Evaluation of Leucaena Genotypes

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EVALUATION OF LEUCAENA GENOTYPES

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Abstract

The objectives of this study were to evaluate the leucaena (*Leucaena leucocephala*) performance and to select the best genotypes, based on yield,.stability parameters, and quality parameters. Annual leucaena yields were obtained by cuts over the rainy and dry seasons. A combined analysis of variance for yield, and quality parameters was performed. Also stability parameters and coeficients of determination were estimated. The combined ANOVA for edible dry matter yield and for acid detergent fiber, and digestibility revealed a significant difference for genotypes, environments, genotypes x environments, row spacings, cutting frequencies, and cutting heights, Six genotypes of leucaena were selected on the basis of edible dry matter yield, stability and quality parameters.

Keywords: Forage legume, yield, quality parameters, stability, semi-arid

Introduction

Forage breeding and selection, in the the semi-arid Northeastern of Brazil, has not received adequate research priority.Therefore shortage of feed associated with the low yield and low quality, is the main problem to develop and improve animal production, in that region.The use of adapted and selected forage plants to enrich native pastures, and to cultivate as a source of protein is viable. Results obtained by Guimarães Filho & Soares (1992) have

demonstrated that Leucaena is a perennial legume, drought resistant, with high potential to improve yield and economic efficiency of animal production. The main objective of this paper is to report the evaluation and selection of leucaena genotypes.

Material and Methods

From 1987 to 1997 three experiments were established to evaluate edible dry matter yield (EDMY) crude protein (CP), total crude protein (TCP), acid detergent fiber (ADF), neutral detergent fiber (NDF), lignine (LIG), in vitro dry matter digestibility (IVDMD), under different management conditions. The experiments were carried out at the National Research Goat Center, at Sobral – Ceará, Brazil. Mean annual rainfall for the last 30 years is 750 mm. The soil type at the experimental field is a non calcic brown, caracterized by: pH = 5,40; Ca(meq) =12,20; Mg(meq) = 8,30; K(meq) = 0,14; Al(meq) = 0,05; P(ppm) = 14,76; and organic matter = 0,66. The experiment I was established to evaluate, in a randomized complete block design (RCBD) with three replications, the effects of three row spacings, two cuttings heights, and two cutting frequencies, on the EDMY of five leucaena genotypes. Since this expreriment was carried out over years, analysis of variance considered genotypes, spacings, heights, and frequencies as a main plot, and years and corresponding interactions as a sub-plot in time. A RCDB with three replications, having 71 (66 plus five from experiment I) genotypes (main plot) as a source of variation, and years and the corresponding interactions as a sub-plot in time for the experiment II. A RCDB having as a source of variation eight leucaena genotypes selected from experiment II with four replications was used for experiment III, where EDMY and quality parameters were evaluated.

Results and Discussion

Edible dry matter yields (EDMY) in experiment I were different ($P < 0.05$) for spacings, cutting heights, years, seasons and frequency x seasons. The lowest EDMY was 2620 kg/ha at the spacing (0,50 m x 0,25 m), which was inferior to those obtained at spacings (1,00 m x 0,50 m) and (1,00 m x 0,25 m) with an EDMY of 3139 and 3104 kg/ha /year, respectively. The mean EDMY of 3526 kg/ha /year for cutting height of 40 cm was superior to the 2730 kg/ ha /year for cutting height of 10 cm. The year effect and the interaction cutting x frequency were higly significant ($P < 0.01$); the EDMY for year 1998 was 3412 kg/ha which was higher than 3139 kg/ha and 2840 kg/ha for years 1989 and 1990, respectively. The interaction cutting frequency x seasons showed that during the rainy season the cutting frequency of 84 days presented an EDMY of 2728 kg/ha higher than that obtained in the 42 days (2464 kg/ha). A combined analyses of variance for EDMY for experiment II, was performed and stability parameters were estimated. Significant differences ($P < 0.05$) were obtained for EDMY for all sources of variation: genotypes, environments, and interactions. Six genotypes of leucaena were selected among 71 genotypes on the basis of the EDMY, stability parameters and coeficient of determination.(Table 1). For experiment III a combined analyses of variance showed a significant difference ($P < 0,05$) among genotypes for EDMY, TCP, ADF and for IVDMD. Genotype G8 was superior to the genotypes G2, G3, G4 and G5 (Table 2). The edible dry matter yields obtained in these experiments were similar to those reported by Hutton & Beattie (1976) in Australia, and Sousa & Araújo (1995) in Brazil, however they were different from those obtained by Silva (1992) in the semi-arid region of Brazil. Quality parameters were similar to those reported by Topps (1992). On the basis of these results, it can be concluded that variability exists for EDMY, ADF, IVDMD among leucaena genotypes, and is viable the use of the six leucaena genotypes selected.

