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Research Paper

Growth performance, carcass characteristics and economics of production of broiler chickens fed diets containing bitterleaf (*Vernonia amygdalina*) meal

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ABSTRACT: *A 70The study was conducted to determine the effects of dietary supplementation of Vernonia amygdalina leaf meal (VALM) on the growth performance, carcass characteristics and economics of production of broiler birds. The birds were allotted to four treatments and three replicates (10 birds per replicate), T_1 (Control – no VALM), T_2 (5% inclusion of VALM), T_3 (10% inclusion of VALM), T_4 (15% inclusion of VALM) in a completely randomized design (CRD). Birds were managed conventionally on deep litter system. Data on body weight, feed intake, feed conversion ratio, carcass characteristics, cost of production and revenue were collected. Weight of birds in T_1 (1632.67g) were significantly highest ($p<0.05$) compared to those in T_2 (1409.67g), T_3 (1359.67g), T_4 (1324.67g). Significant difference ($p<0.05$) was recorded in feed intake with T_1 (3742.67g) consumption being highest while T_4 (3520.33g) was the lowest consumers. In feed conversion ratio, there were no significant differences ($p>0.05$). Birds in T_1 having 20% mortality) were significantly the highest ($p<0.05$) when compared to those of T_4 (6.67%), with T_2 (3.33%) and T_3 (3.33%) having the lowest mortality rate. Significant differences ($p<0.05$) were recorded in dressed weight as T_1 (1035.67g) recorded the highest while T_4 (821.33g) was the lowest. In dressing percentage, there were significant differences ($p<0.05$) with T_4 (65.44%) being the highest in all treatments with T_3 (60.38%) being the lowest. There were no significant differences ($p>0.05$) in all the cut parts across all treatments. Significant differences ($p<0.05$) were recorded in cost of feed consumed, cost of production, revenue and gross margin. T_1 (N1,358.70) recorded the highest cost of feed consumed while, T_4 (N1,182.67) was the lowest. Cost of production observed were N1,848.70 for T_1 N1,793.00 for T_2, N1,710.67 for T3 and N1672.26 for T_4. T_1 recorded the highest revenue of N2,878.14 while T_4 gave the lowest revenue (N2266.00). Gross margin recorded were N1,453.46, N1,097.04, N1,084.34 and N993.88 for T_1 T_2, T_3 and T_4, respectively. It can be concluded that bitterleaf (V. amygdalina) meal at 5%, 10%, and 15% inclusion levels may be beneficial in promoting growth, improving carcass quality, reduction of cost of production of broiler birds. It has the potential of reducing the mortality rate of birds thereby increasing the income from the sale of the birds at maturity.*

KEYWORDS: *Bitterleaf meal, Broiler Chicken, Growth Performance, Carcass Characteristics, Economics of Production*

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I. INTRODUCTION

Poultry farming has emerged as one of the fastest growing agribusiness industry in the world. In order to reduce malnutrition, disease outbreak, it is therefore suggested that improving poultry production and the expansion of this enterprise would help in feeding the expanding population with protein[1]. Some growth promoters which are chemical and biological substances are added to poultry feed with the aim of improving the growth of chicken, improving the utilization of feed and in this way; realize better production [2]. Their mechanism of action varies, but positive effect can be expressed through better appetite, improved feed conversion, stimulation of the immune system and increased vitality, regulation of the intestinal micro flora,

among others. However, the continuous rise in cost of medicines (such as antibiotics) affects local broilers producers. The use of antibiotic growth promoters has been criticized due to its possible role in the occurrence of antimicrobial resistance in humans [1]. This new context caused an increase in the search for alternative growth promoters.

[3] noted that the use of medicinal plants all over the world predates the introduction of antibiotics and other drugs into Africa continent. The use of medicinal and agro-wastes of plants origin in livestock and poultry feed /diet have shown great improvement in growth performance [4][5][6]. Although, they possess anti-nutritional factors, which can be eliminated or reduce drastically through the use of different processing methods. They have shown far better results compared to synthetic drugs/feed additives [7][8][9][10]. One of the major feed additives that can be used is *V. amygdalina* (bitterleaf) leaf meal (VALM).

