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Performance of Finisher Broiler Chicks Fed Varying Replacement Levels of *Chromolaena odorata* Leaf for Soyabean Meal

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Abstract: Sixty 5-week old Marshall broiler chicks were used in a 28-day feeding trial in a Completely Randomized Design, in a deep litter house to evaluate the effect of *Chromolaena odorata* Leaf Meal (COLM) on the growth performance of finisher broiler chicks. The chicks were grouped into four treatments having 0, 2.5, 5 and 7.5% COLM which were replicated thrice. Feed and water supply were *ad libitum*. Also medication, vaccination scrupulous sanitation, regular disinfection of the pens and other standard management practices were adopted. Initial weights of the birds, 633.00, 636.67, 630.00 and 585.67 g for treatments 0, 2.5, 5 and 7.5% COLM respectively did not vary significantly ($p>0.05$). However, significant differences ($p<0.05$) occurred between the final weights 2120,00, 2096.67, 2003.33 and 1506.67 g for treatments 0, 2.5, 5.0 and 7.5% COLM respectively. Daily weight gain, daily feed intake and feed conversion ratio, showed similar trends for birds on 0, 2.5 and 5.0% COLM which were similar in values ($p>0.05$) but differed significantly ($p<0.05$) from the values for birds on 7.5% COLM. Results confirmed that COLM could substitute soya bean as feed ingredient for broiler chicks up to 7.5% but 5.0% is optimal.

Key words: *Chromolaena odorata*, leaf meal, soya bean, finisher broiler, performance

INTRODUCTION

Animal protein demand and supply gap among Nigerians has continued to widen, resulting in sub-optimal animal protein intake and consequently pre-disposing the people to deplorable animal protein malnutrition. This nutritional adversity is traceable to geometric increase in the Nigerian human population without a commensurate increase in livestock production, over dependence on imported livestock products, ignorance, inadequate technical skills, diseases and parasites, environmental stress and high cost of ingredients used to formulate monogastric livestock feeds. Also, the increasing awareness of people on the need for animal protein intake further increases their demand.

Similarly, the competition between man and livestock for feed grains (Tegbe *et al*., 1984 and Madubuike, 1992) and inadequate production of farm crops to meet human and livestock needs (Babatunde *et al*., 1990) have been implicated as remote causes of poor animal protein intake among Nigerians. Consequently, research reports show that feed is a critical input in monogastric livestock production as it constitutes 70-80% of cost of monogastric production (Madubuike and Ekenyem, 2001). It becomes imperative to identify means of reducing the cost of feed items with a view to reducing the cost of livestock products and by extension make them available to and affordable by consumers.

Efforts have been made to reduce the dependence on conventional sources of protein e.g. soyabean and groundnut cake which are major protein sources and maize which is the major energy source as their prices have continued to gallop, resulting from competition of monogastric livestock with man for these materials. Leaves of many legumes, shrubs and weeds used in feeding monogastric livestock reduced their cost of production. For instance, *Leucaena leucocephala* (Udedibie and Igwe, 1989), *Microdesmis puberula* (Esonu *et al*., 2003), *Chromolaena odorata* (Ekenyem *et al*., 2009), *Ipomoea asarifolia* (Ekenyem, 2004), *Alchornia mudiflora* (Opara, 1996) fed the leaves of the various plants on monogastric animals and reduced their cost of production. However, the effective utilization and overall digestibility of the leaves are low as a result of the presence of anti-nutritional factors and high fibre contents (Cheek and Myer, 1975), causing depressed feed intake, poor growth and production of watery droppings (Onwudike and Oke, 1998).

Chromolaena odorata commonly called siam weed is a perennial shrub which belongs to the family *Austeracea*. The plant can grow up to 7 m tall and has white to mauve flowers. The leaves have opposite arrangement, triangular in shape with three conspicuous main veins which are coarsely toothed. It is a prolific seeder (Pink, 2004). In Nigeria, the siam weed is a stubborn weed which smoulders crops in the farm.

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It is plenty in supply and cost little or nothing to procure and prepare as feed material. This feeding trial was carried out to replace the costly soyabean with the readily available low-cost *chromolaena odorata* leaf as a means of reducing the cost of finisher broiler production, making the products affordable by consumers. Thus with 16.67% crude protein and 10.07% crude fibre, COLM appears to have the capacity to partially replace soya bean as a protein source in broiler production.

