Pernambuco Semiarid Native Rhizobial Populations Nitrogen Fixation Potential with Native *Macroptilium*

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Introduction

Nitrogen (N) is one of nature´s most abundant elements, accounting for about 78% of the atmospheric gases, but mostly as the inert N_2 form. As such it is not directly available to plants, and is relatively scarce in most agroecosystems. Biological nitrogen fixation (BNF) through diazotrophic bacteria represents *ca*. 63% of the yearly N input in terrestrial ecosystems (Taiz and Zeiger 2004). Legumes which form effective symbiosis with the diazotrophic group of bacteria commonly known as rhizobia, are a very important source of available N. Tropical forage legumes are usually able to nodulate with a diverse population of rhizobia, and may have a relevant contribution to nitrogen availability in pastures (Santos *et al*. 2003). This diversity may be exploited to find more symbiotically efficient bacterial strains, thereby increasing legume effects on pastures. One way to evaluate this diversity is to isolate strains from different regions, vegetation covers or cultivation systems, and environmental conditions. This practice would potentially lead to a large number of isolates, which would increase the chance of finding some more efficient than those currently available (Chagas Junior *et al*, 2010). Native legumes, including several species of *Macroptilium* are an important forage resource in the Brazilian Northeast semiarid, contributing to the quality of ruminant diet, but they are still not well known in regards to their BNF ability. This work evaluated nodulation efficiency of *Macroptilium lathyroides* when inoculated with Litolic Neossol from eight municipalities of Pernambuco State semiarid.

Methods

Soil samples from Litolic neossols collected in eight municipalities of Pernambuco State (Caetés, Santa Cruz, Petrolina, Floresta, Bom Jardim, Jataúba, Santa Cruz do Capibaribe and Tupanatinga) were evaluated, as well as two uninoculated control treatments, one with added N, and another without. Sterile plastic bottles were used as Leonard jars (Santos *et al*. 2009) contained autoclaved 1:1 (v:v) sand:vermiculite mixture in the upper portion and Hoagland´s nutrient solution (Hoagland & Arnnon, 1950) without N, except for the control treatment. *M. lathyroides* seeds were scarified with concentrated sulphuric acid for 10 minutes, rinsed in potable water, and put to germinate in germtest paper. After 10 days, two seedlings were transferred to the Leonard jars, and inoculated with 2g of the soil samples according to the treatments. Harvest was 50 days after transplantation, and shoot and root were separated, and nodules were separated from the roots, counted (NN) and conserved with silica gel (NDM), for use for bacterial isolation. Shoot (SDM) and root dry masses (RDM) and N content (NC) were determined according to AOAC (1990). Data were evaluated by ANOVA, and when significant, means were compared using Scott-Knott at the 5% significance level using Sisvar 4.0 (Ferreira 2008). The variables SDM, RDM, NN and NDM were transformed by square root.

Results

Significant differences ($P<0.05$) were found for NN between Santa Cruz do Capibaribe, Jataúba and Tupanatinga and the remaining municipalities (Table 1). NDM from those three were not different ($P>0.05$) from those of Bom Jardim and Floresta, but still were significantly ($P<0.05$) higher than those from the remaining municipalities. The non-difference for NDM while there was difference for NN may indicate higher efficiency of the native rhizobial population in Bom Jardim and Floresta, since usually there is a good correlation between higher individual nodule dry mass and higher FBN potential. While the highest SDM and RDM were found for those plants receiving N, plants inoculated with soils from Bom Jardim, Floresta, Jataúba and Santa Cruz had significantly ($P<0.05$) higher SDM and RDM than those inoculated with the remaining soils, and those not inoculated, indicating again that those rhizobial populations are probably more effective.

Conclusions

While all soils had some rhizobial population, there was

a large effect of soil origin on nodule number and nodule dry mass, indicating that Bom Jardim, Floresta, Jataúba and Santa Cruz Capibaribe native rhizobial populations were probably more effective in BNF with *M. lathyroides*

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Table 1. Nodule number (NN), nodule dry mass (NDM), shoot dry mass (SDM), root dry mass (RDM), and nitrogen content (NC) on *Macroptilium lathyroides* inoculated with soil from eight counties at the semiarid region of Pernambuco State, Brazil.

Municipalities	Nodule number	Nodule dry mass (mg plant)	SDM (mg plant)	RDM (mg plant)	NC (dag/kg)
Bom Jardim	6 b	17 a	280 b	70 b	1.0 b
Caetes	0.6 b	1.0 b	27 c	10 c	---
Floresta	4.0 b	14 a	230 c	90 b	2.8 a
Jataúba	13.2 a	21 a	350 b	75 b	3.4 a
Petrolina	2.5 b	5 b	113 c	30 c	3.4 a
Santa Cruz	0.6 b	1 b	59 c	30 c	1.0 b
St Capibaribe	19.2 a	24 a	410 b	96 b	3.3 a
Tupanatinga	14.2 a	32 a	560 b	120 b	3.1 a
Sem nitrogênio	0	0	64 c	20 c	1.1 b
Com nitrogênio	0	0	1880 a	420 a	3.1 a
CV	48.1	12.7	12.6	4.1	12.2 b

Averages followed by the same letter on a column are not significantly different according to Tukey's test.