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Evaluation of Maldonado Lines Near Darwin, Northern Territory

(Macroptilium longepedunculatum)

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ABSTRACT

Twenty-five lines of *M. longepedunculatum* were compared with line CPI 62158 which is adapted to the local environment. CPI 62158 and 61635 were superior in performance to the other 24 lines and appear to be almost identical. CPI 62158 has been released as cultivar Maldonado and is recommended for sowing in the Northern Territory, and may be suitable for sowing in north Queensland.

INTRODUCTION

Macroptilium longepedunculatum CPI 62158 had performed well in plant introduction trials on a range of upland soils in the `Top End' of the Northern Territory between Darwin and Katherine during the 1970's (Cameron *et al* 1984). It had also showed excellent growth, yield, spread, and persistence in introduction trials on upland soils and a seasonally flooded solodic soil at Mount Bundey Station (Cameron and McCosker 1986, Cameron 1991), and in a small plot cutting trial on a seasonally flooded solodic soil at Tortilla Flats Research Farm (Ross and Cameron 1991) near Adelaide River, NT.

As CPI 62158 had been the only introduction of *M. longepedunculatum* evaluated in the NT, the Australian collection of 25 lines was obtained from the CSIRO Division of Tropical Crops and Pastures Genetic Resources Unit to compare with the locally adapted line. This paper reports the results of that comparison over 2 years between 1985 and 1987.

MATERIALS AND METHODS

The trial was conducted on a Hotham red earth soil at Berrimah Farm (BF, 12°26' S, 130°52' E, AAR 1700 mm) where the climate is wet-dry tropical and over 90% of the rain falls in the months of November to April.

Details of the 26 lines tested are included in Table 1. The lines were sown into potting mix in seedling trays in a shadehouse at Berrimah Farm, near Darwin on October 29, 1985. Excess seed was sown, and after establishment excess seedlings were removed or transplanted or in cases of poor establishment more seed was sown to provide at least 6 seedling pots containing a single plant.

The seedlings were transplanted into the field on January 17, 1986. The trial was a randomised block design with three replications. Each plot consisted of two plants at 25 cm spacing except for CPI 40206 where Replicate 3 had only one plant and CPI 92723 where the treatment consisted of Replicates 1 and 2 each containing one plant. The plots were spaced on a 5 metre grid.

Fertilisers applied at sowing were superphosphate (200 kg/ha) and muriate of potash (100 kg/ha).

On February 3, 1986 eleven of the seedlings which had died were replaced by spare plants from the shadehouse. The plants were cut off at 5 cm and the cut material removed in early August 1986.

MEASUREMENTS

The plots were observed at mostly 6-14 day intervals between January 28 and June 6, 1986, followed by a last observation for the 1985/86 season on July 24.

During the 1986/87 wet season, the plots were observed on November 10 and December 17 1986, on February 12 1987, at 8 day intervals between March 3 and March 23 and monthly intervals from March 23 until August 5 1987.

The plots were observed, measured, rated and counted for various characters over the period of the trial. Characters recorded included vegetative growth rating, survival, spread, plot height, plot length, plot width, flower numbers, green pod numbers, mature pod numbers, estimated green leaf percentage, dry matter rating, seedling emergence and seedling establishment.

Dry matter yields were determined by clipping one 0.25 m^2 quadrat per plot from the plots which had formed a sward on March 24 1987.

Seed yields were determined by sweeping up the seed from two 0.25 m^2 quadrats per plot of CPI 61635 and 62158 only on August 18 1987.

RESULTS

RAINFALL

In both years, the rainfall recorded was slightly below average, being 1644 mm in the 1985/86 wet season and 1674 mm in the 1986/87 wet season.

November and December rainfall in 1985 at 61 and 70 mm was only one half and one third of average respectively, which delayed the planting out of the seedlings until mid January. January rainfall at 636 mm was 177 mm over the monthly average, and while over 200 mm of rain was recorded in each of the months February and March, this was below average. The 230 mm recorded in April was 2.5 times the average. This was followed by almost no rain in May and an unusual event, one good fall of over 20 mm in late June.

