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MORPHOLOGY AND PRODUCTIVITY OF "JUREMINHA" GENOTYPES (*Desmanthus* spp.) UNDER DIFFERENT CUTTING INTENSITIES[1]

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ABSTRACT – The aim of the study was to evaluate the morphological and productive characteristics of five genotypes of *Desmanthus* spp. submitted to two cutting intensities (20 and 40 cm), in the semi-arid region of Pernambuco. Of the genotypes studied, three were derived from ecotypes collected in municipalities of Pernambuco (7G, 31D and 50J) and two were from the state of Sergipe, coming from Australia (10AU and 13AU). Four cuttings were made with a frequency of 60 days. The treatments were randomized in blocks, with split plots and three replications. The variables studied were plant height, stem diameter, canopy diameter, the number of leaves per branch, LAI, leaf yield, stem yield, pod yield and forage yield, and leaf stem^{-1} ratio and pod stem^{-1} ratio. Genotypes 7G and 31D had higher forage yield and a larger number of leaves per branch. Forage yield was higher in the intensity of 20 cm. The cuttings reduced the total yield, stem yield, pods yield and forage yield, of the different genotypes studied. For leaf stem^{-1} ratio, the genotype 13AU was higher than genotypes 7G and 50J in the cutting intensity of 40 cm. Genotype 10AU had the highest pod stem^{-1} ratios in the three cuttings. The differences shown between genotypes of *Desmanthus* spp., especially 7G and 31D, in the intensity of 20 cm, indicate the possibility of selecting promising materials for cultivation in the semi-arid region of Pernambuco, with desirable morphological and productive characteristics to the forage plants.

Keywords: Cutting height. Native legumes. Forage yield. Semi-arid.

MORFOLOGIA E PRODUTIVIDADE DE GENÓTIPOS DE JUREMINHA (*Desmanthus* spp.) SOB DIFERENTES INTENSIDADES DE CORTE

RESUMO – O objetivo do trabalho foi avaliar características morfológicas e produtivas de cinco genótipos de *Desmanthus* spp., submetidos a duas intensidades de corte (20 e 40 cm) no Semiárido de Pernambuco. Dos genótipos estudados, três foram oriundos de ecótipos coletados em municípios de Pernambuco (7G, 31D e 50J) e dois advindos do estado de Sergipe, oriundos da Austrália (10AU e 13AU). Foram realizados quatro cortes, com frequência de 60 dias. Os tratamentos foram casualisados em blocos, com parcelas subdivididas e três repetições. As variáveis estudadas foram altura da planta, diâmetro do caule, diâmetro da copa, número de folhas/ramo, IAF, produção de folhas, de caule, de vagem e de forragem, relação folha/caule e vagem/caule. Os genótipos 7G e 31D apresentaram maior produção de forragem e maior quantidade de folhas por ramo. A produção de forragem foi maior na intensidade de 20 cm. Os cortes influenciaram a produção de massa seca total, de caule, de vagem e de forragem dos diferentes genótipos estudados. Para a relação folha/caule o genótipo 13AU foi superior aos 7G e 50J na intensidade de corte 40 cm. O genótipo 10AU obteve as maiores relações vagem/caule nos três cortes. As diferenças apresentadas entre os genótipos de *Desmanthus* spp., com destaque para o 7G e 31D, na intensidade de 20 cm, indicam a possibilidade selecionar materiais promissores para o cultivo no Semiárido de Pernambuco, com características morfológicas e produtivas desejáveis às plantas forrageiras.

Palavras-chave: Altura de corte. Leguminosa nativa. Produção de forragem. Semiárido.

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INTRODUCTION

The native plants of Caatinga represent an important forage resource for ruminant yield in the northeast of Brazil. Traditionally, they are used for grazing in the environment where they occur naturally, especially in the rainy season. One of these plants is a legume known as "jureminha", or bundleflower (*Desmanthus* spp.).

"Jureminha" species occur throughout America. In Brazil, especially in its northeastern region, there is a predominant occurrence of *Desmanthus pernambucanus* (L.) Thell. (PENGELLY; LIU, 2001), which is a member of the species complex of *Desmanthus virgatus* L. Willd. (LUCKOW, 1993). These species are shrub-like, drought resistant (BREWBAKER, 1987) and nitrogen- fixing (FREITAS et al., 2011).

The cultivation of this plant in northeastern Brazil is practically nonexistent, but in some countries such as Australia, there is the presence of commercial cultivars (JONES; BRANDON, 1998). Thus, in order to start the cultivation and support the breeding of this plant, expeditions were carried out to collect specimens in various municipalities in the state of Pernambuco (QUEIROZ, 2012).

