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Review of forages used to feed small ruminants in Ghana in recent times

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Abstract

Forages used to feed small ruminants in Ghana were reviewed for the period 1997-2008. Areas reviewed included forages preferred by small ruminants, intake and digestibility, supplements, grazing behaviour, anti-nutritional factors and nutritional effects of forages. Whereas Cajanus cajan, Leucaena leucocephala, Mucuna pruriens var cochinchinensis and Mucuna pruriens var utilis were the most preferred forages by the animals, Gliricidia sepium was not. Feed intake increased and digestion was stimulated due to the high level of nitrogen in Chromolaena odorata leaves, thus it could therefore be incorporated into diets without any adverse effect. Indigenous browses had greater effect on the growth performance of sheep due to the varied crude protein levels of fodder plants. Animals on pasture were also known to possess the natural instinct whereby toxic plants were avoided. The ingestion of such toxic plants in majority of cases was usually associated with the scarcity of grazing materials on pastures. Anti-nutritional factors such as coumarin and tannin also decreased feed intake and exerted effects contrary to optimum nutrition but if properly managed could result in other beneficial effect. Cultivation of browse fodder during the dry season when supplementation is needed to improve the live weight of animals should therefore be exploited.

Keywords: Fodder plants, forage attributes, supplementation and small ruminants,

INTRODUCTION

The success of livestock production is largely based on materials that serve as forages for animals' consumption. Livestock feeding has always been a production constraint in sub-saharan Africa: Inadequate feeding can lead to low birth weights, high infant mortality etc. (Sumberg, 1985, Reynolds, 1986). Rural small ruminants roam around freely and eat a variety of grasses, legumes and kitchen wastes. However, during the dry season, green forages are less nutritive, particularly grasses which are lignified (Houe'rou, 1983) causing reduction in digestibility. Forages are therefore cut and fed to the animals when green material is in short supply. Given the overwhelming importance of forages, the several ground-breaking studies on forages

and the fact that similar research works for Ghana on forages are probably scattered and unorganised, this research sought to link these works and put together in one volume to enhance access and retrieval.

MATERIALS AND METHODS

Conference proceedings, annual reports and also publications in Animal Science journals obtained from Universities' libraries were studied. Some material was also obtained from the Animal Research Institute at Nyanpkala. The internet was also visited to retrieve some of the information. Works earlier than 1997 were not included in this review as decade bird's eye view was the target.

RESULTS AND DISCUSSION

Some forages studied

The various researches on forages studied were bias towards legumes (Karbo *et al*., 1993: Avornyo *et al*., 2000) (because it is generally known that ruminants on pasture tend to selectively graze plants that contain a high level of crude protein (Karbo et al., 1993). Karbo *et al*., (1993) studied four legumes including *Cajanus cajan*, *Leucaena leucocephala*, *Sesbania sesban* and *Gliricida sepium*. Avornyo *et al*., (2000) also looked at three forages including *Mucuna pruriens* var *cochinchinensis*, *Mucuna pruriens* var *utilis* and *Gliricidia sepium*. It is therefore evident that all the seven forage species used in the preference studies were all legumes.

Preferred forages consumed

The ability to select what is palatable was demonstrated by a ranked order in which the sheep and goats related themselves to a given forage legume (Karbo *et al*., 1997). From the studies conducted by Karbo *et al*., (1997), *Cajanus cajan* and *Leucaena leucocephala* were the most preferred forages by the sheep and goats. This was because *Cajanus cajan* had a higher level of crude protein (26.3%) while *Leucaena leucocaephala* on the contrary had the lowest level of crude protein (18.7%) but the levels of macro and micro minerals in the forages were quite appreciable and most, if made available could meet the dietary requirements of animals. Also, according to Avornyo *et al*., (2000), the two species of *Mucuna* were mostly preferred indicating that animals may shift from a known feed to a new feed gradually. From both studies conducted, the consumption trend showed that *Gliricidia sepium* was the least preferred forage (Karbo *et al*., (1997) probably because the plant has a repulsive odour and other toxic substance in its leaves and stems and Avornyo *et al*., (2000) also confirmed this. *Gliricidia sepium* leaves are known to provide good forage for livestock, however, available information on intake and patronage of this legume by animals are still contradictory (Karbo *et al*., 1997). It is a good fodder for sheep and goats and could be used as protein supplement (Ranjhan, 2001).

Intake and digestibility

Various studies on intake and digestibility of forages have been carried out (Apori *et al*., 1999; Ganyo *et al*., 2001). These studies opened up the possibility of controlling *Chromolaena odorata*, a noxious weed which

is widespread in the tropics in an economic and environmentally friendly manner through its incorporation into diets. Increased feed intake as a response to higher intake of nitrogen has been reported (Orskov, 1994; Abdulrazak *et al*., 1997). Apori *et al*., (2000) carried out investigations into the nutritive value of *Chromolaena odorata* leaf meal (COLM) and reported that it had about 4.12% nitrogen. Additional nitrogen supplied by the high quality forage feed also stimulate rumen digestion, resulting in an increase in feed intake (Orskov, 1994). COLM, which has been shown by Ganyo *et al*., (2001) to have relatively high nitrogen content and high rumen degradable nitrogen (Apori *et al*., 2000) might have enhanced microbial activity, giving rise to degradation of other component in the ration, leading to faster rate of passage through the gastro-intestinal tract, which might have culminated in the high intakes. Consequently *Chromolaena odorata* leaf meal can, without any adverse effects, be incorporated into the diets for ruminant livestock up to 20% of the total dry matter content of the diet as suggested by (Apori *et al*., 1999) and confirmed by Ganyo *et al*., (2001).

