IMPACT OF DIFFERENT COMBINATION OF MORINGA AND BLACK PLUM LEAF MEALS ON THE GROWTH PERFORMANCE AND COST BENEFIT ANALYSIS OF FINISHER BROILERS

[*]Olabode, A.D., [*]Adetutu, O.I., [*]Ebiaku, V., [+]Agu, C.I., *Uzoma, C., *Azodo, L. and *Olabode, D.A.
[*]Federal College of Agriculture, Ishiagu, Ebonyi state.
[+]Enugu state polytechnic, Iwollo, Enugu state.
Corresponding author: adeoladavid2005@yahoo.com

Abstract
One hundred and twenty (120) five weeks old "Agric-tech" broiler birds were randomly allocated to five dietary treatments, e ach replicated three times with eight birds per replicate in a completely randomized design (CRD) to determine the impact of supplemental levels of moringa leaf meal and black plum leaf meal on the growth performance and cost benefit analysis of finisher broilers. Five different diets were formulated such that diets 2, 3, 4 and 5 contained moringa leaf meal and black plum leaf meal at the levels and ratio of 1:4, 2:3, 3:2 and 4:1, while diet 1 served as the control. Feed and water were given *ad-libitum* throughout the experimental period of twenty-one days. Value obtained for final body weight was higher ($P<0.05$) in treatment 4 with 3168.98g, which did not differ ($P>0.05$) from the values of 3055.41g, 2971.53g and 2996.40g obtained in treatment 1, 2 and 3 respectively. While, the least value of 2646.48g was observed in treatment 5. Body weight gain was superior ($P<0.05$) for birds in treatment 4 with 1522.19g, which did not differ from the value of 1423.98g in treatment 1. The least value of 1006.90g was obtained in treatment 5. Optimal efficiency of feed (feed conversion ratio) was observed for birds in treatment 4 with a value of 2.75, while the least performance in term of feed conversion ratio was obtained in treatment 5 (3.53). Value obtained for benefit was highest ($P<0.05$) in treatment 5 with #1525.01, while the lowest value of #927.15 was obtained in treatment 5. Cost benefit ratio was better in treatment 4 (2.12). It can be concluded from the data obtained that the inclusion of moringa leaf meal and black plum leaf meal at different levels and ratio of 1:4, 2:3, 3:2 and 4:1 can be tolerated by the birds at finisher phase without adverse effect on the performance of the birds, with the best performance and net profit in treatment 4 respectively.

Keywords: Growth performance, cost benefit analysis, finisher broiler birds, moringa leaf meal and black plum leaf meal

Introduction

Poultry production is a very important integral part of the agricultural sector of developing countries and one of the most dynamic of world Agric-business trade. Hence research on animal protein production globally indicates poultry as the fastest growing livestock sector especially in developing countries. This is because poultry is the most efficient converter of feed to animal protein and has a short generation interval (Onyimonyi *et al*., 2009). Thus, it has been suggested that the expansion of the Nigeria poultry holds one of the greatest promises of bridging the animal protein gap in the country within the shortest possible time.

The high cost of feeding broiler birds has been traced to the continuous use of conventional feed ingredients. Thus, the cost of conventional feed stuffs which are the major sources of energy and protein in poultry diets has continued to increase due to their short supply. Therefore, there is need to continue to source for alternative sources of energy and protein. Furthermore, one of the major factors that affect poultry production is the inability to secure quality feed at affordable prices. The inadequate feed supply and the resultant high cost of feed has been recognized as a major constraint to livestock production in Nigeria (Oluyemi and Robert, 2007). Hence the need to substitute these conventional feed ingredients with a potential feed ingredient like moringa and black plum leaf meal. Leaf meals have been incorporated in the diets of poultry as a means of reducing the high cost of conventional feed ingredients sources. Thus, the incorporation of leaf sources in the diets of broilers is fast gaining ground because of its availability, abundance and relatively reduced cost.

Vitex doniana is commonly known as black plum (English) Uchakoro (Igbo) Oriri (Yoruba) Dinya (Hausa). The fruit is smooth and oblong, green marked with white dots, and turn black when ripe. It is the tallest and most frequent pan Africa *Vitex* species occurring from Senegal East to Somalia and South Africa (Louppe *et al*., 2008) *Vitex doniana* is among the neglected and underutilized species

known due to their nutritional and medicinal properties. *Vitex doniana*, as an indigenous leafy vegetable is inexpensive but is a high-quality nutritional source, especially when used in the diets of broiler birds They are found to contain much more potassium and phosphate than calcium, magnesium, zinc and iron (Nnamani, *et al*., 2007).