Some studies have evaluated the response of species of *Desmanthu*s to cutting (ADJEI; PITMAN, 1993; TRUJILLO et al., 1996; GONZALEZ-V et al., 2005), but there is no record of work of this nature in the northeast of Brazil. According to Fontenele et al. (2009), further studies on the management of these species are required.

The study of the morphological and productive behavior of these genotypes when grown and managed under cutting is of great importance, since it will allow the selection of materials with desirable characteristics to forage plants such as good capacity for regrowth, persistence, higher leaf/ stem ratio and greater forage yield.

The cutting height is an important aspect in the management of forage legumes, since it affects the regrowth rate (SHEN et al., 2013), the dry matter yield (KARIN et al., 1991), the forage quality and the persistence (TRUJILLO et al., 1996; MEURIOT et al., 2005) of the forage plant in the yield system. Genotypes of the same species may also respond differently to cutting intensities.

The full understanding of the responses of forage plants to cutting is important to define management strategies for them. Hence, considering that the "jureminha" behavior when grown and managed under cutting in the northeastern semi-arid is still unkown, the objective of this study was to evaluate morphological characteristics, as well as the productivity of five genotypes of *Desmanthus* spp. submitted to two cutting intensities in the semi-arid region of Pernambuco.

MATERIAL AND METHODS

The research was conducted in the experimental field of the Academic Unit of Serra Talhada (UAST) of the Federal Rural University of Pernambuco, during the period from March to December 2014. The local climate, according to Köppen classification adapted to Brazil, is BSwh' type, called semi-arid, hot and dry, with summer rains, annual thermal averages exceeding 25°C and average annual rainfall of 650 mm year^{-1} with irregular rainfall (MELO et al., 2008). The rainfall and the average air temperature in the year 2014 are shown in Figure 1.

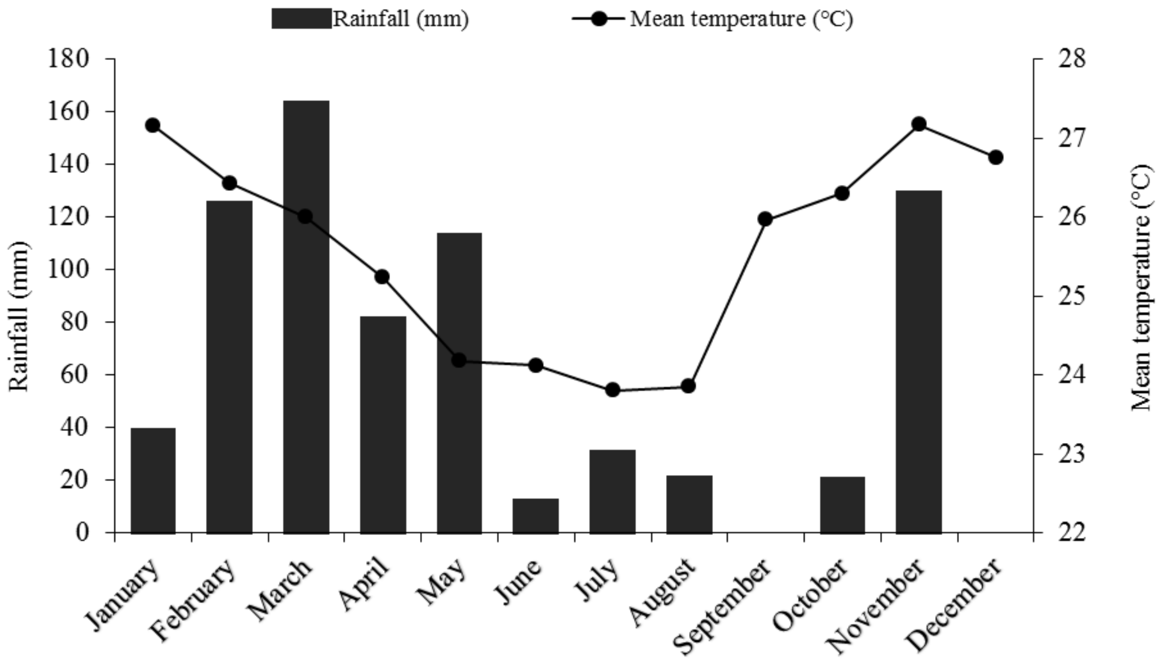

Figure 1. Rainfall (mm) and average temperature (° C) throughout the year 2014.

