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ALTERNANTER DENTATA (JOSEPH'S COAT) LEAF MEAL AS REPLACEMENT FOR MAIZE ON THE PERFORMANCE OF BROILER FINISHER CHICKS

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ABSTRACT

The search for cheaper and alternative feedstuff for poultry has prompted this study. A 28-day feeding trial was conducted using 225 unsexed Marshal strain of broiler finisher chicks fed 0, 10, 20, 30 and 45% ***Alternanter dentata*** *Leaf Meal (ADLM) in a completely randomized design where ADLM replaced whole maize weight for weight. Each of the five dietary treatments was further replicated three times. Routine management practices, vaccination and medication typical of broilers were strictly adhered to. The initial weight, final weight, weight gain, feed intake, feed conversion ratio, feed cost/kilogram, feed cost/kilogram weight gain and mortality were measured. Results show that birds on control (0% ADLM) and 10% ADLM did not differ significantly (p>0.05) in their final weights of 2.10 and 2.01 kg; weight gain of 1.5 and 1.41 kg; average daily weight gain of 0.05.3 and 0.050 kg; average daily feed intake of 0.147 and 0.140 kg and feed conversion ratio of 2.77 and 2.80 respectively but were superior to those of levels 20, 30 and 45%. With the exception of feed cost/kg gain and mortality (which did not follow any particular trend), other parameters decreased in performance as the level of ADLM increased from 0-45% in the diets. Results confirmed that ADLM could substitute whole maize as feed ingredient for finisher broilers up to 10%.*

Key words: Finisher broiler chicks, *Alternanter dentate* leaf meal (ADLM), whole maize DOI: http://dx.doi.org/10.4314/jafs.v14i1.1

INTRODUCTION

The competition between man and livestock for feed grains (Tegbe *et al*., 1984; Madubuike, 1992) and the inadequate production of farm crops to meet human and livestock needs (Babatunde *et al*., 1990) have led to an escalating cost of conventional feedstuff which in turn has resulted in the high cost of production put at 70-80% (Agbakoba *et al*., 1995; Madubuike and Ekenyem 2001) and consequent increase in the cost of poultry products (Iyayi, 2002), making them unaffordable by the average Nigerian. This has prompted the search for cheaper and alternative feedstuff for poultry (Oladunjoye, *et al*., 2005; Onuh, 2005).

Research efforts have been made to reduce the dependence on conventional feedstuff as major sources of energy for monogastric livestock. For example, maize and other cereal grains as well as soybean and groundnut cake are the major sources of protein and their prices

have continued to escalate due to high demand. Leaves of many legumes, shrubs and weeds have been used in feeding monogastric livestock and have been found to reduce the cost of production. Examples include cow pea leaves (Udedibie and lgwe, 1989) *Microdermis puberula* (*Esonu et al.*, 2003) *Chromolaena odorata* (Ekenyem *et al*., 2009; 2010) *Ipomoea asarifolia* (Ekenyem, 2004); *Alchornia mudiflora* (Opara, 1996). However, all the results show that the effective utilization and overall digestibility of the leaves are low as a result of the presence of some anti- nutritional factors and high fibre content (Cheek and Myer, 1975). This in turn leads to low feed intake, poor growth and in some cases the production of watery droppings (Onwudike and Oke, 1998).

Alternanter dentata otherwise known as calicoplant or Joseph's coat belongs to the family *Amaranthecease.* The plant is an erect perennial weed with many branches. It is wide spread in the rainforest area of West Africa and known for colonizing an area aggressively. The dwarf herb has diverse coloured leaves mainly purple and green. The leaves are alternate or opposite and are about 10-12 cm long and up to 4 cm wide. They have short, triangular stipules in the axils. The leaves are smooth and both surfaces have many laterally ascending nerves on the leaf surface (inflorescence) while apetulous flowers appear in small auxiliary clusters. It is bisexual or unisexual. It is superfluous in supply and cheap to procure and prepare as feed ingredient. This feeding trial was conducted to replace the much sought for and expensive maize with the readily available low costing, *Alternanter dentata* leaf meal as a means of reducing the cost of producing table birds and making the product affordable by consumers.

MATERIALS AND METHODS

Location of the experiment: This study was carried out at the Imo State University. Teaching and Research Farm, Owerri, Nigeria. Owerri is located on longitudes $7° 01^{1} 06^{11}$ E and $7^{0} 03^{1} 00^{11}$ E and Latitudes $5^{0} 26^{1} 24^{11}$ N and $5° 30^{1} 00^{11}$ N. Owerri is in the humid tropical region of West Africa.