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Table 1 - Edible dry matter yield (EDMY-kg/ha), coeficients of linear regression, and of determination from 20 leucaena genotypes. EMBRAPA Caprinos, 2000.

Genotypes	EDMY/1989	EDMY/1990	Mean	Relative Yield (%)	b	r^2
CNPC 817	2675	4003	3339	197.34	1.32	0.69
CNPC 823	2293	2468	2381	140.72	0.96	0.76
CNPC 843	1741	2949	2345	138.59	0.95	0.59
CNPC 846	3573	5387	4480	265.07	0.88	0.88
CNPC 847	1899	3744	2822	166.78	1.59 *	0.78
CNPC 849	2583	2111	2347	138,71	1.12	0.93
CNPC 852	3398	1676	2537	149.94	0.66	0.46
CNPC 855	2380	3509	2945	174.05	1.29	0.85
CNPC 857	3792	2216	3004	177.54	1.70 **	0.91
CNPC 863	1539	2878	2209	130.55	1.56 *	0.85
CNPC 883	1992	3365	2679	158.33	1.08	0.64
CNPC 884	3014	2440	2727	161.70	1.01	0.93
CNPC 887	2932	1703	2318	136.99	0.96	0.76
CNPC 890	2471	1953	2212	130.73	0.73	0.75
CNPC 891	2529	2457	2493	147.34	1.01	0.83
CNPC 893	2951	3272	3112	183.92	1.37	0.89
CNPC 900	2670	2516	2593	153.25	1.09	0.98
CNPC 912	2177	4221	3199	189.07	1.84 **	0.83
CNPC 914	2691	3057	2874	169.86	0.77	0.52
CNPC 915	1792	3017	2405	142.14	1.44 *	0.83
CNPC 137	1656	1727	1692	100.00	0.87	0.91
Mean	2412	2771	1727	-	-	-

*, ** - Regression coeficients statisticaly different from 1,00 at 5% and 1% of probability, respectively.
b , r2 – coeficients of linear regression and of determination.

Table 2 - Qualitative and quantitative parameters of eight genotypes of Leucaena leucocephala, combined analysis, year I and year II. EMBRAPA Caprinos, 2000.

Genotypes	CP (%)	NDF (%)	ADF (%)	LIG (%)	IVDMD(%)	DMY(Kg/ha)	TCP(Kg/ha)
G1	22,21 a	44,68 a	22,80 ab	8,30 a	51,02 ab	3.099,60 ab	688,42 ab
G2	22,06 a	45,38 a	24,20 a	9,31 a	47,95 b	2.784,60 cb	614,28 cb
G3	21,97 a	45,48 a	23,06 ab	9,30 a	48,48 b	2.688,80 cb	590,72 cb
G4	21,93 a	44,71 a	22,04 ab	8,51 a	51,49 a	2.705,60 cb	593,34 cb
G5	22,81 a	45,59 a	22,68 ab	8,02 a	51,77 a	2.005,60 c	457,48 c
G6	22,71 a	45,01 a	21,17 b	7,92 a	51,64 ab	3.559,20 ab	808,29 ab
G7	22,49 a	44,46 a	22,31 ab	7,73 a	53,07 a	3.243,00 ab	729,35 ab
G8	22,64 a	44,21 a	22,08 ab	7,49 a	52,60 a	3.960,60 a	896,68 a

Means, within a column follwed by different letters are different (P< 0.05) by Duncan's Test.