CHROMOLAENA ODORATA: A MULTIPURPOSE SHRUB

S.O. Apori
School of Agriculture, University of Cape Coast, Cape Coast-Ghana

ABSTRACT
Chromolaena odorata plant has been classified as a weed. A survey in farming communities in Ghana indicated that the plant is used to reduce fallowing period; improve soil fertility, as medicinal plant; as insect and rodent repellent for temporal storage of maize; and preservation of corpse for about 48 hours in rural Ghana.

Studies on foliage of *Chromolaena odorata* regrowth at 4, 6, 8, 10 and 12 weeks showed that the leaves had crude protein content above 19%, average leaf to stem ratio of 2.1:1, and stem to leaf protein concentration ratio of 0.49. *In-sacco* degradability rate of dry matter, crude protein and gross energy of leaves at 24 hours of incubation were very high (>89%).

When *Chromolaena odorata* leaf (8 weeks old) was incorporated at incremental levels of 10, 20, and 30% to replace maize in a standard rabbit diet, it led to non significant ($P<0.05$) decrease in dry matter intake but an increase in dry matter, crude protein and gross energy digestibilities.

KEY WORDS
Chromolaena odorata, Supplemental Feed, Livestock.

INTRODUCTION
Chromolaena odorata which has spread widely throughout the tropics has been declared as a noxious weed (Baxter, 1995) due to the difficulty in controlling it by both curative and preventive measures (Huguenin, 1993). This has called for various options in using it as green manure in irrigated rice and cassava fields in Cambodia (Litzenberger and Lip, 1961); protein leaf meal for poultry in Nigeria (Ivens, 1974); or making it acceptable as feed for poultry and livestock. *Chromolaena odorata* is not useful as feed in the fresh state because of presence of anti-feedants (odour) in the foliage. Hence it requires some pre-treatment such as drying in order to make it acceptable to livestock.

The objective of this project was to assess the usefulness of dried foliage of *Chromolaena odorata* as livestock feed supplement.

MATERIALS AND METHODS
A survey was carried out in December 1995 in 10 different farming communities each in Ahanta West, Assin Fosu and Sekyere districts in Western, Central and Ashanti regions respectively, to collect information on the local use of *Chromolaena odorata* plant. Purposive sampling method was used in selecting respondents who were mainly farmers.

From January to April, 1996, the chemical composition and nutritive value of the foliage of Chromolaena odorata regrowth at 4,6, 8, 10 and 12 weeks of age from one hectare slashed pasture of the Teaching and Research Farm of the University of Cape Coast, Ghana, was studied. 50 plants were harvested at 15 cm above ground level at each growth stage.

The leaves and the stems were separated, bulked and dried at 50°C for 48 hours, respectively. The dried materials were milled to pass through a 1mm sieve with Hammer mill, and sub samples taken for chemical analysis and in-sacco degradability studies.

Dry matter, crude protein and crude fibre were determined by methods outlined by the Association of Official Analytical Chemists (AOAC, 1970). *In-sacco* degradability of leaf and stem dry matter, crude protein and gross energy at 24 hours of incubation were determined according to procedure outlined by Orskov (1980) at Nungua Agricultural Research Station, University of Ghana, Accra.

In an *in-vivo* digestibility study, 4 x 4 latin square experiment was used to measure the feed intake; dry matter, crude protein and gross energy digestibilities of 0, 10, 20 and 30% *Chromolaena odorata* leaf (8 week old) meal (COLM) based diets by 3 month old male rabbits. The control diet was made up of 70% maize; 15% fish meal, 14.5% wheat bran and 0.5% Salt (NaC1), and the maize component was replaced by the leaf meal at incremental levels of 10, 20 and 30% (DM basis) of *Chromolaena odorata*.

RESULTS AND DISCUSSION
The survey carried indicated that *Chromolaena odorata* has been used in the following ways:
(a) Reducing fallow period of farm lands.
(b) Improvement of soil fertility
(c) As medicinal plant
(d) As insect and rodent repellent for temporal storage of maize
(e) Preservation of corpse for about 48 hours after death (in rural Ghana)

Preliminary research findings (Mensah Bonsu, 1996) did show the ability of *Chromolaena odorata* to improve soil fertility in respect of organic carbon accumulation at a rate (2.92% within four years of fallow) similar to tropical rain Forest (2.5% to 2.82% within four years at Kakum National Reserve). The respondents called for long term research to provide scientific explanation or basis for the benefits allegedly derived from use of *Chromolaena odorata* foliage.

The chemical composition and nutritive value of leaves and stems of *Chromolaena odorata* at different stages of maturity is presented in Table 1. The foliage had an average leaf to stem ratio of 2.1:1 ranging from 1.5:1 (minimum for 12 weeks) to 2.9:1 (maximum for 4 week old foliage). The minimum value of 1.5:1 (60% leaves) was higher than recorded values of 40 to 50% leaves for pre bloom and less than 30% leaves for full bloom leguminous forages (Becker, 1992). The crude protein concentration of leaves (Table 1) were comparable to values of 19% and above reported for most leguminous leaves at prebloom but higher than values of 17 to 13% at early, mid and full bloom maturity stages of leguminous forage leaves (Becker, 1992). The highest crude protein concentration of leaves and stems were attained at 8 weeks of maturity and declined at a rate of 0.9 $gkg^{-1}DMd^{-1}$ and 2.3 $gkg^{-1}DMd^{-1}$ for leaf and stem respectively. An average crude protein content of stem to leaf of foliage was 0.49 which was in line with value of 0.46 for leguminous forages. The rate of fall of crude protein content of leaves with age was lower than an average of $2.2kg^{-1}DMd^{-1}$ (Becker, 1992) for leguminous forages' leaves but similar to that of *Stylozanthes spp* of 0.9 $kg^{-1}DMd^{-1}$.