Bitterleaf (Vernonia amygdalina) is an herbaceous shrub and one of the edible vegetables that grow freely throughout the tropical Africa [11][1]. It is popularly called bitterleaf because of its abundant bitter taste [12]. It performs both medicinal and nutritive functions and the leaf contains a considerable amount of anti-nutritional factors like high level of tannic acid and saponin [13]. [14] reported that the young leaves often preferred for human consumption, contains high cyanide ($60.10mg100g^{-1}$ DM), and tannin content ($40.6mg100g^{-1}$ DM) than the older leaves. [15] reported that *V. amygdalina* aqueous extract did not affect the feed intake of broiler birds but improved the weight gain and feed conversion ratio. *V. amygdalina* has also been fed to broilers where it was able to replace $300gkg^{-1}$ of maize based diet without negative effect on feed intake, body weight gain and feed efficiency [16]. *V. amygdalina* leaf meal (VALM) shows a chemical composition of 527.83 ME kcal/kg, 86.40% DM, 21.50% CP, 13.10% CF, 6.80% EE, 11.05% Ash, and the result on mineral composition indicates that *V. amygdalina* has 3.85% calcium, 0.40% Magnesium, 0.03% Phosphorus, 0.006% Iron, 0.33% Potassium, and 0.05% Sodium[17]. It is one of the natural feed additives which can be of great productive and health importance in the broiler industry.

Research has shown that *V. amygdalina* (either the leaf meal or the aqueous extract) has some beneficial effects in disease management of poultry [18][1], such as anti-coccidiosis, anti-bacterial and anti-parasitic [19][20]; as an anti-oxidant [21] and as a growth promoter by enhancing the gastro intestinal enzymes thus increasing feed conversion efficiency [22]. Synthetic growth enhancers and supplements in poultry nutrition are expensive, usually unavailable and poses adverse effects in birds and human [23]. Sub-therapeutic levels antibiotics given to poultry as growth enhancer may result to the development of antibiotic-resistant bacteria which is hazardous to animals and human health [24].

The feed industry is also faced with a number of challenges, not only regarding the availability of feed ingredients but also the ability to produce high quality products in a cost effective manner. The study was aimed at evaluating the effects of bitterleaf (*V. amygdalina*) on growth performance, carcass characteristics and the economics of production of broiler birds.

II. MATERIALS AND METHODS

Location of the study

The 7 weeks study was carried out at the Poultry Unit of the Teaching and Research Farm of Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria (MOUAU). The area falls within the Tropical rain forest zone, it is located at latitude 05º 21'N and longitude 07º 33'E, its elevation is about 112m above sea level. It has an average Rainfall of about 1777 - 2000mm/annum, Relative Humidity of about 50-90% and a monthly temperature range of 17º - 36ºC [25].

Experimental birds

One hundred and twenty (120) day old Ross 308 Broiler chicks purchased from a reputable Hatchery at Ibadan (Oyo state) and used for this research were brooded for one (1) week. The birds were allotted to four (4) treatments (30 birds / treatment) and replicated thrice (10 birds / replicate) in deep litter system and were fed straight diet *ad libitum.*

Vaccination and other routine poultry management practices in the tropics which include; daily inspection of birds for symptoms of diseases, cleaning of troughs (feeding and watering) and supply of feed and fresh water were all observed.

Experimental diet

The test ingredient bitterleaf (*V. amygdalina*) was bought from those planting and selling bitterleaf within Umuahia and Aba, in Abia State and dried at room temperature for approximately 7days (at constant weight status). Then they were milled and stored in airtight containers for chemical analysis and feed formulation for the trial (Table 1).

Growth performance parameters

Initial weight of the birds was taken on their arrival before they were assigned to different treatments using a weighing scale (sensitive scale of about 10kg capacity). The weight of the birds was noted weekly until the end of the experiment.

Carcass evaluation

Carcass evaluation was carried out according to [26]. At the end of the experiment three (3) birds/treatment (1 bird/replicate) were selected at random, fasted, and weighed. They were slaughtered by severing the jugular vein; they were scalded (defeathered) using hot water and were weighed. The neck, head, feet, and visceral were separated from the carcass to obtain the dressed weight. Weighed part was expressed as percentage (%) dressed weight.

Economics of production

The economics of production were evaluated according to the outline by [27]. Cost (Nigerian Naira, ₦) of 1kg of each feed ingredient was noted and used to calculate the cost of producing a kg of the experimental diet. Total cost of feed was obtained by multiplying the cost/kg of diet multiplied by total feed consumed/bird. Cost per kilogram weight gain equals cost of total feed consumed divided by total weight gain. Cost of production was obtained by multiplying cost per kg weight gain by mean weight gain and revenue by multiplying price of 1kg meat by mean weight gain. Gross margin equals revenue minus cost of production.

