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Carcass Characteristics of Laying Birds Fed *Chromolaena odorata* Leaf Meal in their Ration

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Abstract
The objective of this study was to evaluate the carcass and organ characteristics of laying hens fed graded levels of *Chromolaena odorata* leaf meal (COLM) as a replacement for soya bean in their diets. Sixty points-of-lay pullets (19 weeks) were randomly assigned in triplicates of eight birds per replicate to four experimental diets containing COLM at 0, 5, 10 and 15%. At the end of 56 days of experiment, a bird from each replicate was selected for carcass and organ weights analysis. COLM diets had reduced starve weight, carcass and dressed weights, but recorded good dressed percentages. Prime cuts such as the breast and thigh weight percentages were reduced beyond 5% COLM replacement of soya bean. Same trend was also observed for oviductal development of the birds which drastically reduced with increased inclusion of COLM. Therefore the inclusion of COLM in the diets of laying birds should not exceed 5% beyond which it may negatively affect carcass yield and reproductive performance.

Keywords: Carcass, organ development, leaf meal, C*hromolaena odorata*

Introduction

The inclusion of leaf meals (LMs) of various browse and leguminous plants as alternative feed resources in livestock production has received attention due to the progressive increase in cost and scarcity of conventional feed resources in developing countries like Nigeria. Such inclusions help to reduce feed cost and minimize direct competition between man and livestock industry for available conventional feed resources. As a consequence, trials have been conducted on several leaf meals such as *Alchonia cordifolia* leaf meal (Udedibie and Opara, 1998), *Ipomea asarifolia* leaf meal (Ekenyem and Madubuike, 2006), COLM (Ekenyem *et al*., 2009), Neem leaf meal (Esonu *et al*., 2006), and cassava leaf meal (Iheukwumere *et al*., 2007) etc to establish best levels of inclusion and to ascertain the physiological dispositions of the animals to such novel feedstuffs. Adeyemi *et al*. (2012) reported that when cassava leaf meal is supplemented with blood meal to replaced soya meal at 50% in broiler diets, no deleterious effect was observed while Nweze and Ekwe (2012) concluded that *Ocimum gratissimum* leaf extracts could be used to improve growth performance, stabilize the blood components and reduce the gut and blood micro-organisms in finisher broilers.

Some LMs contain relatively higher crude protein than cereals but also higher crude fiber which in most cases may equal or even exceed its crude protein content (D'Mello, 1992). This could affect their overall digestibility especially when there is significant proportion of leaf meal in the diet thus leading to decrease in performance (Tangendjaja *et al*., 1990). At a higher inclusion level, LMs have been observed to depress feed intake and growth rate in poultry. This study evaluates the effect of partial replacement of soya bean with COLM on the carcass and organ characteristics of laying hens.

Materials and Methods

The *Chromolaena odorata* leaf was harvested from stems and maturing plants. The leaves were sun-dried until they became crispy to touch, while maintaining their green color and further milled in a hammer mill to produce a (COLM). Sixty laying hens at point of lay were procured from a reputable local poultry farmer and were stabilized for a period of two weeks after which they were randomly allotted to cages. The birds were divided into four groups of 15 birds with each of the group further replicated three times with 5 birds per replicate in a completely randomized design. The birds were managed intensively as practiced at the Teaching and Research Farm of Imo State University Owerri. The birds were assigned to four treatment diets containing graded levels of COLM at 0, 5, 10 and 15% to partially replace graded levels of soya meal in the diets respectively as shown in table 2. The COLM was subjected to proximate analysis using the standard method (AOAC, 1995). At the end of experimental feeding (8 weeks), a bird from each replicate of the various treatments was randomly selected, weighed and slaughtered after fasting them over night and used for the determination of carcass and organ weight characteristics. The cuts that were determined included breast muscle, thigh, drumstick, wing, neck, head and shank length and their weights expressed as percentages of live weights of the birds. Organs such as the heart, gizzard, liver, lungs, kidneys, intestines and oviducts were weighed out and expressed as percentages of the live weight of the birds. The intestinal and oviduct lengths were also determined in centimeters.

Data obtained were subjected to analyses of variance using Statistical Package for Social Sciences (SPSS version 20, 2012) and the differences between the treatment means were compared using the Duncan Multiple Range Test (SPSS, 2012).

Table 1: Proximate composition of COLM

Nutrient composition	Percentage
Moisture content	8.95
Crude protein	15.27
Ether extract	1.93
Ash	9.50
Crude fibre	20.10
Nitrogen free extract	44.25

Table 2: Nutrient composition of the COLM based diet for laying hen

Ingredients g/100g	T1	T2	T3	T4
Soya bean meal	15.00	10.00	5.00	0.00
Leaf meal (COLM)	0.00	5.00	10.00	15.00
Total	100.00	100.00	100.00	100.00
Calculated nutrient composition				
Crude protein%	19.01	17.67	16.36	15.00
Metabolizable energy Kcal/kg	2608.10	2508.37	2582.27	2569.43

Each diet contain 45% Maize, 10% Groundnut cake, 12.30% Palm kernel cake, 5% F,ish meal 4% Bone meal, 8% Oyster shell, 0.3% Salt, 0.25%, Vitamin and mineral premix, 0.09% Lysine and 0.06% Methionine.