Collection and preparation of *Alternanter dentata* leaf meal: The leaves were harvested from cut stems of maturing *Alternanter dentata* plants before flowering. The leaves were then spread out evenly on concrete floor in the sun for sun-drying until they became crispy without losing their green colour. The dried leaves were then milled. A sample of the milled leaf meal was analyzed at the Animal Nutrition laboratory of the Imo State University, Owerri, using the standard methods of AOAC (1995) to determine the proximate content of Nitrogen free extract, crude protein, ash, ether extract, crude fibre and moisture.

Formulation of Experimental Diets: *Alternanter denata* Leaf Meal (ADLM) was used in formulating experimental diets at levels of 0, 10, 20, 30 and 45% where it replaced whole maize weight for weight. Other ingredients were procured from reputable dealers (crushed where necessary) and mixed according to the formulae shown in Table 2.

Procurement and Rearing of Experimental Birds: Three hundred unsexed day old Marshal strain of broiler chicks were procured from a local distributor, brooded and reared for 28 days on deep litter in a standard tropical poultry building using a standard commercial broiler starter mash. At the end of the 28 days, starter phase 225 birds were selected from the lot using strong physical appearance as yardstick. The 225 birds were randomly allotted to the five treatments diets as treatments 1, 2, 3, 4 and 5. The five treatments were each replicated three times in a completely randomized design. Standard management practices of routine vaccination, medication and hygiene typical of commercial broiler production were strictly adhered to. Feed and water were supplied *ad libitum.*

Experimental Design, Data Collection and Analysis: The experimental design was Completely Randomized Design (CRD). Each of the five treatments had 45 birds and each replicate had 15 birds. Parameters measured were initial live weight, final weight, weight gain, feed intake, feed conversion ratio, feed cost/kg of feed, feed cost/kg weight gain and mortality. All the birds in each replicate were weighed separately using a top loading (5 g) salter weighing scale. Weighing was done weekly in the morning hours (7.00 am to 8.00 am) before the day's feeding. Initial body weights of the birds were taken at the beginning of the experiment and this was used to calculate the weight gain as final weight minus the initial weight. Daily feed intake was also measured by subtracting the weight of left over feed from the weight supplied. Feed Conversion Ratio (FCR) was calculated as follows:

$$FCR = \frac{\text{Avg. Feed intake}}{\text{Avg. Weight gain}}$$

Feed cost per kilogram was calculated by adding prevailing market prices of the different ingredients (used in formulating the experimental diets) per kilogram multiplied by their inclusion levels and divided by one hundred. The cost per kilogram weight gain was calculated as FCR x cost/kg of feed, All the data were subjected to one way analysis of variance (Steel and Torrie, 1980), while differences in the treatment means were separated using Duncan's multiple range test as outlined by Onuh and lgwemma (1998).

RESULTS

Results of the performance of finisher broiler birds fed varying dietary levels of *Alternanter dentate* leaf meal (ADLM) are shown in Table 3, with the exception of the initial weight, all other parameters measured differed significantly ($P < 0.05$) between treatment means. T_1 and T_2 did not differ significantly ($P > 0.05$) for final weight, weight gain, average daily weight gain, average daily feed intake and feed conversion ratio. In the same vein T_3 and T_4 did not differ significantly ($P > 0.05$) for weight gain and feed conversion ratio.

DISCUSSION

The initial live weights of birds in the five treatments were statistically similar ($P>0.05$). Significant differences ($P<0.05$) were however observed in all other parameters while 0% ADLM (T_1) and 10% ADLM (T_2) did not differ ($P>0.05$) in final weight, (2.10 and 2.01 kg);

weight gain (1.51 and 1.41 kg); average daily weight gain (0.053 and 0.050 kg); average daily feed intake (0.147 and 0.140kg and feed conversion ratio (2.77 and 2.80). With the exception of feed cost/kg gain, other parameters showed a consistent decrease in performance as the inclusion level of ADLM increased from 0% in the control to 45% in diet five. The decline in performance could be attributed to decrease in feed intake as inclusion level of ADLM increased from T_1 to T_5. The birds were expected to eat more as the energy level of the feed decreased (Isikwenu *et al.*, 2000) to make up for the shortfall in energy supply but possibly bared by poor palatability. ADLM was found to have a very bitter taste and this may have contributed immensely to poor palatability resulting in low feed intake. The crude fibre (Table 2) was equally high for all the treatments and increased beyond recommend levels (Maynard *et al*. 1975) as the inclusion level of ADLM increased: Earlier reports by Opara (1996); Ekenyem (2006); Ekenyem and Madubuike (2006); D'Mello *et al.* (1987) indicated that higher levels of fibre in the diets of monogastric animals depressed weight gain. It is therefore possible that the trio of high fibre level, and poor palatability were responsible for the low weight gain as the inclusion level of ADLM increased from 0% (T_1) to 45% (T_5). The feed conversion ratio though similar (P >0 05) for the control (0% ADLM) and 10% ADLM also declined as the inclusion level of ADLM increased. Feed cost/kg of feed declined progressively from the control to diet five (45% ADLM) and differed significantly ($P<0.05$) between treatment means. The wide gap between procurement prices per kilogram of whole maize (N71.00) and ADLM N6.00) is responsible for the steady reduction in feed cost/kg. The feed cost/kg gain did not follow any particular trend since it is a product of FCR x feed cost/kg) and differed significantly ($P<0.05$) between treatment means. Though feed cost/per kg gain was least for birds fed 45% ADLM (T_5), the weight gain is also too low in T_5 thereby making the output uneconomical. Consequently, T_2 (10% ADLM with weight gain 1.41kg and an FCR of 2.80 appears to be optional and most economical for broiler meat production.