It were studied the effects of two cutting intensities (20 and 40 cm) on the morphological and productive characteristics of five genotypes of “jureminha” (*Desmanthus* spp.). The treatments were randomized in blocks and distributed in a split plot design with three replications. The main plots consisted of genotypes and the subplots consisted of cutting intensities.

Three genotypes of “jureminha” came from collections in three municipalities of Pernambuco, namely Santa Cruz do Capibaribe, Caetés and Petrolina, and correspond to the F1 generation of these plants. These were named 7G, 31D and 50J, respectively, in relation to the municipalities mentioned above. The other two genotypes came from the Germplasm Bank of Desmanthus of the Embrapa Tabuleiros Costeiros in Aracaju - SE and have an Australian origin. These were named 10AU and 13AU.

Before planting, the soil of the experimental field was prepared using a disk harrow coupled to a tire tractor. Chemical and physical analyses of soil samples of the experimental area, at a depth of 0-20 cm, were performed. The soil had the following chemical characteristics: pH (water) = 7.9; P (Mehlich I) = >348 mg dm^{-3}; K^+ = 0.39 $cmol_c$ dm^{-3}; Ca^{2+} = 3.20 $cmol_c$ dm^{-3}; Mg^{2+} = 0.10 $cmol_c$ dm^{-3}; Al^{3+} = 0.00; organic matter = 33 g kg^{-1}. Physically, the soil has shown: 102.6 g kg^{-1} clay, 54.8 g kg^{-1} silt and 842 g kg^{-1} sand. No fertilization was performed, whether mineral or organic.

The seedlings obtained from the seeds were used for planting. The plant spacing was 0.5 m x 0.5 m; each plot had 32 plants. The subplots were composed of 16 plants, with an area of 4 m². The useful area of the plot comprised the four central plants of each subplot, with 1 m² area. During the experiment, the plots were drip-irrigated daily. The amount of water provided was based on the annual average daily evapotranspiration. A water depth of 5.5 mm was used at intervals of one day, being suspended whenever rain events occurred. The water used had electrical conductivity of 1.86 dS m^{-1}, classified as C3, with high salinity, according to the classification of Richards (1954).

Ninety days after planting, the first cutting was performed, in June 2014, at which time the treatments were applied (cutting intensities). Since then, three new cuttings were made every 60 days. The cuttings were made from ground level to the height defined for each treatment, 20 or 40 cm, stretching the branches of the plant upright.

At each cutting, morphological and productive evaluations were performed. The morphological characteristics studied were plant height, stem diameter, canopy diameter, number of leaves per branch, leaf area index (LAI) and light interception. The plant height was achieved by means of measuring tape, from ground level to the apex of the plants, without stretching the branches; stem diameter was taken in the basal part of the plant, just above the ground, by means of 150 mm digital caliper; the average canopy diameter was obtained from two measurements in the plant canopy, which were taken in two perpendicular axes on the plant, and then the arithmetic average was calculated; the count of the number of leaves was performed in a representative branch of each plant of the useful plot; LAI and light interception was determined by a canopy analyzer AccuPAR LP-80 (Decagon Devices Inc.®). The measurements with the analyzer were made at four points above and four points below the canopy in each subplot, in clear days, close to noon.

The productive characteristics estimated were leaves, stem and pod yield, besides the total yield and the forage yield, which was obtained by the sum of the of leaves and stems yield. After each cutting, the collected material was separated into pods (with seeds), leaf and stem. Thus, it was also determined the leaf $stem^{-1}$ ratio, through the division of the value obtained on the dry weight fraction of the leaf by the dry weight of the stem fraction, and the pod $stem^{-1}$ ratio, by dividing the dry weight fraction of the pod by the dry weight of the stem fraction. After this separation, the material of each fraction was subjected to drying in a forced circulation oven at a temperature of 55°C for a period of 72 hours. After this period, the material was weighed in semi-analytical balance with a precision of 0.01g, for determining the dry weight of each of the fractions and estimating the productive characteristics mentioned.

The data were submitted to analysis of variance using the procedure PROC MIXED (LITTELL et al., 1998) of SAS (SAS, 1999). The data of the leaves yield, stems yield and forage yield were transformed to log (x) to meet the normality assumption. As for the data of stem diameter, canopy diameter, the number of leaves per branch and plant height, they were transformed to root (x). It was considered the effects of genotypes, cutting intensities and cuttings, besides to the effect of the experimental blocks. The cuttings were considered repeated measures over time. The effect of blocks was random. The method of least squares (LSMEANS) was used to compare means between the genotypes and cuttings, by PDIFF set to Tukey's test. The F-test was used to compare the means of the cutting intensities. All differences were considered significant at 5% probability.

