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308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

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An Assessment of *Ipomoea asarifolia* Leaf Meal as Feed Ingredient in Broiler Chick Production

B.U. Ekenyem and F.N. Madubuike
Department of Animal Science, Imo State University, P.M.B. 2000, Owerri, Nigeria

Abstract: Two hundred and forty one week old Anak broiler chicks were involved in a 49-day feeding trial in a completely randomized design to assess the effect of 0%, 5%, 10% and 15% inclusion levels of *Ipomoea asarifolia* leaf meal (IALM) in the performance, organ and carcass characteristics of broiler chicks. The birds were fed the experimental broiler diets for 28 days while they were fed the finisher diets for the remaining 21 days. Feeding and potable water supply were *ad libitum* while other standard management practices were meticulously observed. The initial weight, final weight, weight gain, feed intake, feed conversion ratio and feed cost per broiler were evaluated. The results show that the final live weight of birds on control diet 0% IALM (2.200kg) and 5% IALM (2.050kg) were significantly ($P<0.05$) superior to birds on 10% IALM (1.775kg) and 15% IALM (1.600kg). Feed conversion ratio for the control 0% IALM was significantly superior ($P<0.05$) to 10% and 15% IALM inclusions, while 0% and 5% levels were statistically similar ($P>0.05$). Daily feed intake in 0%, 5% and 10% levels were significantly higher ($P<0.05$) than 15% level of IALM. Dressed weights for 0% and 5% levels were similar ($P>0.05$) but superior ($P<0.05$) to 10% and 15% levels. Organ weights differed significantly ($P<0.05$) between treatments, showing declining values with increasing levels of IALM. From the results of the experiment, the optimum inclusion level of IALM in broiler diets is between 5% and 10% levels. Further research is therefore necessary to improve the nutritive value of *Ipomoea asarifolia* leaves for livestock because of its abundance and cheapness for improved meat production.

Key words: *Ipomoea asarifolia* leaf meal, broiler chicks, performance, carcass and organ characteristics

Introduction

The animal protein deficit in the diets of Nigerians and people of most developing countries is now a matter of urgent concern and measures to save people from imminent protein malnutrition are imperative. However, poultry products have high potentials for bridging the animal protein gap considering the fact that high yielding exotic poultry adapt easily to our environment and the technology of production is relatively simple with high returns to investment (Idufueko, 1984; Madubuike, 1992). More disturbing is the recent decline in poultry production. For example. Esonu *et al.* (2001) stated that more than 50% of Nigeria's poultry farmers have closed down and another 30% forced to reduce their production capacity due to shortage of feed.

The present shortage of monogastric animal feed has been blamed on ever increasing cost of the feed ingredients, which Opara, 1996; Madubuike *et al.,* 1999; Esonu *et al.* (2001); and Madubuike and Ekenyem, 2001 have rated at 70-80% arising mainly from protein concentrates. This phenomenon is sequel to the increasing competition between man and animals for available grains (Tegbe *et al.,* 1984; Madubuike, 1988). The inadequate production of farm crops to meet the needs of man and his livestock (Babatunde *et al.*, 1990; Esonu *et al.*, 2001) as well as the threat of desert encroachment in many parts of West Africa Sub-region which had destroyed the vegetation and depleted livestock population (Idufueko, 1984; Madubuike, 1992). Thus, for sustainable animal protein production, Nwakpu *et al.* (2000); Ekenyem (2002) and Esonu *et al.* (2003) have suggested immediate search for cheap and readily available sources of protein and energy particularly those that are not competed for between man and livestock. In this direction, Esonu *et al.* (2003) had suggested the leafmeal of tropical legume and browse plants as potential sources of cheap animal feed resources. Furthermore, Udedibie and Igwe, 1989; Esonu *et al* 2003 had worked on *Microdesmis puberula* leaf in poultry feed while Wekhe and Njoku, 2000 had worked on leafmeal of *Alchornia cordifolia* with varying results.

