NUTRITIONAL CHARACTERIZATION OF FORAGE TREES FOR RUMINANTS FEEDING: IDENTIFICATION, INTAKE PREFERENCE AND TREE DENSITY (ADVANCES)

Guerra Liera, J.E. [1]*, Riveros Acosta, B.J. [2], Gastelum Delgado, M.A. [1], Córdova Izquierdo, A.[3], Rodríguez García, J. [4], Soto Angulo, L.E.[1], Moreno Quiroz, J.[1], Corrales Aguirre, J.L.[1], López Juárez, L.A.[1], Gutiérrez Sánchez, N.A.[1], Barrón Olea, I.[1], and Medina Gutier, C.H.[1]

[1]Facultad de Agronomía, Universidad Autónoma de Sinaloa, Culiacán de Rosales, Sinaloa, México. [2]Sub Secretaria de Ganadería del Gobierno de Estado de Sinaloa, México. [3]Departamento de Producción Agrícola y Animal, Universidad Autonoma Metropolitana Unidad Xochimilco, México D. F. [4]Inst. de Cienc. Agric., Universidad Autónoma de Baja California, Mexicali B. C., México

SUMMARY

The objective was to identificate; determine intake preference and tree density of six of the most important forage species of trees present in Culiacán, Sinaloa, Mexico with potential to ruminant feeding. The species selected were those the cattle regularly eats in extensive pasturing conditions, among them are mauto (*Lysiloma divaricata*), vinolo (*Acacia cochliacantha*), ebano (*Caesalpinia sclerocarpa*), amapa (*Tabebuia* spp.) guacima (*Guazuma ulmifolia*) and palo pinto (*Pithecellobium mangense*). *Acacia cochliacantha* presented the highest tree density and intake preference, although *Pithecellobium mangense* had low tree density, showed a second place for intake preference. The other species were considered of intermediate importance.

Keywords: forage trees, intake preference, tree density, ruminants feeding.

INTRODUCTION

Cattle activity in the agriculture based on rain regime in the central part of Sinaloa State has topographic problems, scarce tree covering and serious erosion problems, besides the incorrect utilization of new technologies such a ploughing the land the use of products to control weeds and pests. As a result, ruminant feeding is bad because of the low quality of forages (mainly Graminae) commonly used during the long period without rain which often last from seven to eight months a year and the reduce diversity of foods available, most of them of poor quality. The wrong cattle manage practices utilized for many years have affected forage productivity and increased erosion. In this State most of time different kind of grain species are cultivated, being a great part annual and not always tolerant to dryness, partly because of the characteristics of radical systems, compare to the one some trees found in this area, many of them leguminous from which cows feed and that help to move nutriments from lower to upper strata of the soil (Araya *et al.,* 1994). When using a forage plant, mainly if it is not native, an integral study most be made, including its vegetative and reproductive development, radical system and nutritional value because its presence may change the structure, bromatologic composition, number and

characteristics of flora and soil. (Minson, 1990). These changes affect the forage utilization during the growing and flowering season, besides the weather conditions could also change forage quality (Van Soest, 1982; Jung, 1989) and these conditions are extreme in Sinaloa where temperature have raised up to 50°C during the last few years. Given that bromatologic composition is highly dependent on the species and conditions where it grows, it is possible to know almost certainly chemical season variations of forest trees products (Buxton y Fales, 1994), because will be possible to determine nutrient quality and therefore its management program to optimize their use. For example, the high crude protein content in forage trees may supplement cattle rations, decreasing the level of commercial protein concentrates, therefore lowering the cost of ruminants feeding. Barajas *et al.* (1992) began in the South of Sinaloa the studies of *in situ* degradation of some dependent of rain grasses (known as "temporaleros" grasses). In this State, since 1998 researches of the *in situ* digestibility of rations components or complete rations began at the Faculty of Agronomy, Universidad Autonoma de Sinaloa, Mexico from which some results have improved its knowledge and use by cattle owners (Guerra *et al.,* 1999; Guerra *et a*l., 2005). This has continued and recently began the study of lowland forages trees which are important for cattle in some areas during the dry season, for this reason it is important to begin and continue this research.

OBJECTIVES

The objectives were to know the main tree species use as forage, characterize and determine its ruminal utilization and potential intake and possible addition to rations or partial substitution. With this long term research we also hope to give information to small cattlemen of "temporaleras" areas to improve their cattle feeding, weight gain and consequent productivity and also income through the use of leaves and other parts of forage trees found in central Sinaloa State, finally reducing the areas occupied by foreign grasses.