RESULTS AND DISCUSSION

Morphological characteristics

In relation to plant height and stem diameter, there was a significant effect (P<0.05) of the interaction genotypes x cutting intensities (Table 1).

The genotypes 50J, 10AU and 13AU had lower heights when managed with 40 cm cuttings. The fact that the heights of the genotypes 50J and 10AU, in the intensity of 40 cm, were lower than the applied intensity may be due to the weight of the branches, where, to the extent that the plant was developing and branches grew, there was a tendency for these to be directed to the sides.

Regarding the stem diameter, it was only reduced in genotype 50J, when cut at 40 cm above ground level. In the intensity of 20 cm, the genotype 31D showed higher stem diameter than the genotype 13AU, while in the intensity of 40 cm, the genotypes 7G, 31D and 10AU showed greater stem diameter than the genotype 50J (Table 1). According to Paludo et al. (2012), stem diameter is a contributing factor in the biomass yield of plants, where the larger the diameter, the higher the yield. These same authors, when assessing the guandu bean (*Cajanus cajan* (L.) Millsp) under different cutting heights, found that the plants cut with greater height (lower intensity) showed greater stem diameter.

Table 1. Plant height and stem diameter in different genotypes of "jureminha" (*Desmanthus* spp.) according to the cutting intensities (CI).

Genotypes	Plant height (cm)			Stem diameter (mm)		
	CI (cm)		Mean	CI (cm)		Mean
	20	40		20	40	
	cm			Mm		
7G	50.86aA	57.13aA	53.99	9.85ABa	9.13Aa	9.49
50J	52.00aA	32.27bC	42.13	8.82ABa	7.19Bb	8.00
31D	56.06aA	61.18aA	58.62	10.25Aa	9.24Aa	9.74
10AU	46.74aAB	35.99bC	41.36	8.89ABa	8.84Aa	8.87
13AU	39.49bB	49.38aB	44.43	8.20Ba	8.48ABa	8.34
Mean	49.03	47.19		9.20	8.58	
Standard error	4.99			0.01		

Means followed by the same uppercase letter in the column do not differ by the Tukey test at 5% probability.
Means followed by the same lowercase letter in the row do not differ by the Tukey test at 5% probability.

There was a significant effect ($P<0.05$) of the interaction genotypes x cuttings to the pod/stem ratio and the number of leaves per branch (Table 2). The pod/stem ratio decreased after successive cuts for the genotypes 7G, 50J and 13AU. In genotypes 31D and 10AU, the pod/stem ratio remained constant over cuttings. When comparing the genotypes within the cuttings, in general, genotypes 10AU and 13AU had the highest pod/stem ratios in the cuttings, while genotypes 7G and 50J expressed the lowest pod/stem ratios. According to Allen et al. (2011), forage is defined as the plant parts considered edible to animals, excluding grains. Thus, the pod/stem ratio may be indicative of the forage yield potential, where genotypes with lower pod/stem ratio values have a trend for higher forage yield. Throughout the cuttings, it can be seen that there is a general trend for a reduction of the pod/stem ratio for genotypes 7G, 31D and 50J.

Table 2. Pod stem^{-1} ratio and the number of leaves per branch in different genotypes of "jureminha" (*Desmanthus* spp.) along three cuts 60-day intervals.

Genotypes	Pod stem^{-1} ratio				Number of leaves per branch			
	Cuttings			Mean	Cuttings			Mean
	1º	2º	3º		1º	2º	3º	
7G	0.93Ca	0.79Ca	0.34Bb	0.68	16.17Aa	13.00Ab	13.42Ab	14.19
50J	1.64Ba	1.31BCa	0.60Bb	1.18	14.38Aa	8.79Bc	11.17Ab	11.44
31D	1.60Ba	1.14Ca	1.41Aa	1.38	11.00Bb	11.21Ab	14.71Aa	12.31

Means followed by the same uppercase letter in the column do not differ by the Tukey test at 5% probability.
Means followed by the same lowercase letter in the row do not differ by the Tukey test at 5% probability.

Table 2. Continuation.

Genotypes	Pod stem^{-1} ratio				Number of leaves per branch			
	Cuttings			Mean	Cuttings			Mean
	1º	2º	3º		1º	2º	3º	
10AU	2.33Aa	2.64Aa	1.78Aa	2.25	9.67BCa	7.38Bb	10.60Ba	9.21
13 AU	2.27Aa	1.56Bb	1.62Ac	1.82	7.56Ca	7.21Ba	9.71Ca	8.16
Mean	1.75	1.49	1.15		11.75	9.52	11.92	
Standard error		0.04				0.77		

Means followed by the same uppercase letter in the column do not differ by the Tukey test at 5% probability.
Means followed by the same lowercase letter in the row do not differ by the Tukey test at 5% probability.

