Selection and Agronomic Characterization of Leucaena spp. Genotypes for Cold Tolerance. I. Dry Matter Yield.

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SELECTION AND AGRONOMIC CHARACTERIZATION OF *Leucaena spp* GENOTYPES FOR COLD TOLERANCE. I. DRY MATTER YIELD.

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ABSTRACT

Biotypes of *Leucaena spp* (56) were evaluated in order to identify those with tolerance to low temperature and with desirable characteristics as a forage crop. Selection was done at two phases. Phase I: 92 days old seedlings (n=2800) were subjected at two temperatures treatments during 14 hours: T1= -8 °C and T2= -3 °C. Selection criteria was established as 50% of live leaves remained after treatments were applied. Phase II: Plants that survived phase I were planted at field conditions and agronomic characteristics were measured. Seventeen plants were selected from eleven different biotypes, resulting one from T1 and the rest from T2. Three plants showed good agronomic adaptation and greater chilling tolerance. Only one plant maintained live stem and meristematic tissue after a -8.8 °C freeze occurrence . Plants N° 2, 3, 5, 6, 8, 9, 10, 11, 12, 13, 15 and 16 were the most productive (Dry matter production).

KEYWORDS

Leucaena spp, cold tolerance, selection, dry matter

INTRODUCTION

At Corrientes Argentina, weather conditions (mainly temperature and humidity) enhance rapid grow of leucaena plants during most part of the year. Frost of different intensities limits leucaena growth during winter, but plants survive. Leucaena leucocephala has great potential for animal production in the humid subtropical area of Argentina. At corrientes, beef production of 150 kg/ha/year (Gandara and Casco, (1993) has been obtained with a mixed pasture of Leucaena and Pangola Grass which doubled the production of 45/70 kg/ha/year on range pastures. An improvement of leucaena forage production during the winter period could lead to an increase of beef production under grazing. The purpose of this study was to evaluate 56 biotypes of *Leucaena spp*. in order to identify those with cold tolerance and with desirable agronomic characteristics as a forage crop.

MATERIALS AND METHODS

Leucaena biotypes were seeded (July 6-7 of 1990) in pots with 1.5 kg of soil. Selection was done at two phases. At phase I (A): 92 day old seedlings (n=1400 per treatment) were exposed during a 14 hours period in a growth chamber at two temperature treatments (T1 and T2). T1= -8 °C and T2= -3 °C. Humidity was held constant (90%). Selection criteria was established as cold tolerant seedling when 50% of live leaves remained after the cold treatment was applied. This criteria was applied 14 hours after the temperatures treatments were applied (Goldfarb 1992).

At phase II (B): Plants that passed selection criteria of phase I were transplanted (March 12, 1991) to field conditions with an average age of seven month on a Molisol soil. Phenology and standing crop dry matter (SCDM) were measured during three years. SCDM cuts were done during the winter and the summer of the first year of field evaluation (1) and at the spring, summer and fall (2) of the second year of field evaluation. SCDM yield was composed of leaves, stems up to 5 mm diameter and green pods.

RESULTS AND DISCUSSION

PHASE I: From the 2800 plants exposed to temperatures stress, seventeen plants were selected from eleven different biotypes. Only one plant (plant N° 11) (*L. leucocephala* x *L. diversifolia* SF 9043) survived T1. The sixteen plants that survived T2 were:

Plant 1: *L. leucocephala* x *L. diversifolia*	SF 9036
Plant 2: *L. leucocephala*	SF 9033
Plant 3: *L. pulverulenta* Sel. 22	SF 8696
Plant 4: *L. leucocephala* x *L. diversifolia*	SF 9071
Plant 5: L. leucocephala x *L. diversifolia*	SF 9067
Plant 6: *L. leucocephala* x L. diversifolia	SF 9071
Plant 7: *L. pulverulenta* Sel. 22	SF 8696
Plant 8: *L. leucocephala* x *L. diversifolia*	SF 9071
Plant 9: *L. leucocephala* cv. Cunningham	SF 8612
Plant 10: *L. leucocephala* x *L. diversifolia*	SF 9031
Plant 12: *L. leucocephala* x *L. diversifolia*	SF 9050
Plant 13: *L. leucocephala* K 72	SF 8073
Plant 14: *L. leucocephala* x *L. diversifolia*	SF 9050
Plant 15: *L. leucocephala*	SF 8635
Plant 16: *L. leucocephala* x *L. diversifolia*	SF 9069
Plant 17: *L. leucocephala* K 72	SF 8073

PHASE II: The significant variables measured at field conditions and their results were:

Cold Tolerance: Plant No. 17, Leucaena leucocephala K 72 var Hawaian giganteum SF 8073, was the most tolerant at field condition during the winter of 1991, 92 and 93. During 1992 and 1993 (mild winters) this plant maintained live leaves at a percent range of 40% to 70%. At winter of 1991, the most severe historical freeze occurred (-8° C) at soil level (August,2). At this point, cold tolerance was observed at stems and buds, since leaves were totally killed.

Height: Plant No. 2 was the highest (260 cm) and plant No. 20 the smallest (60 cm).

Diameter: Plant number seventeen showed the greatest diameter (3 cm) at 143 days of planting.

Seed production: Eight plants didnít have seed production (Plant No. 1, 2, 5, 10, 11, 12, 14, and 15). Three plants characterized for Their high seed production since the first year of evaluation. Plant No. 6 (79 gr/plant), No. 3 (20 gr/plant) and No. 16 (18 gr/plant).

Dry matter yield: Plants No. 2, 3, 5, 6, 8, 9, 10, 11, 12, 13, 15 and 16 were the most productive (Dry matter production) at the second year, being plant number five the best. Plant number 17 maintained its production; while plant 14 showed a significant reduction at the second year of evaluation. Dry matter yield of the seventeen selected biotypes are presented at Table 1.

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Table 1
Dry matter yield of seventeen biotypes of *leucaena spp*. selected for cold tolerance across three years.

Plant Number	Biotype	Dry matter production (g /plant)		
		Year 91/92	Year 92/93	Year 93/4
1	SF 9036	31	19	3
2	SF 9033	309	383	137
3	SF 8696	121	131	54
4	SF 9071	171	101	51
5	SF 9067	410	793	207
6	SF 9071	126	136	36
7	SF 8696	220	164	52
8	SF 9071	250	271	90
9	SF 8612	268	287	83
10	SF 9031	298	419	146
11	SF 9043	155	191	56
12	SF 9050	28	55	10
13	SF 8073	259	299	93
14	SF 9050	122	71	16
15	SF 8635	158	380	106
16	SF 9069	153	250	87
17	SF 8073	234	207	70