MATERIALS AND METHODS

Location of the experiment: The experiment was carried out at the Imo State University, Teaching and Research Farm, Owerri, Nigeria, located on Longitudes 07^{o} 01^{1} 06^{11}E and 7^{o} 03^{1} 00^{11}E and latitudes 5^{o} 28^{1} 24^{11} N and 5^{o} 30^{1} 00^{11} N in the humid tropical region of West Africa.

Collection and preparation of *Chromolaena odorata* leaf meal: The *chromolaena odorata* leaf meal was harvested from stems of maturing *Chromolaena odorata* plants (before flowering). The leaves were hand-plucked from stems and put directly into jute bags and later spread out on concrete floor for sun-drying until they become crispy but still retained their green colour. The dried leaves were then milled. A sample of the milled leaves was sent to the Animal Nutrition Laboratory of the Federal University of Technology, Owerri for proximate analysis using the standard methods of AOAC (1995), to determine ash content, crude fibre, crude protein, ether extract, nitrogen free extract and moisture content (Table 1).

Table 1: Results of proximate analysis of COLM

Nutrient	Composition (%)
Crude fibre	10.07
Crude protein	16.67
Ash	8.58
Ether extract	1.87
Nitrogen free extract	54.47
Moisture content	8.65

Formulation of experimental diet: The result of the proximate analysis of COLM was the basis for formulation of the experimental diets. COLM was incorporated at levels 0, 2.5, 5.0 and 7.5% for treatments 1, 2, 3, 4 respectively to replace soyabean weight for weight. Each treatment diet was fortified with vitamin premix, methionine and lysine (Table 2).

Experimental birds: Sixty 4 weeks old Marshall broiler chicks were selected from a brooding stock and allotted to four treatment groups in a deep litter house, which was further divided into three replicates in a completely randomized design.

Management of experimental birds: The birds were fed with commercial finisher broiler diets (top feed) for one week to stabilize them before introducing the experimental diets.

The birds were fed *ad libitum* and supplied with potable water usually between 700-800 h for morning and 1700-1800 h for evening. Record of feed intake was always taken by subtracting the feed left over from the feed supplied the previous day before daily feeding. Vaccination programme against new castle, disease, gumboro, fowl pox and marex diseases were applied appropriately while medication, scrupulous sanitation and disinfection and regular replacement of dirty litter were observed in the properly ventilated deep litter house. The zinc roofing and concrete floor provide adequate shade and ease of drainage and cleaning respectively.

Experimental design: The experimental design used for the experiment was completely randomized design in which sixty 4 week old Anak broiler chicks were allotted to four dietary treatments each having three replicates in a deep litter house.

Data collection and analysis: After one week stabilization, data collection started at the 5^{th} week of their age. Initial weight was taken per replicate at the start of the experiment using salter weighing scale. Live weights were also measured weekly to the end of the experiment to determine their final weight. The weight gain was calculated by subtracting the initial weight from the final weights of the birds. The daily feed intake was calculated by subtracting feed left over from the quantity supplied daily. Feed conversion ratio was calculated by dividing the daily feed intake by the daily weight gain. Feed cost per kg feed was calculated as the total cost of all ingredients included to make 1 kg of each diet.

All data from the experiment were subjected to one way analysis of variance (Steel and Torrie, 1980), while the differences between the treatment means were compared using Duncan's multiple range test as outlined by (Onuh and Igwenma, 1998).

RESULTS

The results of performance characteristics of the experimental birds are shown in Table 3. Initial weights were statistically similar ($p<0.05$). The final weights of birds on 0, 2.5 and 5% COLM were significantly higher ($p<0.05$) than those on 7.5%COLM. Also the results of the daily feed intake shows that birds on 0% and 2.5 COLM consumed equal amount of feed within the period of the experiment, while birds on 5% COLM took less feed ($p<0.05$) than those 0 and 2.5% COLM. And durther less was taken by birds fed 7.5% COLM. Feed conversion ratio was similar ($p>0.05$) in treatments 0, 2.5 and 5% COLM but superior in that of 7.5% COLM.