For the number of leaves per branch, genotypes showed different behaviors between cuttings. For 7G and 50J, the number of leaves was higher (P<0.005) in the 1st cutting compared to the 2nd and 3rd, while for 31D, the number of leaves was higher (P<0.005) in the 3rd cutting. For 10AU and 13AU, the number of leaves remained somehow constant in the successive cuttings, with the exception of 10AU, which in the 2nd cutting showed a decrease in the number of leaves per branch. Within the cuttings, in general, genotypes 7G, 50J and 31D had a greater number of leaves than genotypes 10AU and 13AU (Table 2).

A significant effect (P<0.05) was observed of genotypes for canopy diameter. Genotypes 7G and 31D had higher canopy diameter than the other genotypes, averaging 90.74 cm and 85.26 cm, respectively. The canopy diameter shown by the other genotypes was 75.95, 69.79, and 69.47 cm for 50J, 10AU and 13AU, respectively.

The cutting intensity significantly influenced (P<0.05) the canopy diameter (Figure 2). It was observed that in the intensity of 20 cm, the canopy diameter was higher than that obtained in the intensity of 40 cm. This result suggests that the plants harvested at lower height tend to have a more open growth habit, increasing, consequently, their canopy dimensions. Probably, in the plants cut at lower height, there was elimination of the apical meristem with consequent breaking of the apical dominance. Thus, there was a stimulus for the emergence and growth of side shoots.

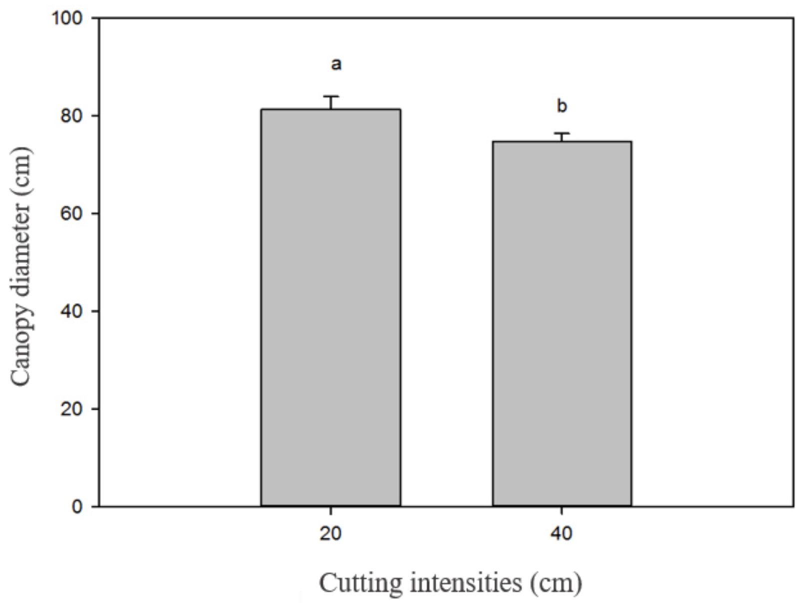

Figure 2. Canopy diameter of "jureminha" (*Desmanthus* spp.) plants according to the cutting intensities. Same letters on the error bar do not differ (P> 0.05) by F test.

There was a significant effect (P<0.05) of the cuttings on the leaf area index (LAI), light interception (LI), plant height, number of leaves per branch, stem diameter and canopy diameter (Table 3). LAI, light interception and plant height were significantly higher in the third cutting in relation to the first and second cuttings. For the number of leaves per branch, the highest average values were observed in the first and third cuttings. The stem diameter increased in the 2nd and 3rd cutting when compared to the 1st cutting. The canopy diameter decreases only in the second cutting.

The genotypes have shown an ability to recover after four consecutive cuttings (including the uniformity cut), maintaining the stable yield of leaves and canopy diameter, besides increasing the leaf area index and thus the light interception. These factors are of great importance for the forage yield and are closely related to each other, considering that increased leaf yield contributes to the increased canopy diameter, which also contributes to increases in the leaf area index, and consequently in the light interception.

The fact that the number of leaves and the canopy diameter have shown a reduction in the second cutting may be related to an attack of leaf-cutting ants, which occurred in one of the blocks, just prior to the second cutting, affecting all plots in that block. The increased stem diameter observed, from the first to the third cutting, was associated with the age of plants and successive cuttings, which naturally promotes the thickening of their stem.