Moringa is a fast-growing drought resistance tree of the family Moringaceae, native to Indian sub-continent. It is widely cultivated for its young seed pods and leaves used as vegetables and for traditional herbal medicine. It is a sun and heat loving plant and does not tolerate freezing or frost (Oyeyinka and Oyeyinka, 2018). Moringa is particularly suitable for dry regions as it can be grown using rainwater without expensive irrigation techniques. The leaves are the most nutritious part of the plant, being a significant source of B vitamins, vitamin C, provitamin A as beta-carotene, vitamin K, manganese and protein. It is also a good source of dietary fiber, potassium and manganese.

Materials and methods

The research work was conducted at the poultry unit of Animal Production Technology Department, Federal College of Agriculture, Ishiagu, Ebonyi State. The moringa and black plum leaf that was used for the experiment was sourced from Ishiagu town and its environs, Ebonyi state. The leaves were obtained fresh, washed, air-dried and then sun-dried for an hour to get a crispy-like leafy material. The crispy leaves were then turn to powder by means of grinding and then incorporated into the diets of the birds.

Table 1: Experimental diet for finisher broilers fed supplemental levels of moringa and black plum leaf meal

	Treatments				
Ingredients	**T1**	**T2**	**T3**	**T4**	**T5**
Wheat offal	6.90	3.90	3.90	3.90	3.90
Palm kernel cake	6.00	4.00	4.00	4.00	4.00
Black plum leaf meal	0.00	4.00	3.00	2.00	1.00
Moringa leaf meal	0.00	1.00	2.00	3.00	4.00
Total	**100**	**100**	**100**	**100**	

Other feed ingredient had same value across treatment group: Maize-58.00; Full fat soya-5.00; Groundnut cake-14.00; Fishmeal-1.50; Blood meal-3.50; Bonemeal-2.50; Limestone-1.50; Salt-0.25; Finisher premix-0.35; Lysine-0.20; Methionine-0.30.

Table 2: Proximate composition of moringa and black plum leaf meal

Component (%)	Moringa leaf meal	Black plum leaf meal
Dry matter	91.86	89.06
Moisture	8.14	10.94
Crude protein	26.49	11.27
Crude fiber	7.92	7.37
Ether extract	4.31	2.60
Ash	9.62	9.38
Nitrogen free extract	43.52	58.44
Metabolizable energy (Kcal/kg)	2,816.70	2,660.85

One hundred and twenty (120) five weeks old "Agritech" broiler birds were used for the research work. Each treatment had twenty-four birds with three replicates consisting of eight birds each distributed in a completely randomized design (CRD). Feed and water were given *ad-libitum* and vaccinations were given as at when due according to standard practices. The initial weight of the birds was taken at the beginning of the study and then subsequently on a weekly basis. Feed intake was also recorded as the difference between the quantity of feed given the previous day and the quantity that was left the next day. Feed conversion ratio was obtained as the ratio of feed intake divided by the body weight gain. Data collected were subjected to analysis of variance (ANOVA). Significantly different means were separated according to the method of Duncan multiple range test. Proximate analysis of moringa and black plum leaf meal were carried out using the standard

procedure of AOAC (2005). Cost benefit analysis was calculated using the following formula as outlined by Olabode *et al*. (2022).

- **Cost of bird =** Amount expended or spent on purchase of bird
- **Cost per kg of feed** = Cost of feed/25kg
- **Cost of feed consumed** = Total feed intake x cost per kg of feed/1000
- **Other cost**
- **Total cost of production**
- **Revenue** = Average final Weight of birds x cost per kg of current market price of 1kg meat of broiler/1000
- **Benefit/Profit** = Revenue – cost of production
- **Cost benefit ratio** = Cost of production/Benefit