Experimental design and statistical analysis

The experiment was carried out in a completely randomized design using the statistical model;

$Yij = \mu + Ti + eij$

The data collected were analysed using Analysis of Variance (ANOVA) of Completely Randomized Design (CRD) by Steel and Torrie (1980). The mean separation for significant effect was done using Duncan's Multiple Range Test Separation according to [28].

III.RESULTS AND DISCUSSION

Proximate composition of bitterleaf meal and the experimental diets

The proximate composition of bitterleaf meal (Table 1) and the dietary treatments are displayed on Tables 2 and 3, respectively. The bitterleaf (*V.amygdalina*) meal was made up of 84.51% dry matter, 15.49% moisture content, 15.02% ash, 17.75% crude protein, 0.30% ether extract, 1.65% crude fibre and 49.79% nitrogen free extract with a gross energy value of 2219.73kcal/kg. The proximate composition of the experimental diets observed (Table 4) were 91.84%DM, 8.16% M.C., 7.28 % ash, 20.85% CP, 5.62% ether extract, 4.46% crude fibre and 53.63% nitrogen-free extract with a gross energy of 2903.41kcal/kg for the control diet. Inclusion of 5% bitterleaf meal in T_2 resulted to 8.80%MC, 8.04% ash, 19.53% CP, 5.55% EE, 4.49% crude fibre and 53.59% NFE.

Table 1. Proximate composition of bitterleaf (*V. mygdalina*)

Parameter	DM (%)	MC (%)	Ash (%)	CP (%)	EE (%)	CF (%)	NFE (%)	GE
VALM	84.51	15.49	15.02	17.75	0.30	1.65	49.79	2219.73

DM, M.C, CP, EE, CF, NFE and GE represent dry matter, moisture content, crude protein, ether extract, crude fibre, Nitrogen Free Extract and gross energy, respectively.

Table 2. Gross compositions of experimental broiler starter diets

INGREDIENT (kg)	T_1 (0%VALM)	T_2 (5%VALM)	T_3 (10%VALM)	T_4 (15%VALM)	COST/ KG (₦)
Maize	55.00	60.00	60.00	60.00	260
Soya Bean Meal	34.10	24.10	20.10	15.10	420
Fish meal	4.00	4.00	3.00	4.20	1680
Bone Meal	3.00	3.00	3.00	3.00	90
Oyster	2.00	2.00	2.00	2.00	70
Lysine	0.20	0.20	0.20	0.20	1600
Methionine	0.20	0.20	0.20	0.20	2300
V. amygdalina	0.00	5.00	10.00	15.00	300
Vitamin Premix	0.25	0.25	0.25	0.25	1450

Salt	0.25	0.25	0.25	0.25	300
Palm oil	1.00	1.00	1.00	1.00	1000
Total	**100**	**100**	**100**	**100**	
Calculated Analysis					
M.E (Kcal/kg)	3140.00	2883.10	2756.80	2628.20	
Crude Protein (%)	22.60	20.50	19.27	18.24	
Crude Fibre (%)	3.01	3.78	4.20	5.58	
Ether Extract (%)	8.5	7.30	6.97	6.41	
Calcium (%)	2.18	2.55	2.68	2.86	
Lysine (%)	1.47	1.20	1.05	0.92	
Methionine (%)	0.59	0.54	0.50	0.48	

Vitamin/Mineral premix (2.5kg) contains: Vit. A (12,500,000 I.U), Vit. D3 (2,500,000 I.U), Vit. E (40,000 mg), Vit. K3 (2,000 mg), Vit. B1 (3,000 mg), Vit. B2 (5,500 mg), Niacin (55,000 mg), Calcium Pantothenate (11,500 mg), Vit. B6 (5,000 mg), Vit. B12 (25 mg), Choline Chloride (500,000 mg), Folic Acid (1,000 mg), Biotin (80 mg), Manganese (120,000 mg), Iron (100,000), Zinc (80,000 mg), Copper (8,500 mg), Iodine (1,500 mg), Cobalt (300 mg), Selenium (120 mg), Anti-Oxidant (120,000 mg).

