

Growth Dynamics of ISA brown Pullets on Dietary Bitter Leaf (*Vernonia Amygdalina*) Meal Intervention

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Abstract

A feeding trial was conducted to determine the effect of dietary inclusion of bitter leaf (*Vernonia amygdalina*) meal (BLM) on the growth performance of ISA Brown pullets. The bitter leaf was air-dried at room temperature and later milled. Five diets were formulated to contain 0, 1, 2, 3, and 4 % inclusion levels of the BLM respectively. Each of the dietary treatments had five replicates, with ten birds per replicate, in a completely randomized design. Birds were fed starter diet from 0 to 8 weeks and grower diet from 9 to 18 weeks. Results showed that at 0 - 8 weeks, birds fed 0% BLM had significantly better ($P<0.01$) final weight, weight gain, feed conversion ratio (FCR), and weight gain than pullets on the other 4 diets. At 9 -18 weeks, pullets fed diets containing BLM at 3 and 4% BLM had significantly increased ($P<0.01$) final weight and weight gain than birds fed diet containing 0% BLM. Results showed that there was no significant difference ($p>0.05$) between birds fed 0% BLM and those offered 1 and 2% BLM in final weight and weight gain. Birds fed 1% BLM recorded significantly ($p<0.05$) higher feed intake than those birds fed 2% BLM. In conclusion, the inclusion of BLM at 1, 2, 3 and 4% in the diet of growing pullets from week 0 to 8 did not improve growth performance parameters. In converse, the inclusion of BLM at 3 and 4% improved feed conversion ratio, and body weight of pullets from weeks 9 to 18. It is therefore recommended that the inclusion of 3 and 4% BLM may be well-tolerated by the pullets from weeks 9 to 18 for best feed conversion ratio and weight gain.

Keywords: Bitter leaf, pullets, body weights, feed intake, body weight gain, feed conversion

Introduction

Nigeria is highly deficient in animal protein, with per capita consumption put at 9.3 g/day as against 34 g/day recommended by FAO as the minimum requirement for growth and development of the body (Akorede *et al.*, 2021; Agina *et al.*, 2017). Therefore, bridging the gap in animal protein availability in Nigerians' diets is a serious challenge. Poultry products are considered good sources of protein because of their high biological value. Incidentally, chicken meat and eggs are still deemed luxury in most households in Nigeria (Adene and Oguntade 2006). This is mostly attributed to the exorbitant cost of the chicken egg and meat, which is controlled mainly by the high cost of chicken feed, and this has compelled researchers and poultry nutritionists to find cheaper feed resources to minimize the cost of finished feed (Chukwukaelo *et al.*, 2018). Alternative, cheaper, and readily available feed resources are one way of reducing the high cost

of chicken products, and this could be actualised via the use of phytochemicals as growth promoters (Mountzouris *et al.*, 2011; Adegbenro *et al.*, 2020). One of such phytochemicals, is *Vernonia amygdalina* popularly called bitter leaf, which belongs to the genus *Vernonia* in the family Asteraceae. Bitter leaf is widely cultivated in Nigeria mainly for its medicinal and nutritional values (Ogwu & Ikahajagbe, 2023). Bitter leaf meal (BLM) has been shown to contain 15.67 – 32.60% (Durunna *et al.*, 2009; Fajemisin *et al.*, 2009). Phytochemical analysis of BLM revealed high levels of flavonoids, saponins, tannins, and alkaloids (Harahap *et al.*, 2021; Ofongo *et al.*, 2021). In a study other than laying hens, Akorede *et al.* (2021), found that inclusion of 5 and 10% BLM in broiler diets improved feed intake, feed conversion ratio, and body weight gain. Although BLM has been studied as feed ingredients for broiler chickens (Durunna *et al.*, 2009; Akorede *et al.*, 2021), laying hens (Adegbenro *et al.*, 2020), and West African Dwarf ewes (Fajemisin *et al.*, 2009), not much has been done on impact of BLM on pullet performance. Therefore, this work was carried out to assess the effect of dietary BLM on growth dynamics of pullets.

Materials and Methods

The research work was carried out at the Poultry Unit of the Teaching and Research Farm of the School of Agriculture and Agricultural Technology (SAAT), Federal University of Technology, Owerri, Imo State. The bitter leaf used as the test ingredient for this study was procured from Relief market in Owerri, Imo State. They were air-dried at room temperature and later milled for subsequent inclusion at specified levels in the diets of growing pullets. Two hundred and fifty (250) - day old ISA Brown pullet chicks raised on a deep litter were used for the trial. There were five dietary treatments, with five replicates per treatment and ten birds per replicate. Diets contained 0, 1 %, 2, 3 and 4 % inclusion levels of the BLM respectively, in a completely randomized design. Water was provided *ad-libitum*, and all necessary medications and vaccinations were given as at when due. The chicks were fed a starter diet for 0-8 weeks (Table 1) and a grower diet for 9-18 weeks (Table 2), during which the live weights of the birds were determined at the beginning of the experiment and biweekly thereafter. The weight gained by each replicate was calculated as the difference between the final weight and initial weight and divided by the number of birds. Daily feed intake was determined as the difference between feed given and the quantity left over every morning. Feed conversion ratio (FCR) was calculated as the ratio of feed intake and weight gain.

