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Converting Bush to Meat: A Case of *Chromolaena odorata* Feeding to Rabbits

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Abstract: The feasibility of using *Chromolaena odorata* leaf meal (COLM) in the feed of rabbit was investigated in a study that lasted for twelve weeks. *Chromolaena odorata* leaves were harvested, dried, crumbled and incorporated into five iso-nitrogenous and iso-calorific diets at 0, 10, 20, 30 and 40% levels of inclusion. Feed intake, weight gain and digestibility of the rabbits were monitored using a completely randomized design. Results showed that DM intake (g/d) of 41.42, 32.86, 32.66, 24.65 and 26.72 for 0 (control), 10, 20, 30, and 40% COLM diets respectively were not significantly different among diets that contained COLM, while only those of 10 and 20% COLM diets compared favourably with that of the control diet. Weight gain (g/d) of the rabbits were not significantly different in the control (7.73), 10% (6.30), 20% (6.64) and 30% (4.12) COLM diets, while the least weight gain (3.0g/d) from 40% COLM diet did not show any significant difference from those of other COLM diets. Feed conversion efficiency of the rabbits were found similar in all the diets (range = 0.11 in 40% to 0.19 in 0% COLM). Digestibility values were generally good, and were not significantly affected by diets in DM (58.57 - 74.00%) and NFE (74.77 - 81.94%) digestibilities. It is concluded that COLM can be incorporated into the feed of rabbits up to the level of 30% of the DM fed and still obtain good performance especially weight gain comparable to those fed on standard concentrate.

Key words: *Chromolaena odorata,* digestibility, feed intake, rabbit, weight gain

Introduction

Chromolaena odorata, previously called *Eupatorium odoratum* is known to have originated from South and Central America and is commonly called siam weed, triffid weed, bitter bush or jack in the bush (King and Robinson, 1970). It is a herbaceous perennial that grows to a height of three meters in open situation and up to eight meters when assumed a scrambling habitat in the interior forests (Ambika and Jayachandra, 1980). *Cromolaena odorata* is an aggressive colonizer which finds its way to Nigeria, the first African country to be affected, in 1940s through contaminated seeds of *Gmelina arborea* and there after spread to Ghana, Ivory Coast and Cameroon (Cruttwell, 2002). The plant has also naturalized in many other countries of the world where it is often considered a menace due to danger it poses to crops and forage species as well as its fast rate of invading cleared forest. The threat of *C. odorata* to agriculture has been of global concern such that studies have been carried out in different laboratories all over the worlds on the ways of effectively controlling the weed. An evaluation of the progress made (Ambika and Jayachandra, 2002) revealed that, after several years of research efforts, the problem of Chromolaena has remained unsolved.

In this unfolding scenario, it is necessary to develop ways of putting *C. odorata* to beneficial uses. The assessment of nutritive value of *C. odorata* (Apori *et al.,* 2000), showed that it is a plant that has good potential for feeding livestock due to its high crude protein (CP), low fibre and low extractable phenolic contents. Its dry matter (DM) and CP contents are highly degradable and the protein contains about 56% amino acids (Apori *et al.,* 2000). Other toxic components such as N-oxides are reported to be low in the leaves and high in other parts of the plant (Biller *et al*., 1994). Despite the array of potentialities *C. odorata* possesses as a livestock feed, especially in the dry season period of feed scarcity, livestock generally are very reluctant to feed on it. This study considers the option of processing the leaves of Chromolaena into meal by drying and incorporate to diets of rabbits at different levels to monitor the performance of these animals on such diets.

Materials and Methods

The study was conducted at the rabbitry unit of the University of Benin farm project between December, 2001 and March 2002. The rabbitry is dwarf walled with the remaining space to the roof netted with wire mesh to allow free flow of air while the unwanted animals are kept away. The hutches with dimension 60 x 60 x 80cm and raised on wooden stand of about 75cm high, were arranged on a concrete floor in the rabbitry. The entire rabbitry and the hutches were cleaned and disinfected before the rabbits arrived at the farm. Thirty weaned rabbits consisting of 13 males and 17 females and of mixed breeds were purchased from different locations in Benin metropolis. At purchase, they aged between 7 - 8 months and weighed between 400 to 470g. The rabbits on arrival at the farm were administered antibiotics

Table 1: Ingredient composition of the experimental diets and their calculated nutrient contents