This trial is intended to evaluate the potentials of *Ipomoea asarifolia* leaf as a feed ingredient in broiler production. *Ipomoea asarifolia* (morning glory) belongs to the family convolvulaceae. It is a perennial herbaceous plant, preponderant in South Eastern Nigerian and rapidly multiplying by seed and stolen. With crude protein level of 32% and 2760 Kcal/kg metabolisable energy, good mineral profile, and no-cost, *Ipomoea asarifolia* is a potential cheap feed ingredient for optimum and sustainable poultry production.

Materials and Methods

Fresh and blooming *Ipomoea asarifolia* leaves were harvested green from the bush and fallow sections of

the Imo State University premises and environs. The leaves were chopped to facilitate dying and spread on clean concrete floor of well ventilated room for four days until they became crispy. This measure was to prevent nutrient leaching and maintaining the green coloration. The dried leaves were then milled using a hammer mill with a sieve size of 3.15mm to produce the leaf meal. Proximate analysis of the leaf meal was conducted using standard methods (AOAC, 1995) to determine the percentage crude protein, crude fibre, total ash and other extract. The mineral analysis was carried out by methods of Grueling (1966) while gross energy was determined with Gallencamp oxygen adiabatic bomb calorimeter (Table 1).

Table 1: Proximate composition of *ipomoea asarifolia leaf meal*

Nutrient	Value %
Crude fibre	16.90
Crude protein	32.00
Ash	7.10
Ether Extract	7.60
Moisture	15.00
NFE	20.79
Metabolisable Energy (Kcal/kg)	2760.00
Mineral composition:	
Mineral calcium	0.50
Magnesium	0.63
Sodium	0.29
Potassium	0.50

The results of the chemical analysis of *Ipomoea asarifolia* was a guide for the formulation of four broiler starter diets and four finisher diets each containing IALM at 0, 5, 10, and 15% levels. The diets were iso-energetic. Commercial starter diet (top brand) was fed to the birds for the first week before the experimental broiler starter diets, which lasted till 5th week of life.

Two hundred and forty one-week old Anak broiler chicks were divided into 4 groups fed diets containing 0, 5, 10 and 15% inclusion levels of *Ipomoea asarifolia* leaf meal (IALM) respectively in which 0% is the control. Each treatment group having 60 birds was further split and allotted into four replicates of 15 birds each in a completely randomized design and in a 10 x 8m deep litter apartment. The birds were fed in two phases: starter phase (first 4 weeks) and the finisher phase 5th week to 8th week of life. Feed and potable water were supplied *ad libitum* throughout the period of the experiment.

Body weight of the birds was taken at the start of the experiment and weekly thereafter till the end of the experiment. At the end of the experiment, one bird was randomly picked from each replicate group, starved of food for 24 hours but supplied with water, and slaughtered by cutting the jugular to cause thorough bleeding. The birds were eviscerated after plucking their feathers in warm water. The weights of the various organs, e.g. heart, kidney, liver and gizzard were determined with a sensitive weighting scale and each value obtained as percentage of body weight. Also, the dressed weights and dressing percentages were measured as carcass parameters.

Results were subjected to one-way analysis of variance according to the methods of Snedecor and Cockran (1978) and differences in means separated by Duncan's multiple range test as outlined by Onuh and Igwemma (1998).

Results

The performance, organ and carcass characteristics of birds on different levels of IALM are presented in Table 4.

The final live weight of broilers on 0 and 5% IALM were not significantly different but both differed ($P<0.05$) from birds on 10 and 15%. Significant differences ($P<0.05$) were observed in all parameters but 0 and 5% levels had similar values in most of the parameters. This trend was similar in total live weight gain. The value of feed intake showed high acceptability of the IALM. Feed conversion ratio varied significantly between treatments with 0 and 5% levels superior to 10 and 15% levels. The carcass characteristics showed that 0% and 5% levels did not differ ($P>0.05$) while both differed from birds on 10 and 15% levels of the lead meal. The dressing percentage also showed that 0% was superior to other treatments while 5 and 10% were not different ($P>0.05$). In organ weighs, significant difference ($P<0.05$) was observed between treatments, showing lower values with increasing levels of *Ipomoea asarifolia* leaf meal.