VALM – *Vernonia amygdalina* leaf meal

Table 3. Gross composition of experimental broiler finisher diets

INGREDIENT (kg)	**T_1 (0%VALM)**	**T_2 (5%VALM)**	**T_3 (10%VALM)**	**T_4 (15%VALM)**	**COST/ KG (₦)**
Maize	58.00	58.00	57.00	57.50	260
Soya Bean Meal	34.00	29.50	25.55	20.00	420
Fish meal	2.00	2.00	2.00	2.00	1680
Bone Meal	3.00	2.50	2.50	2.50	90
Oyster	2.00	2.00	2.00	2.00	70
Lysine	0.25	0.25	0.20	0.25	1600
Methionine	0.25	0.25	0.25	0.25	2300
V. amygdalina	0.00	5.00	10.00	15.00	300
Vitamin Premix	0.25	0.25	0.25	0.25	1450
Salt	0.25	0.25	0.25	0.25	300
Total	**100**	**100**	**100**	**100**	
Calculated Analysis					
M.E (Kcal/kg)	3140.00	2883.10	2756.80	2628.20	
Crude Protein (%)	22.60	20.50	19.27	18.24	
Crude Fibre (%)	3.01	3.78	4.20	5.58	
Ether Extract (%)	8.5	7.30	6.97	6.41	
Calcium (%)	2.18	2.55	2.68	2.86	
Lysine (%)	1.47	1.20	1.05	0.92	
Methionine (%)	0.59	0.54	0.50	0.48	

Vitamin/Mineral premix (2.5kg) contains: Vit. A (12,500,000 I.U), Vit. D3 (2,500,000 I.U), Vit. E (40,000 mg), Vit. K3 (2,000 mg), Vit. B1 (3,000 mg), Vit. B2 (5,500 mg), Niacin (55,000 mg), Calcium Pantothenate (11,500 mg), Vit. B6 (5,000 mg), Vit. B12 (25 mg), Choline Chloride (500,000 mg), Folic Acid (1,000 mg), Biotin (80 mg), Manganese (120,000 mg), Iron (100,000), Zinc (80,000 mg), Copper (8,500 mg), Iodine (1,500 mg), Cobalt (300 mg), Selenium (120 mg), Anti-Oxidant (120,000 mg).

VALM – *Vernonia amygdalina* leaf meal

Table 4: Proximate compositions of broiler starter diets containing bitterleaf meal

Parameters\Treatments	**T_1**	**T_2**	**T_3**	**T_4**
Dry matter (%)	91.84	91.20	91.14	91.08
Moisture (%)	8.16	8.80	8.86	8.92
Ash/Minerals (%(	7.28	8.04	8.43	8.87
Crude protein (%)	20.85	19.53	18.25	17.75
Ether extract (%)	5.62	5.55	5.55	5.50

Crude fibre (%)	4.46	4.49	4.56	4.72
Nitrogen Free Extract (%)	53.63	53.59	54.35	54.24
Gross Energy (kcal/kg)	2903.41	2848.49	2824.84	2804.40

Effect of bitterleaf (*V. amygalina*) meal on the growth performance of broiler chickens

Table 5 shows the growth performance of broiler birds fed graded levels of bitterleaf meal. The average daily feed intake were observed to be 76.38g/b/d for T_1, 74.70g/b/d for T_2, 73.50g/b/d for T_3 and 71.84 for T_4. The results also revealed final weight of 1632.67g, 1409.67g, 1359.67g, and 1324.67g with mean weight gain of 1439.07g, 1217.77g, 1167.34g and 1132.67g and average daily weight gain of 29.37g/b/d, 24.84g/b/d, 23.83g/b/d and 23.13g/b/d for T_1, T_2 T_3 and T_4 respectively. There were no significant differences ($p>0.05$) observed in the feed conversion ratio of birds fed all the dietary treatments. However, morality rate of 20.00%, 3.33%, 3.33% and 6.67% were observed for T_1, T_2 T_3 and T_4, respectively.

Table 5: Growth performance of broiler birds fed varying levels of bitterleaf meal

Parameters	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**
Initial weight (g)	193.60	191.90	192.33	191.00	0.58
Final weight (g)	1632.67^a	1409.67^b	1359.67^b	1324.67^b	41.84
Weight gain (g)	1439.07^a	1217.77^b	1167.34^b	1132.67^b	39.82
Average daily weight gain (g)	29.37^a	24.85^b	23.82^b	23.12^b	0.81
Feed intake (g)	3742.67^a	3660.67^b	3601.33^b	3520.33^c	26.53
Average daily feed intake (g)	76.38^a	74.71^b	73.50^b	71.84^b	0.55
Feed conversion ratio	2.60	3.01	3.09	3.11	0.41
Mortality (%)	20.00^a	3.33^b	3.33^b	6.67^b	2.71

^{a,b,c} Means within the rows with different superscripts are significantly different ($p<0.05$); SEM – Standard error of the mean. VALM – *Vernonia amygdalina* leaf meal.