Ingredient	% Proportion of COLM in diet				
	0% (Control)	10%	20%	30%	40%
Maize	27.5	24.0	19.0	12.5	7.5
COLM	-	10.0	20.0	30.0	40.0
Groundnut cake	11.0	11.0	10.0	10.0	10.0
Dried brewers grain	24.5	17.5	10.5	-	-
Palm kernel cake	34.0	28.0	17.0	14.0	-
Wheat offal	-	6.5	20.5	30.5	39.5
Oyster shell	1.0	1.0	1.0	1.0	1.0
Bone meal	1.5	1.5	1.5	1.5	1.5
Salt	0.25	0.25	0.25	0.25	0.25
Min./Vit. Mix*	0.25	0.25	0.25	0.25	0.25
Calculated nutrient composition					
Crude protein (%)	18.23	18.22	18.26	18.18	18.27
Crude fibre(%)	10.08	10.09	10.10	10.26	10.99
Energy (ME kcal/kg)	2460.5	2505.9	2511.6	2508.7	2514.0

*Composition of the mineral and vitamin mix per 2.5Kg: Vitamin A, 7,000,000 IU; Vitamin D_3, 1400,000 IU; Vitamin E, 5000 IU; Vitamin K, 2.0g; Vitamin B_1, 1.5g; Vitamin B_2, 4.0g; Vitamin B_6, 1.5g; Vitamin B_{12}, 10mg; Niacin, 15g; Panthotenic acid, 5.0g; Folic acid, 0.5g; Mn, 75g; Zn, 45g; Fe, 20g; Cu, 5g; I, 1g; Se, 100mg; Co, 200mg; Choline chloride, 100g.

Table 2: Proximate composition (g/100g DM) of the experimental diets and *Chromolaena odorata* leaf meal (COLM)

Composition	Diet					
	0% COLM (Control)	10% COLM	20% COLM	30% COLM	40% COLM	COLM
Dry matter	89.80	88.28	87.14	88.10	87.92	85.98
Organic matter	91.43	92.23	91.23	89.47	91.43	89.65
Crude protein	22.07	20.10	17.25	17.06	18.22	29.76
Crude fibre	13.07	13.36	12.39	12.26	12.17	10.75
Ether extract	1.87	2.11	1.91	1.85	2.53	1.48
Ash	8.58	7.77	8.77	10.53	8.57	10.35
Nitrogen free extract	54.47	56.67	59.69	58.30	58.52	47.42

Table 3: Feed intake and weight gain of rabbits fed diets containing different levels of *Chromolaena odorata* leaf meal (COLM)

Parameter	Diet					
	0% COLM (Control)	10% COLM	20% COLM	30% COLM	40% COLM	SEM
Daily intake (g/day)						
Dry matter	41.42a[1]	32.86ab	32.66ab	24.65b	26.72b	3.42
Organic matter	37.86a	30.41ab	29.22ab	22.49b	24.43b	3.13
Crude protein	9.15a	6.60b	5.57b	4.25b	4.87b	0.72
Crude fibre	5.42a	4.39ab	4.00ab	3.06b	3.25b	0.44
Ether extract	0.78a	0.69ab	0.61ab	0.47b	0.68ab	0.06
Ash	3.57a	2.53bc	3.44ab	2.16c	2.29c	0.29
Nitrogen free extract	22.56a	18.62ab	19.04ab	14.71b	15.64b	0.90
Weight gain (g/day)	7.73a	6.30ab	6.64ab	4.12ab	3.00b	1.21
Feed conversion efficiency	0.19a	0.19a	0.21a	0.17a	0.11a	0.04

[1]Means in a row with the same letters are not significantly different at 0.05 level of probability.

Table 4: Digestibility (%) of dry matter and its nutrient components in rabbits fed diets containing different levels of *Chromolaena odorata* leaf meal (COLM)

Parameter	Diets 0% COLM (Control)	10% COLM	20% COLM	30% COLM	40% COLM	SEM
Dry matter	74.05a[1]	70.57a	68.88a	58.57a	59.72a	4.46
Crude protein	77.79ab	73.49ab	83.81a	62.23b	69.72ab	3.98
Crude fibre	67.38a	56.47b	57.44b	55.59b	60.89b	2.15
Ether extract	74.71ab	69.37ab	73.92ab	61.85b	77.03a	3.06
Ash	73.62a	52.67b	48.00b	45.99b	50.00b	8.85
Nitrogen free extract	81.94a	81.73a	78.83a	74.77a	76.22a	3.24

[1]Means in a row with the same letters are not significantly different at 0.05 level of probability.

(Neo-teramycin) and anti-stress (Aminovit) in drinking water for five days. They were also dewormed with coopane dewormer which is a brand of piperazine. *Chromolaena odorata* leaves were harvested from old experimental plots of the farm project and were sun dried and crumbled to produce *Chromolaena odorata* leave meal (COLM). Extremely young leaves were deliberately avoided due to the possibility of high concentration of nitrate in them. COLM was used at five levels of 0 (control), 10, 20, 30 and 40% in five iso-nitrogenous and iso-calorific experimental diets. The rabbits were grouped into five by weight and were randomly allocated to hutches and experimental diets. Experimental diets were served in troughs hung to the side of the hutches at reasonable height to forestall feed wastage by the rabbits, as the feeds were not pelleted. Each rabbits received daily supply of feed amounting to 50 g DM/kg live weight, served twice a day, with half each at 0800 and 1400h.