Results and Discussion

Results of the proximate composition (Table 1) showed that COLM had higher fibre and moderate CP content similar to most tropical LMs while the ash content was relatively high. The CP level of 15.27% was lower than the value reported by Aro *et al*. (2009), but much higher than the values reported for Basil leaf meal (Nworgu, 2016). The fibre content of COLM in this study was also higher than the values reported by Aro *et al*. (2009) for COLM. Fibre especially at higher levels imposes severe limitations on the utility of leaf meals as animal feeds because of its limitations on feed intake.

Results of the carcass analysis (Table 3) showed that there were treatment effects as a result of COLM inclusion in the layer ration. The starved weights, carcass weights and dressed weights of the birds on treatment diets significantly differed ($p<0.05$) and were lower than those of the control. All the diets supported similar dressed weight percentages indicative of cumulative flesh deposition. Nworgu (2016) reported carcass percentage range of 63.55 – 70.00% for pullets fed Basil leaf meal in their diets while Esonu *et al.* (2006) reported dressed percentage range of 62.00 - 62.90% for layers fed Neem leaf meal. Therefore the present range of 70.55 - 72.70% dressed weight highlights the positive effects of COLM inclusion in layer diets. The percentage breast and thigh cuts at 5% and 10% COLM inclusion were similar to the control but were superior to the 15% inclusion. The breast, thigh and drumstick are prime cuts that reflect carcass meatiness and meat product profitability (Agunbiade *et al*., 2002).

Table 3: Carcass characteristics of layers fed COLM

Parameters	T1	T2	T3	T4	SEM
Starved weight (g)	1925.00^{a}	1525.00^{b}	1550.00^{b}	1575.00^{b}	57.66
Carcass weight (g)	1875.00^{a}	1450.00^{b}	1450.00^{b}	1460.67^{b}	61.64
Dressed wt. (g)	1400.00^{a}	1075.00^{b}	1125.00^{b}	1125.00^{b}	44.39
Dressed (%)	72.70	70.55	72.51	71.43	0.39
Breast (%)	14.44^{a}	14.10^{a}	13.78^{a}	11.87^{b}	0.34
Thigh (%)	9.06^{a}	9.57^{a}	9.71^{a}	7.34^{b}	0.36
Drumstick (%)	7.81	8.08	8.44	8.40	0.20
Wing (%)	7.47^{ab}	6.72^{c}	7.71^{a}	6.98^{bc}	0.15
Neck (%)	3.75	3.41	4.04	3.33	0.12
Shank (%)	2.64	2.68	3.18	2.82	0.11
Head (%)	3.51	3.48	3.56	3.70	0.09

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

The percentage organ weight characteristics of the COLM supplemented birds are presented in table 4. The supplemented groups recorded higher gizzard percentage weights than the control. Again, the feeding of COLM also resulted in increased length of the intestines and could be attributed to the increased grittiness of the experimental diets as a result of COLM inclusion in the diets. The increasing bulkiness of feed as a result of with increasing COLM inclusions engender larger gut capacity to enable birds cope with the fibrous diet. Treatment effects were also observed for oviduct lengths and oviduct percentage weights. They were negatively related to progressive increase in COLM content of the diets. This is in line with the laying pattern observed in these birds hence further explained the reduced laying performance especially at 15% COLM inclusion (Ekenyem *et al*., 2009). It therefore appeared that beyond 5% COLM, development of the oviduct was delayed indicating that the birds are yet to assume full / moderate laying (Nwogu *et al*., 2014).

Table 4: Organ weight measurement of layers fed COLM

Parameters	T1	T2	T3	T4	SEM
Gizzard (%)	1.87^{c}	2.61^{b}	2.53^{b}	3.20^{a}	0.16
Intestinal length (cm)	174.00^{b}	159.00^{b}	204.00^{a}	183.50^{ab}	5.82
Liver (%)	1.69^{b}	1.77^{b}	2.21^{a}	1.82^{b}	0.06
Lungs (%)	0.69^{b}	0.58^{b}	1.05^{a}	0.57^{b}	0.06
Heart (%)	0.57	0.46	0.68	0.76	0.06
Oviduct length (cm)	69.32^{a}	49.82^{ab}	30.50^{b}	22.75^{b}	6.98
Oviduct weight (%)	2.61^{a}	1.19^{b}	1.01^{bc}	0.50^{c}	0.25

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

Conclusion and Recommendation

The dressed weight and prime cuts (breast and thigh) were negatively affected with increasing inclusion of COLM in the diets of the pullets, especially at 15% COLM inclusion. While birds on COLM supplemented diets recorded higher gizzard percentage weights than the control, their oviductal development were negatively affected and at such depicts that of birds that are yet to assume full/ moderate egg laying. Therefore the inclusion of COLM in the diets of poultry should not exceed 5% beyond which it may have negatively effects carcass yield and reproductive performance.

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