Table 3. Morphological characteristics in genotypes of "jureminha" (*Desmanthus* spp.) along three cuts 60-day intervals.

Cutting	Leaf area index	Light interception (%)	Height plant	Nº of leaves per branch	Stem diameter	Canopy diameter
			cm		mm	cm
1º	1.30b	45.56b	44.13b	11.80a	8.25b	80.65a
2º	1.27b	46.65b	44.42b	9.58b	8.98a	71.81b
3º	1.95a	58.60a	55.77a	11.93a	9.47a	82.28a
Mean	1.50	50.27	48.11	11.10	8.90	78.25
Standard error	0.01	9.71	0.04	0.03	0.02	0.08

Means followed by the same letter do not differ by the Tukey test at 5% probability.

According to Silva et al. (2010), the number of leaves present in a plant is related to the potential plant biomass accumulation, which is an important feature for recommending the use of forage species. In addition to the yield potential, forage plants that produce increased amounts of leaves tend to provide better-quality forage, considering that in the leaves there is a higher concentration of nutrients for the animal.

The canopy dimensions interfere with the performance of physiological processes and in many cases are used as indicators of the capacity of a plant to compete for other resources (LEITES et al., 2012). Nutto (2001) explains that this variable is directly related to the growth and biomass yield of a plant. Therefore, it is possible that plants with larger canopy diameter, as well as an increased number of leaves on the branches, produce higher amounts of forage, with better quality. In the management of consecutive and regular cuttings, the analysis of variables related to the size of the canopy aims to provide information that reflects the potential capacity for regrowth of the forage species that was subject to such management.

Productive characteristics

There was a significant effect ($P<0.05$) of genotypes for leaf yield, forage yield and pod yield (Table 4). For leaf yield, the genotype 7G was superior to genotypes 50J, 10AU and 13AU, but did not differ from 31D. The genotype 13AU was inferior to the others regarding leaf yield, except for 10AU. For forage yield, genotype 7G was superior to the others, except for 31D, which did not differ from 50J. Genotypes 10AU and 13AU had the lowest forage yield. As for pod yield, genotypes 31D and 10AU showed higher yield of pods than genotypes 7G and 50J. The genotype 13AU did not differ from the others.

Table 4. Leaves, forage and pod yield in different genotypes of "jureminha" (*Desmanthus* spp.).

Genotypes	Leaves yield	Forage yield	Pod yield
	kg DM ha^{-1}		
7G	508.80a	1102.06a	342.75b
50J	359.44b	771.31b	393.92b
31D	414.58ab	867.23ab	578.79a
10AU	293.56bc	552.41c	560.71a
13AU	258.39c	509.68c	464.11ab
Mean	366.96	760.54	468.05
Standard error	0.01	0.02	29.23

Means followed by the same letter in the column do not differ by the Tukey test at 5% probability.

The genotypes coming from Pernambuco (7G, 50J and 31D) showed higher yield of leaves and forage in relation to those of Sergipe (10AU and 13AU), from Australia. The genotypes derived from the Agreste region, 7G (Santa Cruz do Capibaribe) and 31D (Caetés), stood out compared to the others, although all of these genotypes have been collected in semi-arid environments. Based on these results, it is observed that the genotypes that were not derived from Pernambuco (10AU and 13AU) expressed a lower yield of leaves and forage compared to the native ones.

Genotypes 31D and 10AU produced more pods than genotypes 7G and 50J, but did not differ from 13AU. Throughout the experiment, it was found through in loco observations that the genotypes did not show uniformity in the maturation of their fruits and these, in turn, had shown dehiscence. In this case, the genotypes 7G and 50J had most of their pods open, with the release of seeds showing a precocity in relation to the others, which contributed to the reduction of the dry weight of the pods (yield) at the time of the cuttings. Hence, the precocity of the opening of pods in these genotypes may facilitate the harvest management, yielding a higher proportion of the fractions that led to a better quality of forage (leaf and stem).

The total yield and the yield of leaves, stem, pod and forage differed ($P<0.05$) between the cuttings made (Table 5). It was found that, with the exception of the pod yield, all previously cited variables showed higher yields in the third cutting. The pod yield was higher in the first cutting. In the first and second cuttings, the yield of leaves, stem and forage did not differ statistically. Total yield was lower in the second cutting, which may have the attack of ants as a cause, as mentioned above, and the lower availability of water due to the reduced rainfall in the period before the second cutting.