Major forage supplements used to feed small ruminants

A number of forage supplements used to feed small ruminants have been studied (Otieku, 2008; Osei-Owusu *et al*., 1999; Annan and Tuah 1999). Three such species studied included indigenous browses and an exotic browse legume. These species were *Gliricidia sepium*, *Ficus exasperata* and *Toxicaria* by Oteiku (2008), Annan and Tuah (1999) and Osei-Owusu *et al*., (1999) respectively. Their availability as cut and carry to confined animals will depend largely on the availability and accessibility of these plants, the authors noted.

Grazing behaviour

Karbo *et al*., (1997) recognized that fighting or group disturbance (agonistic behaviour) at feeding was dominant with goats and not in sheep and accounted for the comparatively low value goats recorded. In addition, due to the bullying behaviour exhibited by the stronger goats, there was group unrest leading to animals constantly moving from one forage site to the other in other to avoid being beaten. Animals on pasture were also known to posses the natural instinct whereby toxic plants are avoided. Guided by their sight, smell and taste, they are able to select which food material is immediately desirable for ingestion. The ingestion of such toxic plants in majority of cases was usually associated with the scarcity of unavailability of grazing material on pastures (Karbo *et al*., 1997). It was also observed that once wethers adjusted to diets containing 10% *Chromolaena odorata*, they easily accepted diets with higher levels of *Chromolaena odorata* leaf meal (Apori *et al*., 1999).

Anti-nutritional factors

Most forages are found to contain anti-nutritional factors which either limit their intake or causes loss of weight in animals. Karbo *et al*., (1997) reported that *Gliridia* leaves have very characteristic scent or smell which may not prove attractive to the animals. Furthermore, the presence of potential toxic substance called coumarin which changes to dicumerol when the leaves

are damaged could also contribute to the rejection of *Gliricidia* by animals which was also reported by Avornyo *et al*., (2000). Fleischer *et al*., (1998) also came out that, some browses and shrubs have a higher degradability. The degradation of these browses and shrubs is however affected by anti-nutritive factors such as tannin (Norton, 1991). Annan and Tuah (1999) also indicated that it is possible that *Ficus exasperata* contains anti-nutritional factors which limited its intake but however, due to research limitation, they could not indicate the presence of anti-nutritional factors in them.

Nutritional effects of forages

Ganyo *et al*., (2001) indicated that no deleterious effects on health and behaviour were evident in sheep fed *Chromolaena odorata* leaf meal-based rations and Apori *et al*., (1999) also confirmed this. In-vitro and in-sacco studies by Apori *et al*., (2000) indicated that *Chromolaena odorata* leaf meal had high rumen degradable nitrogen (47.2gN/kgDM) with in-sacco organic matter degradability value of 90.9% at 24hrs and was not toxic to rumen microbes. However, the high rumen degradability reported by Apori *et al*., (2000) could be put into effective use only when an adequate energy supply is ensured as explained by Degan *et al*., (1997) and Mawunenyegah *et al*., (1997). The levels of most macro and micro-minerals of most forage legumes reported by Karbo *et al*., (1997) were also found to be high and could additionally serve as important sources of minerals for livestock. Due to the varied crude protein levels reported by Osei-Owusu *et al*., (1999), browse supplements had greater effect on the growth performance of sheep. Oteiku (2008) also deduced that, proper and correct compounding of animal ration especially sheep with *Gliricidia sepium* leaves, a basal diet of known history in terms of its source, dry matter content, quality, quantity and mineral supplement in the form of salt-lick will result in high growth rate and weight gains. This tends to agree with the results of feeding trail conducted by Preston and Leng, (1987) which revealed that feeding a supplement of *Gliricidia sepium* to growing sheep on a basal diet of freshly harvested *Brachiara multiformis* gave a significant response in body weight gain when the legume comprised up to 28% of diet. There were also high levels of crude protein in some browses and shrubs (Fleischer *et al*., 1998) that improved the supply of protein to the animals.

CONCLUSION

Small ruminants preferred C*ajanus cajan*, *Leucaena leucocephala*, *Mucuna pruriens* var *cochinchinensis*, *Mucuna pruriens* var *utilis. Gliricidia sepium* was the least preferred forage. *Chromolaena odorata* leaf meal was not detrimental to the well being of sheep, neither did it also negatively influence feed intake and the degradability of feed constituents. Browses were found to have greater effect on the growth performance of sheep. Anti-nutritional factors such as coumarin and tannin resulted in symptoms such as anorexia and weight loss. Levels of most macro and micro-minerals of most forage legumes were found to be high.