The results showed that there were significant differences ($p<0.05$) in all the parameters except the initial body weight and feed conversion ratio. Feed consumption decreased as the level of inclusion of *V.amygdalina* increased in the diets in line with the report of [29]. Birds fed diets T_2 (3660.67g), and T_3 (3601.33g) showed no significant different ($p>0.05$) in their total feed consumption. Birds fed diet containing 15% *V.amygdalina* consumed the least quantity of feed (3520.33g). This may be attributed to poor palatability of the diet due to high level of bitterleaf in the diet. The bitter taste of bitterleaf could be as a result of the presence of antinutritional factors such as alkaloids, saponins, tannins and glycosides and this may hindered digestion and proper utilization of the feed containing higher concentration of *V.amygdalina* according to [16] . This suggests that birds have well developed taste buds in line with the report of [30], who observed that chickens find tannin in sorghum distasteful.

Weight gain decreased as level of *V.amygdalina* increased in the diet. However, [31] gave a contrary report of improved weight gain, feed intake and FCR as level of inclusion of *V.amygdalina* increased from 5% to 10%. The low weight gain observed in the birds fed 15% *V.amygdalina* could be attributed to the low crude protein content and gross energy of that diet. The NFE of diet T_4 was high but it may have been unavailable for the birds to utilize. The low weight gain recorded in T_4 could be due to low crude protein and high fibre of the diet relative to other diets. The result showed significant difference ($p<0.05$) in the mortality rate. T_1 had the highest mortality rate (20%) compared to other treatments. Adding bitterleaf meal up to 15% resulted to higher mortality than 5% and 10%. The high mortality of birds fed the control diet suggests that bitterleaf had some components that may have provided some beneficial medical or health properties to birds in T_2, T_3 and T_4 which was optimal at 5% and 10%.

The result showed clearly that incorporation of *V.amygdalina* into the broiler diet could improve their growth performance. The reduction in Weight Gain observed in the *V.amygdalina*-treated groups explains the poor FCR. [23] reported that inclusion level of *V.amygdalina* meal at 2% did better than those fed 3% inclusion of *V.amygdalina*. This might indicate an optimal level of inclusion level of *V.amygdalina* meal for better

performance, since levels used in this research did not yield comparable result to those lower levels reported by [23].

Mortality was significantly reduced ($p<0.05$) in *V.amygdalina*-treated groups compared to control group. This observation could be attributed to the health benefits of bitterleaf in diseases, suggesting that *V.amygdalina* could be used as antibacterial in poultry diets agrees with reports of [19].

Carcass characteristics of broiler birds fed varying levels of bitterleaf meal

The carcass characteristics of broiler birds fed graded level of bitterleaf meal is summarized in Table 6. There were significant differences between the treatments in their dressed weight and dressing percentage but none in the cut parts of birds fed the different experimental diets. Dressed weight of 1035.67g, 873.33g, 821.33g and 868.00g were recorded for T_1, T_2 T_3 and T_4, respectively.

The diets containing 0%, 5%, 10% and 15% bitterleaf meal recorded dressing percentages of 64.15%, 61.95%, 60.38% and 65.44% respectively. Dressing percentage were statistically similar ($p>0.05$) between birds fed T_1 and T_4. But T_4 had the highest dressing percentage of 65.44% while the least dressing percentage of 60.38% was observed in T_3. There were no significant differences ($p>0.05$) observed in the cut parts of birds fed all the dietary treatments.

Table 6: Carcass characteristics of broiler birds fed varying levels of bitterleaf meal

Parameter\Treatment	T_1	T_2	T_3	T_4	SEM
Live weight (g)	1632.67[a]	1409.67[b]	1359.67[b]	1324.67[b]	39.93
Dressed weight (g)	1035.67[a]	873.33[b]	821.33[b]	868.00[b]	29.07
Dressing percentage (%)	64.15[a]	61.95[ab]	60.38[b]	65.44[a]	0.80
Carcass (% dressed weight)					
Back cut	22.14	20.97	22.64	21.70	0.36
Breast cut	30.10	31.74	30.60	30.97	0.48
Thighs	17.80	17.35	17.70	16.96	0.19
Drum sticks	17.10	16.79	16.47	17.29	0.19
Wings	12.87	13.14	12.59	13.08	0.19