Table 2: Ingredient composition of experimental diet treatment

Ingredient	T_1 (0% COLM)	T_2 (2.5% COLM)	T_3 (5.0% COLM)	T_4 (7.5% COLM)
Maize	45.00	45.00	45.00	42.00
Soyabean	7.50	5.00	2.50	0.00
Leaf meal (COLM)	0.00	2.50	5.00	7.50
PKC	12.00	12.00	12.00	12.00
Fish meal COLM	5.00	5.00	5.00	5.00
CONC	14.80	14.80	14.80	14.80
BSG	8.00	8.00	8.00	8.00
Bone Meal	7.00	7.00	7.00	7.00
Common Salt	0.30	0.30	0.30	0.30
Premix	0.25	0.02	0.25	0.02
L-lysine	0.09	0.09	0.09	0.09
Methionine	0.06	0.06	0.06	0.06
Total	100.00	100.00	100.00	100.00
Crude protein (%)	20.72	1998.00	19.09	18.49
ME (Kcal/kg)	2805.43	2783.33	2779.23	2757.13
Crude fibre (%)	5.49	5.79	6.12	6.49
Ether extract (%)	5.06	5.03	4.99	4.95

Table 3: Performance of finisher broiler chicks fed varying levels of *Chromolaena odorata* leaf meal

Parameter	0% COLM	2.5% COLM	5.0% COLM	7.5% COLM	SEM
Initial weight (g)	633.00	636.67	630.00	585.67	57.11
Final weight (g)	2120.00	2096.67	2003.33	1506.67	74.89
Daily feed intake (g)	161.67	161.67	151.00	134.67	11.45
Weight gain					
Daily weight	53.11	52.14	49.05	32.86	0.02
Feed conversion ratio	3.04	3.10	3.08	4.10	
Fed cost/kg (N)	58.84	56.89	54.33	52.08	2.28

Means with different superscript in the same horizontal row are significantly different ($p<0.05$)

Feed cost per kg feed was significantly lowest ($p<0.05$) on birds fed 7.5% COLM.

DISCUSSION

The similar ($p>0.05$) initial weights of all the experimental birds was to reduce bias which could arise from using birds of different weights and to further guarantee the reliability of the results. The final live stocks of the birds on 0, 2.5 and 5% COLM were similar ($p>0.05$) but significantly ($p<0.05$) varied with those birds on 7.5% COLM. This suggests high level of acceptability of the leaf meal. It further assures the high nutritional profile of the leaf meal as well as its ability to effectively replace soya bean, producing comparable results. However, the significant ($p<0.05$) differences with the birds fed in 7.5% of inculcate of the fact that the fibre level has reached a point where the birds can still make the efficiency of the feed utilization of the advantage of 7.5% COLM. Similar cases of depressed growth with increasing levels of feed with higher fibre levels leaf meal are documented (D'Mello *et al*., 1987; Ekenyem, 2004) the feed intake of the birds were highest among birds on 0, 2.5 and 5% COLM which were similar ($p>0.05$) but differed ($p<0.05$) with birds also on 7.5% which fed the least. This difference could be attributed to decrease in palatability of the feed as the levels of the leaf meal increased. This depressed body weight could be attributed to lower feed intake arising from higher fibre content of the leaf meal which caused the insufficient consumption of digestible nutrients particularly protein and energy required to sustain rapid growth.

Also the daily weight gain was statistically similar among birds on 0, 2.5 and 55% COLM while birds on 7.5% COLM has significantly least ($p<0.05$) gain. Weight is usually an indication of the efficiency of feed utilization and the nutritional safety level. This result confirms earlier reports that *Chromolaena odorata* leaves contain safe levels of toxic factors that could impede feed utilization (Biller *et al*., 1994; Irobi, 1997). However the lower in feed intake with increasing levels of COLM 5 and 7.5% groups could also be attributed to anti-nutritional factors inherent in the plant (Nwokolo, 1987) and also agrees with Onwudike and Oke (1998) who worked on alfalfa leaf meal.

The feed conversion ratio was similar ($p>0.05$) for birds on 0, 2.5 and 5% COLM but significantly differed from birds on 7.5% COLM. It must also have contributed to the levels of weight gain observed away the experimental birds. However, the feed conversion ratio for birds on 7.5% COLM may be attributed to high fibre level of the diet.

The cost of feed per kg gain showed a consistent significant difference ($p<0.05$) between treatments. It appears that 5% is the optimum substitution level of COLM for soya bean in broiler diets.

Conclusion: *Chromolaena odorata* leaf meal could be used as a cheap feed ingredient in broiler diets. It could substitute soya bean up to 7.5% in broiler diets. But 5%

level appears optimum considering the results on the final weight, weight grain and cost per kg gain

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