Table 5. Total, leaves, stems, pods and forage yield in different genotypes of "jureminha" (*Desmanthus* spp.) along three cuts 60-day intervals.

Cuttings	Total yield	Leaves yield	Stems yield	Pod yield	Forage yield
	kg DM ha^{-1}				
1º	1240.10b	337.87b	350.16b	552.08^{a}	688.02b
2º	1063.29c	330.26b	315.49b	417.54b	645.75b
3º	1360.01a	418.07a	494.44a	447.51b	912.51a
Mean	1221.13	362.06	386.70	472.37	748.76
Standard error	115.42	0.01	0.01	29.23	0.02

Means followed by the same letter in the column do not differ by the Tukey test at 5% probability.

During the conduct of the experiment, it was observed in loco that the bundleflower plants showed recovery capacity at each cutting. According to Marcelino et al. (2006), the ability of a forage plant to support the performance of successive cuttings may be related to greater efficiency in the renewal of tissues, which results in increased forage yield.

Throughout the cuttings, an increase in the stem yield in relation to pod yield was observed (Table 5), which explains the decrease of the pod/ stem ratio for the genotypes 7G, 50J and 13AU (Table 2). In this sense, it is important to highlight that the process of yield/maturing of pods in genotypes did not occur uniformly. At the time of cutting, the pods could have already been opened and released seeds (influence on weight), which in turn influenced the pod/stem ratio behavior. Notwithstanding, what was observed for this variable is that as the cuttings were performed, there was a reduction in pod yield and increased stem yield. These facts may be related to the greater water availability during the rainy season, leading to reduced pod yield. Possibly, the plants started to concentrate photoassimilates for the yield of vegetative organs (leaf and stem), making the yield of pods limited and/or delaying their yield.

During the evaluation period, it was observed that in the first interval, between the uniformity cut and the first cutting, there was an accumulated rainfall of 53.4 mm. In the interval between the first and second cuttings, the rainfall was 17.2 mm. In the interval between the second and third cuttings, the rainfall was 126.1 mm (Figure 1). Observing the behavior of genotypes for total yield, leaf yield, forage yield and stem yield, it is clear that, even with the regular supply of water for all genotypes and although bundleflower is a species that is resistant to low levels of rainfall, there was a positive response of these genotypes to the increasing amount of rainfall in the intervals between the cuttings for the variables mentioned above.

The cutting intensity significantly influenced (P<0.05) the forage yield. The forage yield obtained in plants cut at 20 cm was higher than in relation to the yield obtained in those submitted to the intensity of 40 cm (Figure 3).

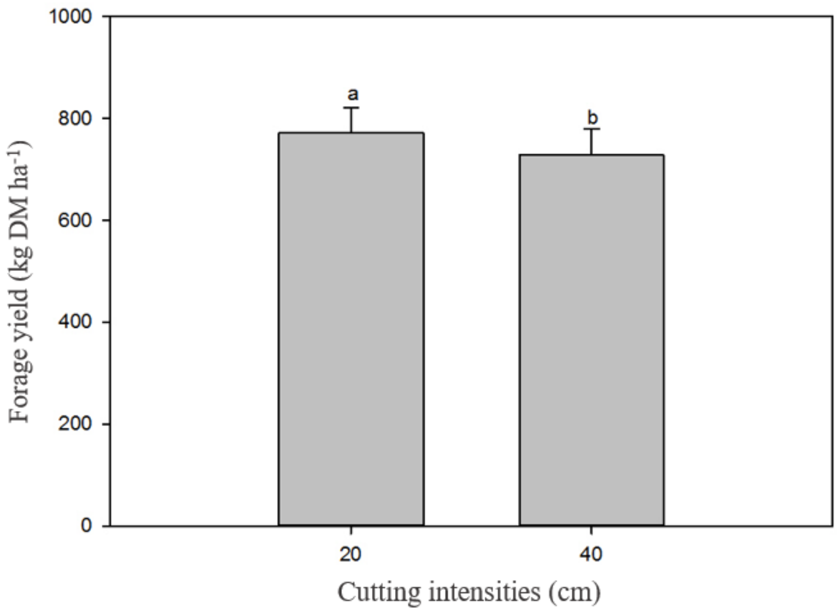

Figure 3. Forage yield, in kg DM ha^{-1}, of "jureminha" (*Desmanthus* spp.) plants according to the cutting intensities, Serra Talhada-PE. Same letters on the error bar do not differ (P> 0.05) by F test.