The 1986/87 was characterised by good rainfall in October (171 mm, double average) January (636 mm), February (390 mm) and May (53 mm, over double average) and low rainfall in December (113 mm, half average) and March (111 mm, one third of average).

GROWTH

Vegetative growth ratings were good up until March 13, 1986 except for 5 lines CPI 78635, 84999, 91089, 91094 and 93084 which were poor - fair. After that date, another 6 lines CPI 40206, 55751, 91347, 92525, 92723 and 93092 showed poor or no growth.

The lines with the best early growth were CPI 33498, 51368 and 68835 while CPI 61635 and 62158 consistently had the best growth ratings from April 2 1986 through until the end of the trial in August 1987. The only other lines with good growth ratings in the 1986/87 wet season were CPI 33498 and CPI 67650.

The trial was visually rated for dry matter yield on April 23, 1986 and March 23, 1987. Lines CPI 61635 and 62158 both rated good in 1986 and excellent in 1987. In 1986 CPI 33498 rated fair while in 1987 CPI 67650 rated good. On both occasions many of the other lines were rated poor or had insufficient plant material present to be rated.

Spreading ability, measured by plot width was significantly greater ($P < 0.05$) on April 2 1986 for CPI 62158 (243 cm) and 61635 (223 cm) than the other 24 lines.

MATURITY

In 1986, first flowers were produced between late March (CPI 33498, 38288, 91089 and 92533) and late May (CPI 61635 and 62158). Measured as days after January 1, CPI 61635 and 62158 flowered significantly later than all of the lines except CPI 40207 and 561368 ($P < 0.05$). In 1987, most of the lines flowered earlier than 1986, with some flowering in early March and 62158 flowering in late April/early May.

Peak flowering occurred between mid April (CPI 91039) and mid June (CPI 61635 and 62158) in 1986. Following peak flowering the plants rapidly senesced, dropping leaf so that by June 24 there were only four lines with a significant estimated green leaf, CPI 61635 and 62158 (both 50%), CPI 40207 (30%) and CPI 93084 (20%). These had all dropped to 5% one month later. In 1987 CPI 61635 and 62158 were the only lines which retained green leaf in late May (estimated 80%), and this had dropped to 15 to 20% in early July.

SURVIVAL

Survival, measured as the last recording in each plot of one of the original plants transplanted into the field as days after January 1 1986 was significantly higher ($P < 0.01$) for CPI 62158 than the other 25 lines. For CPI 62158 at least one plant in each replicate survived the 1986 dry season, and was recorded on November 10 (314 days). Line CPI 61635 was the second longest living line and lived significantly longer than the other 24 lines ($P < 0.05$).

A number of plants had died out by mid April 1986 and two lines died out before the end of April (CPI 92525 and 93092), while a further 5 lines did not survive until the end of May. On April 24 only 11 lines had a survival rate of over 50 % for the individual plants and only 5 had a survival rate of 100%.

RE-ESTABLISHMENT

Seedling emergence on November 11, 1986 was variable, ranging from 0 plants per plot in 4 lines to 160 and 167 in CPI 61635 and 62158 respectively. The data was analysed after log transformation, and CPI 62158 had significantly more emerged seedlings than all lines except CPI 33498, 37203, 61635, 67650, 91094 and 92533 ($P < 0.05$).

Established seedlings counted on December 17, 1986 followed a similar trend to emerged seedlings, except that there were 5 lines with zero seedlings, and that CPI 62158 and 61635 had significantly higher numbers of established seedlings than the other lines ($P < 0.01$). The number established compared with the numbers emerged ranged from 46 to 210 percent, averaging 94%. Most of the large changes in numbers were based on small initial figures except for CPI 37203 where numbers dropped from 54 to 37 per plot and CPI 92533 where numbers increased from 20 to 42.

A majority of the plants recorded in December were still alive on February 12, 1987 although for many, their growth was only rated poor or fair.