Quantity of feed consumed was monitored daily for ten weeks by taking note of the difference between the feed served and that remaining after 24hrs. The rabbits were also weighed once a week during this period to determining weight gain. At the end of this trial, the rabbits were transferred to metabolism cages for collection of faeces, which lasted for five days. Total daily faeces, voided were weighed and 10 % aliquot taken for each day and preserved for chemical analysis. The DM and its proximate components in the experimental feeds, COLM and faeces were analyzed using the standard methods of analysis (AOAC, 1990). All data emanated from this study were analyzed statistically in a completely randomized design using the procedures of SAS (1995)

Results and Discussion

Experimental diets (Table 1) contain 0 - 40 % COLM were formulated to meet the requirements of growing rabbits for protein, energy and fibre in equal proportions. The proximate compositions of these diets and COLM are presented in Table 2. The high protein and low fibre contents of COLM indicate its inherent quality as a feed for livestock. The CP content is much higher than reported values for most of the tropical legume forages (Becker, 1992) commonly used as livestock feed. The entire nutrient profile of COLM, characterized it as a concentrate, and even compared well with the standard concentrate used as the control diet in this study. This shows that COLM could be explored as a possible feed for other monogastric animals as well.

In the current case of rabbit feeding, COLM could satisfy 198.4, 107.5 and 49.3% of rabbits requirements for crude protein, fibre and fat respectively. Beside the ether extract components which is lower, other nutrient components are in line with the values reported by Apori *et al*. (2000). The effects of including COLM in the diets on feed intake and weight gain of rabbits are presented in Table 3. There were no significant differences in the intakes of DM, OM, CF and NFE, among the control, 10 and 20% COLM diets. For CP intake, it was significantly best in the control diets. Among the COLM diets, all the intake values reduced insignificantly with increasing dietary levels of COLM. This observation did not however reflect in the weight gains of the rabbits, which were not significantly different in the control, 10, 20 and 30% COLM diets. The feed conversion efficiency (FCE) of the rabbits also reflected this, as the values were similar in the control and all the levels of COLM diets. The slight reduction in feed intakes with increasing levels of COLM in the diets may be attributed to the physical characteristics of COLM, especially its dustiness, resulting from the act of drying and crumbling of the leaves. This observation not withstanding, the rabbits were able to consume 5.87, 5.01, 4.89, 4.76 and 4.95% of their body weight as DM, which were in line with the recommended values of 4.5 - 7 % (Prudhon, 1968). Furthermore, going by a more recent recommendation of 26 g/kg BW (Jenkins, 1999), all the rabbits satisfied over 100% of this requirement in their DM intake. This good level of DM intake explains the good performance the rabbits have shown in terms of the weight gain and FCE. These weight gain values agreed with what were reported previously in concentrate plus forage diets (Bamikole and Ezenwa, 1999). Good weight gain response of animals is also an indication of feed utilization and thus supported the earlier report that *C. odorata* leaves contains save level of toxic factors that could impede feed utilization (Biller *et al.*, 1994; Irobi, 1997).

In the digestibility of the experimental diet by the rabbit (Table 4), the digestibility of DM also was not significantly affected by dietary level of COLM inclusion. This is a furtherance of the feeding quality of COLM and thus corroborated the high DM degradability of the leaves earlier reported in sheep (Apori *et al*., 2000). The digestibilities of other nutrient components were equally good and in most cases were similar with the control diet. Crude protein digestibility of the diet compares favourably with values of 75 - 85 % reported for alfalfa protein and confirms the good efficiency of rabbits in digestion of protein in forages (McNitt *et al*., 1996). The CF digestibility values in COLM diets are in agreement with 41-55 % reported previously for diets of equal mixture of grass or legume and concentrate (Bamikole and Ezenwa, 1999)

Conclusion: *Chromolaena odorata* leaf meal has a nutrient profile that is similar to that of a concentrate feed and thus can be used as an ingredient for formulating animal feeds. In feeding rabbits, it can be used up to 30 % of the dry matter fed and still obtain weight gain, feed conversion efficiency and feed digestibility that are comparable to that of a standard concentrate. It may be possible to feed COLM at higher levels if such feeds could be pelletized to address the characteristic problem of dustiness. Feeding COLM to rabbits, apart from making rabbit production more economical, will also encourage its production among farmers due to the availability of this feed resources in their domain, and also provide means of reducing the menace of this weed in our environment.

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