Results and Discussion

Growth performance and cost benefit analysis result are presented in table 3. The final body weight of finisher broiler birds was superior (P<0.05) in treatment 4 with a value of 3168.98g, which did not differ (P>0.05) from the values of 3055.41g, 2971.53g and 2996.40g obtained for birds in treatments 1, 2 and 3. The least value of 2646.48g was observed in treatment 5. The superior final weight observed in treatments 1, 2, 3 and 4 could be attributed to the higher feed intake which in-turn reflected in the meat and muscle gain. More so the high level of amino acid, minerals and vitamin embedded in moringa leaf meal could be key to the high level of weight observed in this treatment. Also, the antioxidant factor and bioactive compounds in the black plum could be seen as having the ability and potency to increase weight at a low level of inclusion. Superior value of final body weight in treatment 4 was supported by the accession of Kakengi *et al*. (2003) where they observed enhanced weight when moringa leaf meal was added to the diet of broiler birds at finishing phase. Birds in treatment 4 had a superior daily feed intake value of 199.35g which did not differ (P>0.05) from the values of 194.80g, 188.05g and 191.18g obtained for birds in treatments 1, 2 and 3 respectively. The lowest value of 169.41g was observed in treatment 5. This research is similar to the work carried out by Safa and Tazi (2012) who observed significant (P<0.05) difference in daily feed intake of broiler birds fed moringa based diets. These they attributed to the iso-caloric and iso-nitrogeneous nature of the experimental diets. Birds in treatments 1, 2, 3 and 4 had feed conversion ratios of 2.87, 2.99, 2.94 and 2.75 respectively which were significantly (P<0.05) different to the value of 3.53 obtained for birds in treatment 5. The superior feed conversion ratio observed in treatments 1, 2, 3 and 4 could be a reflection of the ability of the birds in those treatments to utilize to an optimal level the nutrient in the diets, as also seen in the final body weight and daily weight gain. This work contradicts with the study conducted by Atuahene *et al*. (2008) where they reported that feed conversion efficiency was highest for birds fed diets containing 750g/100kg moringa leaf meal and declined as the proportion of it in the diets decreased. Superior net benefit/profit value of #1525.01 was obtained in treatment 4, which was significantly (P<0.05) different from the value of #927.15 obtained for benefit in treatment 5, being the least value for benefit. Values of #1314.06, #1279.85 and #1308.42 was obtained for benefit in treatments 1, 2 and 3 which were by themselves similar to each other statistically. This was similar to the report of Olabode *et al*. (2022), where they observed better profit in leaf meal fortified diets.

Conclusion

It can be concluded from the results obtained that the inclusion of black plum and moringa leaf meal in the diet of finisher broiler birds at the levels and ratio of 1:4, 2:3, 3:2 and 4:1 can be tolerated by the birds and does not pose any negative effect on the birds in terms of their performance and benefit derived from production.

Table 3: Growth Performance Characteristics and cost benefit analysis of Finisher Broiler Birds fed supplemental levels of moringa and black plum leaf meal.

	Treatments					
Parameters	T1	T2	T3	T4	T5	SEM
Initial body weight (g)	1631.43	1648.75	1630.83	1646.79	1639.58	-
Final body weight (g)	3055.41^{a}	2971.53^{a}	2996.40^{a}	3168.98^{a}	2646.48^{b}	65.34
Body weight gain (g)	1423.98^{a}	1322.78^{b}	1365.57^{b}	1522.19^{a}	1006.90^{c}	46.69

Daily weight gain (g)	67.81[a]	62.99[a]	65.03[a]	72.49[a]	47.95[b]	2.49
Feed intake (g)	4090.80[a]	3949.05[a]	4014.78[a]	4186.35[a]	3557.61[b]	88.96
Daily feed intake (g)	194.80[a]	188.05[a]	191.18[a]	199.35[a]	169.41[b]	3.16
Feed conversion ratio	2.87[b]	2.99[b]	2.94[b]	2.75[b]	3.53[a]	0.08
Cost of bird at 4 weeks	1800.00	1800.00	1800.00	1800.00	1800.00	-
Cost of kg of feed	298.00	285.50	283.00	281.50	279.00	3.22
Cost of feed consumed	1219.06[a]	1127.45[a]	1136.18[a]	1178.46[a]	992.57[b]	23.81
Operational cost (#)	250.00	250.00	250.00	250.00	250.00	-
Total cost (#)	3269.06	3177.45	3186.18	3228.46	3042.57	33.48
Revenue (#)	4583.12[a]	4457.30[b]	4494.60[b]	4753.47[a]	3969.72[c]	72.83
Benefit/profit (#)	1314.06[b]	1279.85[b]	1308.42[b]	1525.01[a]	927.15[c]	52.50
Cost benefit ratio	2.49[b]	2.48[b]	2.44[b]	2.12[c]	3.28[a]	0.11

[abc]Means on the same row with different superscripts are significantly ($p<0.05$) different.

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