YIELD

Quadrats were cut on March 24, 1987 only from the 13 plots which had formed a sward during the 1986/87 wet season. Only two lines were harvested from all three replicates, CPI 62158 which yielded 5220 kg/ha and 61635 which yielded 4028 kg/ha. Two replicates were harvested for CPI 67650 and single replicates from 5 other lines. The yields obtained in those plots were similar to those obtained from the CPI 62158 and 61635 plots.

SEED YIELD

Clean seed yields of the only lines harvested CPI 61635 and 62158 were 83 and 79 kg/ha respectively. This yield is only one third of that recorded from other trials (A. Cameron, unpublished data) and irrigated seed crops (N. Thomas, pers. comm.) In each uncleaned seed lot many seeds were shrivelled and discoloured, and had not filled out.

DISEASES AND PESTS

During the 1985/86 wet season, leaf blight caused by *Rhizoctonia solani* was suspected to be the cause of leaf loss, dying back and early plant death, and this was confirmed during the 1986/87 wet season. Leaf losses in the 22 lines present caused by *R. solani* estimated on March 2, 1987 ranged from 0 in CPI 40207 and 93084 up to 50% in 91089 and 91094. Other lines with negligible leaf loss (<5%) were CPI 61635, 62158 and 92530.

The presence of Legume Little Leaf caused by Tomato big bud mycoplasma was noted in at least one replicate of each line except CPI 51368, 55751, 91089 and 91449, but the only plot it affected severely was one replicate of CPI 78635.

Seed yields in both years were reduced by parrots consuming the developing seeds from green pods. The parrots involved were red-wing parrots (*Apromictus erythropterus*) and galahs (*Kakatoe roseicapilla*) in 1986 and little corellas (*Kakatoe sanguinea*) in 1987. They appeared to have no preference as green pods of all lines were damaged.

DISCUSSION

CPI 62158 was consistently superior to all of the other lines except 61635 in growth, survival, re-establishment and dry matter yield. These two lines were outstanding and appeared to be almost identical in performance and appearance, including flower colour (A. Cameron, unpublished data). They may be selections from the same population of *M. longepedunculatum* as both lines were originally collected from Venezuela.

Most of the other lines were clearly not adapted to the climate near Darwin and this does not appear to be related to the latitude or rainfall of their origin (Table 1). Although susceptibility to *R. solani* which infects twining legumes during periods of wet monsoonal weather reduces their potential use in the NT, they may be more productive in areas where this leaf blight is less prevalent. These lines were subjected to a severe test in the two years of this trial with January - February rainfall totalling over 900 mm in 1986 and almost 1100 mm in 1987.

CPI 62158 was released as cv Maldonado (Cameron 1992) by the Northern Territory Department of Primary Industries and Fisheries.

Maldonado is now recommended for sowing in the `Top End' of the Northern Territory where annual rainfall exceeds 1100 mm (Cameron 1990). It should also be suited to areas of coastal and sub-coastal Queensland north of Mackay, except for the wet tropical coast where it has shown good growth in introduction trials but has failed to regenerate from seed (D. Cooksley, pers. comm.).

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Table 1 Details of the lines used

Error! Bookmark not defined.**CPI Number**	**Origin**			
	Country	**Latitude**	**Rainfall (mm)**	**Altitude (m)**
33498	Venezuela			75
37203	Nicaragua	12°N		66
38288	Venezuela	10°N		450
40206	Brazil	4°S		
40207	Brazil	4°S		
51368	Brazil			
55751	Brazil	12°S	620	450
61635	Venezuela			
62158	Venezuela	7°N	1300	
67650	Guatemala	15°N	550	250
68835	Colombia	11°N		
78635	Brazil	5°S		
84999	Mexico	23°N	250	250
91089	Mexico	23°N	1000	50
91094	Mexico	23°N	1000	10
91329	Mexico	16°N	1600	20
91337	Mexico	16°N	960	10
91347	Mexico	16°N	960	30
91446	Mexico	20°N	1080	10
91449	Mexico	20°N	1080	3
92525	Colombia	11°N		20
92530	Brazil	12°S		200
92533	Venezuela	10°N	1200	100
92723	Colombia	11°N	800	50
93084	Brazil	16°S		550
93092	Brazil	16°S		600

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