Table 1. Ingredient composition of chick's starter mash containing bitter leaf meal

Ingredients	Inclusion levels of bitter leaf meal (%)				
	0	1	2	3	4
Bitter leaf meal	0.00	1.00	2.00	3.00	4.00
Maize	56.00	56.00	56.00	56.00	56.00
Soybean meal	28.00	28.00	28.00	28.00	28.00
Palm kernel cake	8.00	7.00	6.00	5.00	4.00
Bone meal	4.00	4.00	4.00	4.00	4.00
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Vitamin/Mineral*	0.25	0.25	0.25	0.25	0.25
Common salt	0.25	0.25	0.25	0.25	0.25
Fish meal	3.00	3.00	3.00	3.00	3.00
Total	100.00	100.00	100.00	100.00	100.00
Calculated nutrient composition (%)					
ME(Kcal/kg)	3011.78	3013.64	3015.50	3017.31	3019.2
Crude protein	20.698	19.99	20.21	20.43	20.65
Ether extract	3.95	3.94	3.88	3.81	3.75
Crude fibre	4.32	4.41	4.57	4.74	4.91
Ash	3.30	3.35	3.39	3.44	3.48

*Vitamin and mineral premix (TS-TOSAMVIT®, Hebei Junyu Pharmaceuticals Co., Ltd) formulated to provide per kg diet vitamin A-8,000,000 I.U; vit. D3- 1,6000,000 I.U; Vit. E-5,000 I.U; vit. K-2,000mg; thiamine-1,500mg; riboflavin-4,000mg; pyridoxine-1,500mg; niacin-15,000mg; vit. B12-10mg; pantothenic acid-5,000mg; folic acid-500mg; biotin-20mg; choline chloride-200g; antioxidant-125g; manganese-80g; zinc-50g; iron-20g; copper-5g; iodine-1.2g; selenium-200mg; cobalt-200mg.

Table 2. Ingredient Composition of chick grower's mash containing bitter leaf meal

Ingredients	Inclusion levels of bitter leaf meal				
	0	1	2	3	4
Bitter leaf meal	0.00	1.00	2.00	3.00	4.00
Maize	50.00	50.00	50.00	50.00	50.00
SBM	18.00	18.00	18.00	18.00	18.00
PKC	12.00	11.00	10.00	9.00	8.00
Wheat offal	12.00	12.00	12.00	12.00	12.00
Fish meal	4.00	4.00	4.00	4.00	4.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Vitamin/Mineral*	0.25	0.25	0.25	0.25	0.25
Common salt	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated nutrient composition (%)					
ME(Kcal/kg)	2735.96	2737.82	2739.68	2741.54	2743.40
Crude protein	17.80	17.85	17.90	17.95	18.00
Ether extract	4.39	4.33	4.26	4.20	4.13
Crude fibre	5.09	5.15	5.21	5.26	5.32
Ash	3.75	3.75	3.75	3.75	3.75

*Vitamin and mineral premix ((TS-TOSAMVIT®, Hebei Junyu Pharmaceuticals Co., Ltd) formulated to provide per kg diet vitamin A-8,000,000 I.U; vit. D3- 1,6000,000 I.U; vit. E-5,000 I.U; vit. K-2,000mg; thiamine-1,500mg; riboflavin-4,000mg; pyridoxine-1,500mg; niacin-15,000mg; vit. B12-10mg; pantothenic acid-5,000mg; folic acid-500mg; biotin-20mg; choline chloride-200g; antioxidant-125g; manganese-80g; zinc-50g; iron-20g; copper-5g; iodine-1.2g; selenium-200mg; cobalt-200mg.

Result and Discussion

The result of the performance of starter pullets fed varying levels of BLM (weeks 0- 8) is presented in Table 3. Results showed that all parameters except the initial weight were significantly different ($P < 0.05$). This fact is worthy of note because it showed that no particular treatment had undue advantage over others which could cause variations in other parameters (Igene *et al.*, 2018). Birds fed 0% BLM had significantly higher final weight (554.29 g/b) and weight gain (526.00 g/b) than birds offered the other four diets. The present results are in tandem with earlier reports of Akorede *et al.* (2021) and Daramola *et al.* (2019), but in harmony with the findings of Igene *et al.* (2018). Birds on 0% BLM with significantly higher feed intake than those on the other 4 diets, disagrees with the findings of Igene *et al.* (2018), who

reported increased feed intake in broiler chickens fed graded levels of BLM. However, the feed intake results are consistent with the findings of Akorede *et al.* (2021), who reported that feed intake decreased with increasing levels of BLM in broiler chicken diets. The lowest FCR value was recorded for birds fed the control diet (2.27), while the highest FCR was recorded for birds fed 1% BLM. The significantly better FCR value recorded at 0% inclusion level indicates better digestion and nutrient absorption, leading to increased body weight. The poor weight and FCR in pullets fed BLM implies the low ability of the diets to support muscle protein synthesis. This might be linked to anti-nutritional factors (Durunna *et al.*, 2009) present in the BLM diets, which may have exceeded the level growing chickens can utilize (Akorede *et al.*, 2021).