Possibly, there was a greater removal of tissues and meristems in the highest cutting intensity, which led to the stimulation of forage yield of the bundleflower. This increase in yield is related to the fact that, in the highest cutting intensity, the apical meristem may have been eliminated, which led to the stimulation of the emergence of new side shoots. This can also be associated with the enhanced light condition to which such plants were exposed during the removal of higher amounts of biomass. Taiz and Zeiger (1998) argue that stem elongation as a function of incident radiation is an adaptive response of plants to maximize the interception of light. Therefore, by reducing shading and allowing more radiation on the remaining meristems, there was a greater stimulus for the growth and development of new shoots, thus contributing to the increase in forage yield.

For stem yield, there was a significant effect (P<0.05) for the interaction between genotypes and cutting intensities (Table 6). In the intensity of 20 cm, genotypes 7G and 31D showed higher stem yield than the others. In the intensity of 40 cm, genotypes 7G, 50J and 31D showed higher stem yield than the others. The stem yield in the intensity of 20 cm did not differ from that obtained in the intensity of 40 cm only for genotypes 50J and 10AU. For the other genotypes, the yield of stems was higher in the intensity of 20 cm.

Table 6. Stem yield and leaf stem-1 ratio in genotypes of “jureminha” (*Desmanthus* spp.) according to the cutting intensities.

Genotypes	Stem yield			Leaf stem-1 ratio		
	Cutting intensities		Mean	Cutting intensities		Mean
	20 cm	40 cm		20 cm	40 cm	
	kg DM ha^{-1}					
7G	664.13Aa	546.01Ab	605.07	0.80Ba	1.00Ba	0.90
50J	351.29Ba	472.43Aa	411.86	1.10Aa	0.90Ba	1.00
31D	537.06Aa	368.24Ab	452.65	0.90ABa	1.10ABa	1.00
10AU	279.40Ba	238.29Ba	258.84	1.10Aa	1.20Aa	1.20
13 AU	290.26Ba	212.32Bb	251.29	0.90ABb	1.30Aa	1.10
Mean	424.43	367.46		1.00	1.10	
Standard error	0.03			0.01		

Means followed by the same uppercase letter in the column do not differ by the Tukey test at 5% probability.
Means followed by the same lowercase letter in the row do not differ by the F test at 5% probability.

The leaf $stem^{-1}$ ratio was also influenced by the effect of the interaction cutting intensity x genotypes (Table 6). For cutting intensities, there were significant differences only for genotype 13AU, which showed a higher leaf $stem^{-1}$ ratio when cut in the intensity of 40 cm. In the cutting intensity of 20 cm, genotypes 50J and 10AU had higher leaf/stem ratio than the genotype 7G. Genotypes 31D and 13AU did not differ from these genotypes. However, in the cutting intensity of 40 cm, genotypes 10AU and 13AU had higher leaf $stem^{-1}$ ratio than genotypes 7G and 50J, but did not differ from 31D.

The leaf $stem^{-1}$ ratio is a feature that varies depending on the production of the fractions of leaves and stems and, for forage plants, it is important that it shows values greater than 1, given that in this case there is always a larger amount of leaves than stems. These variations influence the nutritional value of the forage, since the chemical composition of each of the fractions may differ widely, because, generally, in leaves, the concentration of digestible nutrients is larger than in the stem.

Overall, it was observed that variations of the leaf/stem ratios of the genotypes submitted to cutting intensities were small, except for the genotype 13AU, which, in the intensity of 40 cm, obtained a much higher value when compared to the intensity of 20 cm. The leaf/stem ratio exerts great influence with regard to animal nutrition. Teixeira et al. (2010) report that the leaf/stem ratio existing in a legume may interfere with the forage intake by animals, as they prefer to feed on more tender material and of better nutritional value, in this case, the leaves.

Araújo et al. (2008) state that the behavior of a forage plant results from the interaction of its genetic potential with the environment. The authors mention that to maximize the forage production potential, it is necessary to adapt the plant to the environment, either through breeding or through partial changes in the environment. The latter can be achieved by cutting management. Therefore, it can be seen that for the conditions of this study, the genotypes derived from Pernambuco showed the best results for the variables related to production and growth, suggesting higher regrowth ability of these genotypes when subjected to cutting management.

CONCLUSIONS

Genotypes of *Desmanthus* spp. should be cut at 20 cm, at the expense of the 40 cm cutting, to stimulate growth and forage yield.

The morphological and productive differences shown between genotypes of *Desmanthus* spp., especially 7G and 31D, in the intensity of 20 cm, indicate the possibility of selecting promising materials for cultivation in the semi-arid region of Pernambuco, with desirable morphological and productive characteristics to forage plants.

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