[a,b] Means within the rows with different superscripts are significantly different ($p<0.05$)
SEM – Standard error of the mean
VALM – *Vernonia amygdalina* leaf meal

Significant difference ($p<0.05$) was recorded in dressed weight and dressing percentage of the birds fed the different dietary treatments. T_1 (1035.67g) recorded the highest ($p<0.05$) dressed weight, though it did not translate to corresponding best dressing weight. T_2 (821.33g) had the lowest dressed weight. T_4 (65.44%), recorded the highest dressing percentage among the groups fed diets containing *V. amygdalina* but, compared with the control. There was no significant difference ($p>0.05$) in all the cut parts across all treatments.

The result showed clearly that incorporation of VALM in the broiler diet had a positive effect on dressed weight. The high dressed weight observed in the control could indicate that the feather and gut may have contributed to the high weight. The results of the present study are in accordance with the report of [32] who observed variation in carcass characteristics of broiler birds fed varying levels of garlic leaves. The results on the cut parts is in line with the findings by [33] who reported no significant difference on thigh, drum stick, wings, breast and back on birds fed olive leaf extract. The significant ($p<0.05$) higher dressing percentage of birds on T_4 may suggest a better efficient utilization of nutrients in terms of digestion, absorption and assimilation for tissue production, in line with the report by [34]. The inclusion of bitterleaf in broiler diets appeared to improve dressing percentage and significantly promoted higher dressed weight and carcass quality than the control.

Economics of production of broiler birds fed varying levels of bitter leaf meal

The Naira cost (₦) implication of bitterleaf (*V. amygdalina*) in broiler diets is shown in Table 6. There were significant differences ($p<0.05$) in all parameters except the cost per kilogram feed of the treatments. T_1 had the highest cost of total feed consumed (₦ 1,421.09), closely followed by T_2 (₦1338.71) and T_4 (₦1271.75). The least cost of feed consumed was observed in T_3 (₦ 1250.02). Cost per kilogram weight gain were ₦ 990.00, ₦ 1099.31, ₦ 1070.83 and ₦ 1122.79 for T_1, T_2, T_3 and T_4 respectively. The cost of production were ₦1848.70, ₦1793, ₦1710.47 and ₦1672.36 for T_1, T_2, T_3 and T_4 respectively. T_1 recorded the highest ($p<0.05$) cost of production (₦1424.68) for a bird, followed by T_2 (₦ 1338.96), T_4 (₦ 1272.12) while, T_3 (₦ 1249.66) had the least cost of production. T_1 (₦ 2878.14) showed significantly highest ($p<0.05$) revenue compared to other

treatments T_2 (₦ 2436.00), T_3 (₦ 2334.00), with T_4 (₦ 2266.0033) having the least revenue. Also, there were significant differences ($p<0.05$) in gross margin with T_1 (₦ 1453.46) being the highest and T_2 (₦ 993.88) being the lowest.

There were no significant difference ($p<0.05$) in the cost per kilogram feed formulated. This shows that incorporating *V.amygdalina* in broiler diet does not add any significant extra cost in procuring the feeds. Addition of bitterleaf meal reduced the cost of feed consumed per bird. This could be attributed to the low quantities of *V.amygdalina*-diets consumed by the birds due probably to the poor palatability of these diets resulting from the bitter taste of *V.amygdalina.* The low cost of total feed consumed observed in the birds fed 15% *V.amygdalina* is positively proportional to the low quantity of feed consumed by those birds. The cost of feed/kg body weight gain was least for the birds in T_1, indicating that each kilogram gain in weight was attained at a low cost. Those in T_2 had the highest cost per kilogram gain in weight because their weight gain in relation to feed consumed was poor. Cost of production of birds fed control diet was the highest because they had the highest quantity of feed consumed. T_1 gave the highest revenue, the best profit (benefit) were obtained from birds on T_1 while the lowest revenue was obtained in T_4. The cost of feed and cost of production appeared to be about 70% of the total cost of production in line with the report of [28].

IV. CONCLUSION

In conclusion, the low mortality observed in the birds fed diets containing bitterleaf meal suggests that bitterleaf meal could be a potential broiler feed ingredient. Also, it supported growth since the feed conversion ratio was not inferior to the control diet. Moreover, the cost of production of birds fed diets containing bitterleaf meal was lower than the control.

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