MATERIAL AND METHODS

This research takes place in the central area of Sinaloa, Mexico, 107° 23' and 24° 55' North and about 88 m above sea level and means temperature of 25.1°C, being the minimum mean during January (19.3°C) and the maximum in July (30.3°C). The climate is defined as BS1 (h') w (e), warm semidry and extreme, with an annual rain average of 724.4 mm, being the maximum rain during August and the lowest in January (Köppen modified by García, 1987). In order to identify the forage trees eaten by ruminant cattle, three ways were utilized, a) a poll for cattlemen, regarding tree or bush species eaten by cattle, b) direct observation of cattle feeding at the lowland losing leaves forest in central Sinaloa to determine feeding frequency and species preference and c) by reading scientific information about the species already reported for other sites. According to Scheaffer y Mendenhall (1987) a randomized stratified sampling was used to identify *in situ* representative trees species for their later identification by specialists. Monthly samplings were taken using the sampling technique proposed by Shinozaki *et al.* (1964) which includes taking, identifying and weighting leaves and pods of the chosen trees. Samples were oven dried to constant weight (about 48 h) at 60°C. The optimum sampling size *per* species used was according to Scheaffer and Mendenhall, (1987) to estimate dry matter production. After drying, samples were finely grounded (Willey # 4) passed through a 1mm mesh, and put in glass tars for later

analysis of variables Apparent Dry Matter (at 60°C for about 48 h), Residual Dry Matter at 105°C for about 24 h, Crude Protein (Kjelhdal method), Ashes (AOAC, 1975), Neutral Detergent Fiber and Acid Detergent Fiber (Goering y Van Soest, 1970), Hemicelullose, Cell Content, Organic Matter and the Energetic Characterization were also evaluated (Undersander *et al.,* 1993), besides Green Matter Production (kg ha^{-1}), Bromatologic Composition, Leave Area, Potential Intake and Ruminal Degradation of Green and Dry Matter and Protein Content. Analyses were performed at the Nutrition and Animal Bromatology Laboratory at the Facultad de Agronomía of the Universidad Autonoma de Sinaloa. The *in situ* degradability of Green Matter was carried out at la Posta Zootecnica of the Faculty of Agronomy, by using four Cebu cattle males 130 kg weight fistulated and with a rumen cannula to which an adaptation diet was given for ten days, giving 1.5 kg of commercial concentrate and alfalfa *ad libitum*. The *in situ* degradability was determined by using nylon bags, five replicates by plant species and by sampling month. Bags were taken out of animals at intervals of 0, 12, 24, 36 and 48 h (Orskov *et al.,* 1980; Orskov y Mc Donald, 1979). From the Neutral Detergent Fiber the Dry Matter Potential Intake and Protein Content were estimated (Pioneer, 1990; Schroeder, 1996; Thiex, 2001). Analysis of variance and later media compassion (Tukey ≤ 0.5) were made for variables evaluated (SAS version 9.2, 2004) using a randomize complete block design.

RESULTS AND DISCUSION

Preliminary results of this research are here presented, but continue and probably will last two or three more years. The most important forage plants were determined through the polls applied to the most experienced cattle owners and the direct observation of animals feeding on them. Species identified as eaten by ruminants were Mauto (*Lysiloma* sp), Vinolo (*Acacia sp*), Ébano (*Lysiloma* sp), Amapa (*Tabebuia* sp), Guazima (*Guazuma* sp) and Palo pinto (*Pithecellobium mangense*). Seven monthly samplings were made, each at the end of every month, from May through November 2006. Because of changes of structure and morphological and composition of trees it is necessary to perform a long term research including climate variables (Minson, 1990). Additional information related to different uses of forage species by people and cattle is presented in Table 1. There and as a result of *in situ* observations we conclude that Vinolo (*Acacia sp*) is the main forage species followed by Palo Pinto (*Pithecellobium mangense*), Guazima (*Guazuma* sp), Ébano (*Lysiloma* sp), Mauto (*Lysiloma* sp) and Amapa (*Tabebuia* sp). For density, it was found that the previous order slightly changed, although being Vinolo (*Acacia sp*) again the first, ad then Mauto (*Lysiloma* sp) Guazima (*Guazuma* sp), Amapa, Palo Pinto (*Pithecellobium mangense*) and finally Ébano (*Lysiloma* sp). Given that in general results of bromatologic composition are highly dependent on species studied, soil, climate and other conditions were they grow, it is possible to know almost certainly the season variation in its chemical composition, what may help to determinate nutritive quality and the manage programs to improve this quality and availability for cattle feeding. One advantage of high crude protein contents of forage trees would help to add or lower the proportion of commercial concentrates, decreasing its cost.

Table 1. Chraracteristics and utilization and density of the most important forage trees found in the studied area in Culiacán, Sinaloa, México.

Collected material	Common name	Scientific name	Type of plant	Use	Intake	Density (per sampling area)
Leave and pods	Vinolo	*Acacia farnesiana* *Acacia cochliacantha* Humb. & Bonpl. ex Willd.	Tree	Lumber	1	1
Leave, pods and fruits	Amapa	*Tabebuia palmeri*	Tree	Furniture, lumber	5	4
Leave, pods and fruits	Mauto	*Lysiloma divaricata*	Tree	Fence	5	2
Leave and pods	Palo pinto	–	Tree	Fence lumber	2	5
Leave, pods nd fruits	Guasima	*Guazuma ulmifolia*	Tree	Medicinal	3	3
Leave, pods and fruits	Ébano	*Lysiloma* sp	Tree	Lumber	4	6

CONCLUSIONS

Up to date the advances may permit to state that Vinolo trees is the most consumed forage tree by cattle in the central area of Sinaloa, having at the same time the greatest density per hectare. Although Palo pinto was the second most preferred specie, its importance according to tree density was very low. The rest of species showed intermediate importance. It is necessary to end the analysis of data collected and continue with similar and extended experiments the next years.

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