The mortality profile did not suggest that: ADLM contains anti-nutritional factors at a level that could be detrimental to the health and performance of the birds.

Conclusion: Though the experimental birds were able to tolerate 20% ADLM with fairly good result, 10% replacement level for whole maize diets appears optimum. Replacing whole maize with ADLM reduced the cost of production at 10% replacement level, thereby making animal protein cheaper and consequently affordable by consumers.

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APPENDIX

Table 1: Proximate composition of *Alternanter dentate leaf meal (ADLM)*

Nutrient	**Composition (%)**
Nitrogen free extract	68.62
Crude protein	12.25
Ether extract	2.80
Crude fibre	4.63
Ash	3.05
Moisture	8.64

Table 2: Composition of experimental diets

Ingredients	**T_1 (0% ADLM)**	**T_2 (10% ADLM)**	**T_3 (20% ADLM)**	**T_4 (30% ADLM)**	**T_5 (45% ADLM)**
Whole maize	45.00	35.00	25.00	15.00	0.00
ADLM	0.00	10.00	20.00	30.00	45.00
Palm kernel cake	12.30	13.30	14.30	13.30	16.30
Soybean meal	10.00	10.00	10.00	10.00	10.00
Groundnut cake	11.00	12.00	13.00	14.00	15.00
Fish meal	5.00	5.00	5.00	5.00	5.00
Brewers spent grain	10.50	8.50	6.50	4.50	2.50
Bone meal	5.50	5.50	5.50	5.50	5.50
Common salt	0.30	0.30	0.30	0.30	0.30
L-Lysine	0.09	0.09	0.09	0.09	0.09
DL-Methionine	0.06	0.06	0.06	0.06	0.06
Broiler starter premix	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated nutrient composition (%)					
Crude Protein (%)	21.16	21.38	21.61	21.91	22.17
ME (kcal/kg)	2887.48	2881.58	2875.68	2851.78	2815.93
Crude fibre (CF) (%)	5.89	6.15	6.42	6.68	7.07
Ether extract (EE) (%)	5.08	4.96	4.84	4.72	4.54
Lysine	0.95	0.99	1.07	1.08	0.85
Methionine	0.37	0.52	0.69	0.73	0.37

Table 3: Performance characteristics of finisher broilers fed varying levels of ADLM as replacement for whole maize

Parameters	**T_1 (0% ADLM)**	**T_2 (10% ADLM)**	**T_3 (20% ADLM)**	**T_4 (30% ADLM)**	**T_5 (45% ADLM)**	**SEM**
Initial weight (kg)	0.59	0.60	0.60	0.61	0.61	0.001
Final weight (kg)	2.10^a	2.01^a	1.60^b	1.49^c	1.10^d	0.032
Weight gain (kg)	1.51^a	1.41^a	1.00^b	0.88^b	0.49^c	0.004
Avg. daily weight gain (kg)	0.053^a	0.050^a	0.036^b	0.031^c	0.018^d	0.006
Avg. daily feed intake (kg/chick/day)	0.15^a	0.14^a	0.13^b	0.12^c	0.10^d	0.001
Feed conversion ratio (FCR)	2.77^c	2.80^c	3.53^b	3.81^b	5.56^a	0.012
Feed cost/kg (N)	63.89^a	53.98^b	44.30^c	36.38^d	24.60^e	0.018
Feed cost/kg gain (N)	176.98^a	151.14^b	156.38^b	138.61^c	136.78^c	0.026
Mortality	2.00^c	0.00^d	3.00^b	2.00^c	4.00^a	0.001

abcde Means within the same row with different superscripts are significantly different ($P < 0.05$)