Table 3: Performance of starter pullets fed varying levels of bitter leaf meal from weeks 0 to 8.

Parameter	Inclusion levels of bitter leaf (%)					SEM
	0	1	2	3	4	
Initial weight (g/b)	28.29	28.14	28.00	28.14	28.29	0.022
Final weight (g/b)	554.29 ^a	515.00 ^{bc}	520.00 ^b	502.61 ^c	514.18 ^{bc}	4.165
Weight gain (g/b)	526.00 ^a	486.86 ^{bc}	492.00 ^b	474.47 ^c	485.89 ^{bc}	4.157
Feed intake (g/b)	1193.79 ^c	1376.77 ^a	1269.19 ^b	1281.71 ^b	1345.00 ^a	14.179
Feed conversion ratio	2.27 ^d	2.83 ^a	2.58 ^c	2.70 ^b	2.77 ^{ab}	0.043

^{abc} Means within the same row with different superscripts are significantly different ($P < 0.05$).

The results of the growth performance traits of grower pullets fed varying levels of BLM (weeks 9 - 18) is presented in Table 4. The results showed that all the measured parameters differed ($P < 0.05$) across the dietary groups. Initial weight ranged from 554.29 – 514.18 g/b. Birds on 1% BLM had the highest feed intake (5058.73 g/b) while those on 2% BLM inclusion level recorded the lowest feed intake (4770.89 g/b). The comparable feed intake values among pullets fed BLM-based diets in this study indicate that BLM had no effect on feed consumption. These results imply that their digestive tract is capable of handling antinutritional factors present in bitter leaf which has been reported to reduce feed intake in broiler chickens (Durunna *et al.*, 2009). This result disagreed with the findings of Ali *et al.* (2020) who reported that dietary BLM reduce feed intake in broiler chickens. This finding is not in agreement with Olobatoke and Oloniruha (2009), who

observed a significant difference in feed intake in cockerels fed BLM- based diets. These variations can be attributed to differences in diet composition, chemical composition of bitter leaf, age of chicken, and strains. The final weight and weight gain ranges from 2800.00 -3050.00 g/b and 2245.71 - 2535.82 g/b, respectively. Birds on diet with 4% BLM inclusion level had the highest final weight (3050.00 g/b), which differed significantly ($P < 0.05$) from birds fed 0% BLM, but similar ($P > 0.05$) to those fed 1, 2 and 3% BLM. Significant differences ($P < 0.05$) were observed in feed conversion ratio, suggesting the improved quality of diets containing 3 and 4% BLM. Similar findings were obtained by Mohammed and Zakariya (2012) with broiler chickens. The significantly better FCR value recorded at 3 and 4% dietary levels implies better quality of the diets, resulting in improved weight gain.

Table 4: Performance of grower pullets fed varying levels of bitter leaf meal from weeks 9 to 18.

Parameter (g)	Inclusion levels of bitter leaf meal (%)					SEM
	0	1	2	3	4	
Initial weight (g/b)	554.29 ^a	515.00 ^{bc}	520.00 ^b	502.61 ^c	514.18 ^{bc}	4.164876
Final weight (g/b)	2800.00 ^b	2850.00 ^{ab}	2940.00 ^{ab}	3030.00 ^a	3050.00 ^a	34.12233
Weight gain (g/b)	2245.71 ^b	2335.00 ^b	2420.00 ^{ab}	2527.39 ^a	2535.82 ^a	36.22841
Feed intake (g/b)	4838.58 ^{ab}	5058.73 ^a	4770.89 ^b	4802.98 ^{ab}	4927.62 ^{ab}	43.06459
FCR	2.16 ^{ab}	2.18 ^a	2.00 ^{bc}	1.91 ^c	1.94 ^c	0.035967

^{abc} Means within the same row with different superscripts are significantly different ($P < 0.05$).

Conclusion

The inclusion of BLM at 1, 2, 3 and 4% in the diet of growing pullets from week 0 to 8 did not improve growth performance parameters. In contrast, the inclusion of BLM at 3 and 4% improved feed intake, feed conversion ratio, and body weight of pullets from week 9 to 18. It is therefore recommended that inclusion of 3 and 4% BLM may be well-tolerated by the

pullets from week 9 to 18 for best feed conversion ratio and weight gain.

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