.08	1455.67	1449.07
Total weight gain (Kg)	1.76	1.80	1.84	1.80	1.85
Feed cost (₦/Kg gain)	482.12	491.63	509.38	516.75	563.11

CONCLUSION AND RECOMMENDATION

The study suggests that broiler chickens raised on pearl millet diets in combination with synthetic methionine inclusion levels performed just as well as those fed the standard maize diet, with optimal economic benefits observed at lower methionine inclusion levels. Pearl millet in combination with inclusion levels of synthetic methionine presents a viable alternative to maize in broiler production, especially where it is readily available and economically advantageous. Further research should explore practical applications and long-term implications of Pearl millet-based diets in poultry production.

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