Discussion

The observations of significant differences in body weight gain of experimental birds agreed with Esonu *et al.* (2003), which assessed the potentials of M*icrodesmis puberula* leaf meal as feed ingredient and found significant differences ($P<0.05$) between the control 0% and groups on *Microdesmis puberula* leaf meal. The result also agreed with Dada *et al.* (2000) which worked on supplementing broiler finisher rations at 0% (control), 5.25%, 10.50% and reported significant differences in final weight and daily weight gains between treatments only when the feed was included at high levels. The significant differences in performance characteristics between treatments observed in this study, agreed with Okonkwo *et al.* (1995) which reported significant reduction in feed conversion ratio as *Leucaena leucocephala* leaf meal (LLM) increased up to 10% in broiler finisher diet. It however differed with Dada *et al.* (2000) which reported non-significant ($P>0.05$) difference in feed to gain ratio in birds fed three dietary levels (5%, 10%, 15%) of LLM. The feed cost per broiler

Table 2: Composition of the broiler starter diets

Ingredients	0%	5%	10%	15%
Maize grain	28.0	28.0	28.0	28.0
Soyabean meal	20.0	15.0	10.0	5.0
Groundnut cake	15.0	15.0	15.0	15.0
Leaf meal (IALM)	0	5.0	10.0	15.0
Wheat offal	14.50	14.50	14.50	14.50
Deoiled cake	10.0	10.0	10.0	10.0
Fish meal (local)	6.0	6.0	6.0	6.0
Oyster shell	2.96	2.96	2.96	2.96
Limestone	3.0	3.0	3.0	3.0
Nacl (Refined)	0.3	0.3	0.3	0.3
L-Lysine	0.08	0.08	0.08	0.08
Methionine	0.06	0.06	0.06	0.06
Enxyme (Roxazyme)	0.10	0.10	0.10	0.10
Calculated chemical composition (%DM)				
Dry matter	83.95	83.70	83.45	83.20
Crude protein	24.42	23.92	23.42	22.92
ME Kcal/kg	2568.29	2571.69	2575.09	2578.48
Ether Extract	4.70	4.92	5.12	5.33
Crude fibre	5.54	6.07	6.58	7.11

Table 3: Composition of the finisher broiler diets (for 100kg feed)

Ingredients	T_1	T_2	T_3	T_4
Maize grain	30.0	30.0	30.0	30.0
Soyabean meal	25.0	20.0	15.0	10.0
Groundnut cake	5.0	5.0	5.0	5.0
Leaf meal (IALM)	0	5.0	10.0	15.0
Palm kernel meal	10.0	10.0	10.0	10.0
Wheat offal	6.0	6.0	6.0	6.0
Oyster shell	3.2	3.2	3.2	3.2
Limestone	3.11	3.11	3.11	3.11
Nacl	0.3	0.3	0.3	0.3
L-lysine	0.08	0.08	0.08	0.08
DL Methionine	0.06	0.06	0.06	0.06
Premix	0.25	0.25	0.25	0.25
Calculated chemical composition:				
Dry matter	83.16	82.91	82.60	82.41
Crude protein	22.71	22.21	21.71	21.21
ME Kcal/kg	2577.22	2580.47	2583.87	2587.27
Ether Extract	4.62	4.83	5.03	5.24
Crude fibre	5.86	6.38	6.90	7.42

To provide the following per kg of feed: Vit A 10,000 iu, Vit D_3 2,000 iu, Vit E 5 iu, Vit K 2mg, riboflavin 4.20mg, Vit B_{12} 0.01mg, Panthothenic acid 5mg, micotinic acid 20mg, folic acid 0.5mg, chlorine 3mg; mg 56mg; fe 20mg; cu 10mg; 2n 50mg; co 125mg; iodine 0.8mg.

showed significant differences ($P<0.05$) between treatments as the values reduced with increasing levels of IALM. This trend is caused by the fact that IALM was barely free of cost except for milling. The results generally support the use of IALM as feed ingredient in poultry production since it has almost no cost, no adverse effect on birds and caused no mortality.

