Effect of Defoliation Frequency and Planting Density on Yield and Nutritive Value of *Coursetia ferruginea* (HBK) Lavin

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ID # 06-08

EFFECT OF DEFOLIATION FREQUENCY AND PLANTING DENSITY ON YIELD AND NUTRITIVE VALUE OF *COURSETIA FERRUGINEA* (HBK) LAVIN

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Abstract

The aim of the present study was to asses the influence of the frequency of defoliation and density of sowing on yield and nutritive value of C*oursetia ferruginea*. Three defoliation frequencies (6, 8 and 10 weeks) and three densities of planting (1 x 1 m, 1 x 1.5 m and 1 x 2 m) were evaluated. A randomized block design, in a split plot arrangement and four repetitions, was used. Frequency of defoliation has a strong significant ($P<0.01$) effect on dry matter (DM) yield (13.6, 18.1 and 27.8 g DM/plant for 6, 8 and 10-week defoliation frequencies), plant height (63.5, 76.6 and 101.2 cm) and plant survival (71, 74 and 86%). Nutritive value was significantly ($P<0.05$) affected by the frequency of defoliation. Mineral content was reduced as the defoliation interval increased. Density of planting did not affect ($P>0.05$) any of the variables. It is concluded that, C. *ferruginea* is a forage shrub with potential to improve animal feed quality, but it does not stand frequent defoliation.

Keywords: C*oursetia ferruginea*, forage legume shrub, defoliation frequency, forage nutritive value.

Introduction

Most of the livestock production in the sub-humid region of Maracaibo highlands, Venezuela, is based on guinea grass (*Panicum maximum*, Jacq.) under grazing conditions. This region has an area of about 200 000 ha used for milk and meat production. Currently, the main problems that negatively affect animal production in the region are: 1. Irregular distribution of the forage production and quality over the year; 2. Bad management grazing practices (i.e. high stocking rate); 3. High costs of supplementary feed.

An alternative to these problems is the use of legumes, specially the native ones. *Coursetia ferruginea* (H.B.K.) Lavin is shrub native from Maracaibo that is well accepted by livestock and appears to have a high nutritive value. The use of this legume in the animal production systems of the region of Maracaibo could be an economical alternative, since it is well adapted to the edafoclimatic conditions of the livestock of that region. Nevertheless, there is not documented information regarding its management.

Therefore, the objective of the present study was to asses the influence of the defoliation frequency and density of sowing on forage yield and nutritive value of *C. ferruginea*

Material and Methods

The present study was undertaken in the state of Zulia, Venezuela. The experimental site is located in the town Jesus Enrique Losada, in the livestock region El Laberinto, at 10° 30’ LN y 72°00’ LW, and 10 m abovesea level (COPLANARH, 1974). Mean annual rainfall ranges from 900 to 1200 mm, with a bimodal distribution (April to June and September to December). Monthly mean annual maximum and minimum temperatures are 36 and 22 °C, respectively (MAC, 1968). The vegetation climax of the region is a tropical dry forest. Main grasses are buffelgrass (*Cenchrus ciliaris*, L.) and guineagrass. Soils are classified as Ultisol and Alfisol, with a pH of 6

and low mineral content.

Treatments and experimental design

Three densities of planting (1 x 1 m, 1 x 1.5 m and 1 x 2 m) and three defoliation frequencies (6, 8 and 10-week interval) were evaluated from January 1997 to May 1998. A randomized block design with four replications was used. Treatments were arranged in a split plot, where densities were the main plots and frequencies of defoliation the sub-plots. A total of twelve main plots of 20 x 14 m were used, which were divided into three sections of 6.7 x 14 m each. Seedlings of *C. ferruginea*, of about seven months of age, were planted during the rainy season, at the corresponding densities. An year later, just before the start of the experiment, plants were cut down to 60 cm above ground level. During the whole experimental period, weeds were controlled manually and with herbicides.

A total of ten plants per sub-plot were harvested, by cutting them down to 0.60 m above the soil, according to the defoliation frequency. Before cutting, plant height was determined from each of the ten harvested plants. Harvested forage was weighed and sampled to determine dry matter (DM) percentage and chemical composition: crude protein (Kjeldahl), FDA, FDN (Van Soest, 1967), and Ca, Mg, K, Zn, Mn and Cu (A.O.A.C., 1990).

Data were submitted to an analysis of variance using SAS (SAS, 1982). Means were compared by Tukey test.

Results and Discussion

Dry matter yield and plant height were significantly ($P<0.001$) influenced by the defoliation frequency (Table 1). The highest yield (27.8 g DM/plant) was obtained for the 10-week cutting interval; on the other hand, the lowest yield (13.6 g DM/plant) was recorded for the 6-week cutting interval. Similar results have been found with other forage shrubs and tree legumes (Faria et al., 1998). Frequent defoliation reduces the reserves of assimilates and, consequently, rate of

growth is diminished, which, in turn, resulted in lower DM yield and plant survival (i.e. 71, 74 and 86 % for the 6, 8 and 10-week defoliated plants, respectively) than with the unfrequented defoliation. In contrast, long defoliation interval resulted in an accumulation of forage and increased rate of growth, because of the high availability of assimilates, high leaf area and more root biomas, as it has been shown by other authors (Broughan, 1956; Sollenberger et al., 1988). In general, DM yield recorded in the present study was low, compared with other shrubs and trees forage legumes. This could be due to the long water deficits associated with the low and irregular rainfall distribution during the experimental period (January 1997 to May 1998). Density of planting did not influence ($P>0.05$) DM yield nor plant height.

Mineral content was significantly ($P<0.05$) influenced by frequent defoliation (Table 2). Mineral content were reduced as plant aged from 6 to 8 weeks, except Ca whose content was highest with the 10-week defoliation frequency. This increment of Ca content could be associated to the plant water deficit due to the irregular rainfall distribution, which resulted in less Ca translocation to the root system. It has been suggested that, mineral content is reduced as plant ages due to a dilution process, during plant growth, and translocation of nutrients to the root system (Newman et al., 1999).

It is concluded that, *C. ferruginea* is a forage with potential to improve the feed quality of livestock in view of its good adaptation and mineral content. Nevertheless, it appears to be susceptible to frequent defoliation. Further studies are required to determine its influence on animal performance.

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Table 1 - Effect of defoliation frequency on dry matter yield and plant height of *C. ferrugínea.*

Defoliation frequency (weeks)	Yield (g DM/plant)	Plant height (cm)
6	13.6 a	63.5 a
8	18.1 a	76.6 b
10	27.8 c	101.2 c

Means within a column followed by different letters differ (P<0.001).

Table 2 - Effect of defoliation frequency on mineral content of *Coursetia ferrugínea.*

Defoliation Frequency (weeks)	N (%)	P (%)	Ca (%)	Mg (%)	Zn (%)
6	4.2 a	0.3 a	2.1 a	0.8 a	56.5 a
8	3.6 b	0.2 b	2.3 b	0.8 a	38.9 b
10	3.5 b	0.2 b	2.6 b	0.9 b	48.8 c

Means within a column followed by the different letters differ ($P<0.05$).