The high dry matter production and foliage with high crude protein concentration indicates that if used as livestock feed, more green material with high organic nitrogen source could be made available to the livestock.

The high *in-sacco* degradability rates for dry matter, crude protein

and gross energy of leaves above 90% (Table 1) suggest that if eaten, *Chromolaena odorata* leaves might be highly digestible. The crude protein levels of stems coupled with the high degradability rates of its crude protein and gross energy (Table 1) indicate that the stems when fed could provide the minimum nitrogen and energy needed for effective fermentation, at least, to maintain livestock (other factors held constant). The high rate of fall of the dry matter degradability of stems from 64.45% at week 4 to 50.19% at week 12 could be due to the development of fibrous material and other anti-nutritional factors with age at concentrations, that reduced nutrients degradability as suggested by Diagayete (1981). Diagayete (1981) also reported that tanin and other anti-nutritional factors content of forages from tropical trees and shrubs reduce organic matter intake, digestibility and overall feed utilization by livestock.

Table 2 indicates the feed intake and digestibility by rabbits of diets with incremental levels of *Chromolaena odorata* leaf meal. Dry matter intake tended to decrease with increased levels of *Chromolaena odorata* in the diet. This might be due to reduction in feed density or increase in feed bulkiness as colm was used to replace maize (DM basis). However, the proportion of dry matter, crude protein and gross energy of feed digested tended to increase with increasing levels of COLM in diet.

This might be due to changes in feed characteristics like crude protein and fibre content, carbon to nitrogen ratio physical characteristics with the incorporation of COLM in the diets. The observed results indicate that the levels of anti nutritional factors introduced to diets through COLM inclusion might not be deleterious (if any) at the level of feed intake observed. Earlier studies on leaves of tropical trees and shrubs used as dry season feed supplements showed that with age, increased tannin, lignin, fibre content and other anti-feedants reduce dry matter intake; crude protein and organic matter digestibilities and overall feed utilization by livestock Diagayete (1981).

CONCLUSION

It is concluded from the study that *Chromolaena odorata* a plant which is considered as a nixious weed has a potential as feed supplement for livestock in the tropics where feed for livestock production is always a problem. Whenever the feed is dried, the anti-feedants such as odour are reduced, making it acceptable to livestock. There is the need for long term studies on the use of *Chromolaena odorata* as livestock feed. With long-term studies, the possible limitations likely to crop up with feeding *Chromolaena odorata* to livestock will be revealed and potential remedial measures to address the limitations will be found.

REFERENCES

A.O.A.C. 1970, Official Methods of Analysis. Association of Official Analytical Chemists (11th ed.) Washington, D.C.

Baxter, J. 1995, *Chromolaena odorata*: Weed for the killing or shrub for tilling. Agroforestry Today April-June, pp. 6-8.

Beker, 1992 *Ruminant Production in the Tropics* DSE, Wielinger Strabe 52, Feldafing, Germany pp. 17-54.

Diagayete Mahamadou, 1981. Studies for Extending the knowledge on the Feed Value of West African Forage Plants. Phd Thesis, Inst. of Animal Nutrition, University of Hohenheim, Germany.

Huguenin, J. 1993: Repartition - dynamique incidences de Chromolaena odorata dans huit pays d'Afrique de 1'Quest. Paris: CIRAD-EMVT Working Paper.

Ivens, G.W. 1974. The Problem of *Eupatorium odoratum L* in Nigeria. *PANS VOL 20 No.1* pp. 76-82.

Litzenberger, S.C. and H.T. Lip. 1961: Utilizing *Eupatorium odoratum L* to improve crop yields in Cambodia. *Agronomy Journal* **53**: 321-324.

Mensa Bonsu, 1996, Pers. Comm. Soil Science Department, University of Cape Coast, Cape Coast, Ghana.

Orskov, E.R., F.D.D. Hovel and F. Mould. (1980). The Use of the Nylon Bag Technique for the Evaluation of Feedstuffs. *Trop. Anim. Prod.* **5:** 195-213.

Table 1
Chemical Composition and Nutritive Value of Chromolaena Odorata Foliage at 4, 6, 8, 10 and 10 Week of Maturity

Foliage Part	Age (Wks)	Leaf: Stem Ratio (Dm Basis)	Crude Protein Content	Crude Fibre Content	In-Sacco Degradability Within 24 Hours %		
			%	%	Dry Matter	Crude Protein	Gross Energy
Leaf	4		21.33	9.70	94.41	95.0	95.0
		2:9:1					
Stem	4		10.64	28.80	64.45	85.0	69.0
Leaf	6		20.06	10.27	93.68	96.0	94.0
		2:4:1					
Stem	6		12.65	30.25	59.13	90.0	65.0
Leaf	8		22.81	11.62	94.7	95.0	89.0
		2:1:1					
Stem	8		13.97	31.49	67.39	88.0	73.0
Leaf	10		20.89	13.49	91.64	94.0	92.0
		1:6:1					
Stem	10		9.50	38.33	58.91	85.0	66.0
Leaf	12		20.25	13.52	93.02	96.6	93.0
		1:5:1					
Stem	12		7.29	38.52	50.19	83.0	67.0

Table 2
Intake and Digestibility by Rabbits of Diets With Incremental Levels of Chromolaena Odorata Leaf Meal

Factor	Level of Chromolaena Odorata Leaf Meal in Diet % (DM Basis)			
	0%	10%	20%	30%
Dry Matter intake as % of Body Weight (%)	2.94	2.91	2.49	2.29
Dry Matter Digestibility %	75.45	76.27	77.48	78.54
Crude Protein Digestibility %	77.68	78.70	79.56	84.13
Gross Energy Digestibility %	74.65	73.71	76.93	77.30