NAS (1997) had stated loss of weight, loss of appetite, stunted growth, goitre and alopecia as symptoms of mimosine toxicity. Among these, alopecia and some degree of stunted growth were apparent in treatment 15% IALM but no mortality was recorded. However, this result agrees with D'Mello and Acamovic (1989) which reported that high dietary levels of LLM induced depression in growth of chicks and D'mello *et al.* (1987) which had earlier reported that diets containing 100g/kg of leaf meal significantly reduced growth but did not affect the dry matter intake. The higher crude fibre content observed with increasing levels of IALM was probably responsible for reduced weights with

Table 4: Performance, organ and carcass characteristics of broiler on ialm performance

Parameter	0%IALM	5%IALM	10%IALM	15%IALM	SEM
Initial live weight (kg)	0.166[a]	0.161[a]	0.161[a]	0.160[a]	0.004
Final liveweight (kg)	2.200[a]	2.050[a]	1.775[b]	1.600[b]	0.057
Live weight gain (kg)	2.034[a]	1.888[a]	1.614[b]	1.446[b]	0.057
Daily liveweight gain	0.044[a]	0.038[ab]	0.033[bc]	0.029[c]	1.971
Daily feed intake	0.104[a]	0.103[a]	0.100[a]	0.092[b]	0.003
Feed conversion ratio	2.88[c]	3.12[bc]	3.52[ab]	3.68[a]	0.128
Feed cost per broiler	20.166[a]	185.15[b]	164.46[c]	136.06[d]	5.197
ORGAN WEIGHTS:Heart weight	0.563[ab]	0.558[ac]	0.550[bc]	0.490[a]	0.006
Weight of liver	2.125[a]	1.900[b]	1.513[c]	1.435	0.036
Gizzard	2.850[a]	2.100[b]	1.675[c]	1.475	0.057
Kidney	0.295[a]	0.258[bc]	0.233[cd]	0.220[bd]	0.012
CARCASS CHARACTERISTICS:					
Dressed weight (kg)	1.400[ab]	1.300[b]	1.125[c]	1.000[d]	0.05
Dressing percentage	63.63[a]	63.41[b]	63.38[b]	62.30[c]	0.007

abc: Means within same row having different superscripts are significantly different (P<0.05).

increasing IALM, Esonu *et al.* (2003). Yellow pigmentation were noticed on the shanks, beaks and skin of the experimental birds with the concentration increasing with level of inclusion of IALM. This observation agreed with the report of D'Mello *et al.* (1987) which reported that broilers fed two levels 50 and 100g/kg of leaf meal from *L. leucocephala* exhibited yellow pigmentation of shank and skin which increased with higher levels of the leaf meal. It also agreed with Opara (1996) which recorded increasing yellow pigmentation on its skin, shank and beak with increasing amounts of IALM when compared with the control and associated this phenomenon to the carotenoid pigments contained in the leaf meal.

The results of organ weights showed a consistent trend of lower values for each organ with increasing level of IALM. This trend may be attributed to stress effect on the organs caused by increasing amount of fibre intake and digestion.

Conclusion: The results of the experiment show that *Ipomoea asarifolia* leaf meal could be used as a feed ingredient in broiler production. It also shows that even though the leaf meal could be included up to 10% in broiler diets without deleterious effects, the optimal level of inclusion appeared to be between 5 and 10%. Increasing levels of the leaf meal reduced the organ weight and carcass characteristics. The inclusion of *Ipomoea asarifolia* leaves in broiler diets reduced the cost of feed and consequently cost of broiler production, thus fulfilling one of the principle objectives of this trial. Thus, this reduction in cost of broiler production is capable of boosting production and thus helping to resolve the much orchestrated animal protein gap.

This is imperative as feed cost has continued to constitute a major limiting factor in poultry production in Nigeria and further demonstrates the potential value of IALM in poultry production.

Finally, the yellow coloration of shanks, skin and beak observed in the broilers on the leaf meal increased their visual attraction and market acceptability. Research efforts are therefore needed on how to improve the inclusion levels of IALM in diets of monogastric animals generally to further reduce cost and improve animal protein production and consumption.

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