REFERENCES

Abdulrazak, S.A., Muinga, R.W., Thorpe, W., Orskov, E.R. 1997 Supplementation with *Gliricidia sepium* and *Leucaena leucocephala* on voluntary feed intake, digestibility rumen fermentation and liveweight of crossbred steers offered *zea mays* strover. Livestock production Science. Pp 49:53-62.

Annan, P. and Tuah, A.K. 1999 *Ficus exasperata* as supplement to cassava peels fed to Djallonke sheep. Proceedings of the 11th Biennial Conference held at KNUST, Kumasi, Ghana.

Apori, S.O., Ganyo, E.Y and Odoi, F.N.A 1999 Intake and digestibility of organic matter and nitrogen in *Chromolaena odorata* leaf meal based diets by sheep. Proceedings of the 11th Biennial Conference held at KNUST, Kumasi, Ghana.

Apori, S.O., Lang , R.J., Castro F.B and Orskov, E.R. 2000 Chemical composition and nutritive value of leaves and stems of tropical weed *Chromolaena odorata*. Grass and forage science. Pp 55:77-81.

Avornyo, F., Karbo, N. and Addo-Kwafo, A. 2000 Assessment of the preference of *Mucuna pruriens var cochinchinensis*, *Mucuna pruriens var utilis* and *Gliricidia sepium* by sheep at Nyanpkala in the moist guinea savanna agroecology. Annual Report of Animal Research Institute. Nyanpkala-Tamale, Ghana.

Degan, A.A., Blanke, A., Becker, K., Karn, M., Benjamin, R.W. and Makker, H.P.S. 1997 The nutritive value of *Acacia saligna* and *Acacia salicina* for goats and sheep. Animal Science. Pp 64:253-259.

Fleischer, J.E., Sottie, E.T., Amaning-Kwarteng K. (1998). Chemical composition and rumen degradability of protein of browse and shrubs fed to sheep in Ghana. Ghana Journal of Agricultural Science. Volume 31.

Ganyo, E.Y., Apori S.O. and Odoi, F.N.A. 2001 Feeding Chromolaena odorata to sheep: Effect of high energy availability in ration on intake, digestibility and average daily gain. Proceedings of the 12th biennial conference held at Sasakawa centre, University of Cape Coast, Ghana.

Karbo, N., Barnes, P. and Rudat, H. 1993. An evaluation of browse forage preferences by sheep and goats in the Northern Guinea Savannah zone, Ghana. In: Ndikumana J. and de Leeuw P. (eds) Sustainable Feed Production and Utilisation for Smallholder Livestock Enterprises in Sub-Saharan Africa, Proceedings of the Second African Feed Resources Network (AFRNET), Workshop held in Harare, Zimbabwe. 201pp

Le Houe'rou H.N. 1983 Chemical composition and nutritive value of browse in tropical West Africa. In: Le Houe'rou H.N (ed), browse in Africa: The current state of knowledge. ILCA(International Livestock Centre for Africa), Addis Ababa, Ethiopia. Pp. 261-289.

Mawuenyegah, P.O., Warley, T., Harumota, T. and Fujihara, T. 1997 Effect of ammonia or protein supplementation of barley staw on digestion and purine derivative excretion in sheep. Animal science. Pp 64:433-439.

Norton, B.W. 1991 The nutritive value of tree legumes. In Forage tree legumes in tropical agriculture(ed. R.C. Gulteredge and H.M. Shetton). Wallingford, Oxford, CAB International. Pp 176-191.

Orskov, E.R. 1994 Resent advances in understanding of microbial transformation in the rumen. Livestock Production Science. Pp 3:53-60.

Osei-Owusu, S., Baffour- Awuah, O., Adam, I. and Apori, S.O. 1999 *Toxicaria* as browse supplements in the diets of semi-intensively raised sheep in Assin district. Proceedings of the 11th Biennial Conference held at KNUST, Kumasi, Ghana.

Oteiku, F. 2008 The effects of supplementing *Gliricidia sepium* leaves on the growth performance of Djallonke sheep in the dry season in the Northern Region of Ghana. Bsc. Thesis. UDS, Tamale, Ghana.

Preston, T.R. and Leng, R.A. 1987 Matching ruminant production systems with available resources in the and sub-tropics. International colour productions. Standthrope, Queensland 4380 Australia.

Ranjhan, S.K. 2001 Animal nutrition in the tropics, fifth edition. Vikas Publishing House PVT Ltd, New Delhi. Pp 202-377.

Reynolds L. 1986 Small ruminant production: The present situation and possible nutritional interventions for improvement. ILCA Bulletin 25:13-16. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia.

Sumberg J. E. 1985 Small ruminant feed production in a farming systems context. In: Sumberg J E and Cassaday K (eds), *Sheep and goats in humid West Africa.* Proceedings of the Workshop on Small Ruminant Production Systems in the Humid Zone of West Africa held in Ibadan, Nigeria, 23-26 January 1984. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia. pp. 34-46.