Green Manuring Nodules Bacterial Diversity and Its Relation with the Origin Soils from Sugarcane Growing Regions of the Brazilian Northeast

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INTRODUCTION

Nitrogen fixing bacteria and legume green manuring may achieve high sugarcane yields with lower environmental degradation. Rhizobial diversity knowledge may help to understand inoculation response under different soil and climate conditions. This work aimed to evaluate rhizobial diversity for crotalaria (*Crotalaria spectabilis*) and sunhemp (*Schizolobium aterrimum*) from sugarcane growing soils.

MATERIAL AND METHODS

260 soil samples were collected at Alagoas, Pernambuco and Paraíba, and their chemical, physical and meteorological characteristics determined. Crotalaria and sunhemp seedlings were cultivated in Leonard jars with sand:vermiculite (1:1) mixtures and 1g of each soil sample was used as inoculant to obtain nodules. At 60 days, nodules were collected and crushed on Petri dishes with YMA media for isolation and morphological characterization. Similarity dendrograms for all isolates were determined based on morphophysiological characteristics for each legume species and Shannon-Wiener, Simpson and Pielou indexes were calculated. Isolates were authenticated in their respective legume species in a similar manner to the first experiment. 5 mL of each isolate grown on YM media were used as inoculant.

RESULTS

Table 1: Numbers of authenticated isolates in sunhemp and crotalaria and of soil samples with isolates from 13 sugarcane growing regions of the Brazilian Northeast

State Subregion (Sugar Mill)	Area	Number of isolates		Number of soil samples with isolate		Average isolate per soil sample	
		Sunhemp	Crotalaria	Sunhemp	Crotalaria	Sunhemp	Crotalaria
Alagoas (Coruripe)	1	0	0	0	0	0	0
	2	0	0	0	0	0	0
	3	0	0	0	0	0	0
	4	1	12	1	3	1	4
	5	0	4	0	1	0	4
Total	-	1	16	1	4	1	4
Pernambuco Mata Sul (Trapiche)	1	9	7	1	4	9	1.75
	2	15	28	2	6	7.5	4.7
	3	14	6	3	4	4.6	1.5
Total	-	38	41	6	14	6.3	2.9
Pernambuco Mata Norte (Petribu)	1	0	8	0	2	0	4
	2	0	14	0	6	0	2.3
	3	0	6	0	3	0	2
Total	-	0	28	0	11	0	2.5
Paraíba (Japungu)	1	0	0	0	0	0	0
	2	0	23	0	6	0	3.8
Total	-	0	23	0	6	0	3.8

Table 2 – Shannon-Wiener diversity and Simpson dominance indexes for crotalaria and sunhemp rhizobial isolates from 13 sugarcane growing regions from Northeast Brazil.

	Crotalaria	Sunhemp
Shannon-Wiener Diversity (H)	4,28	3,23
Simpson Dominance (D)	0,02	0,05

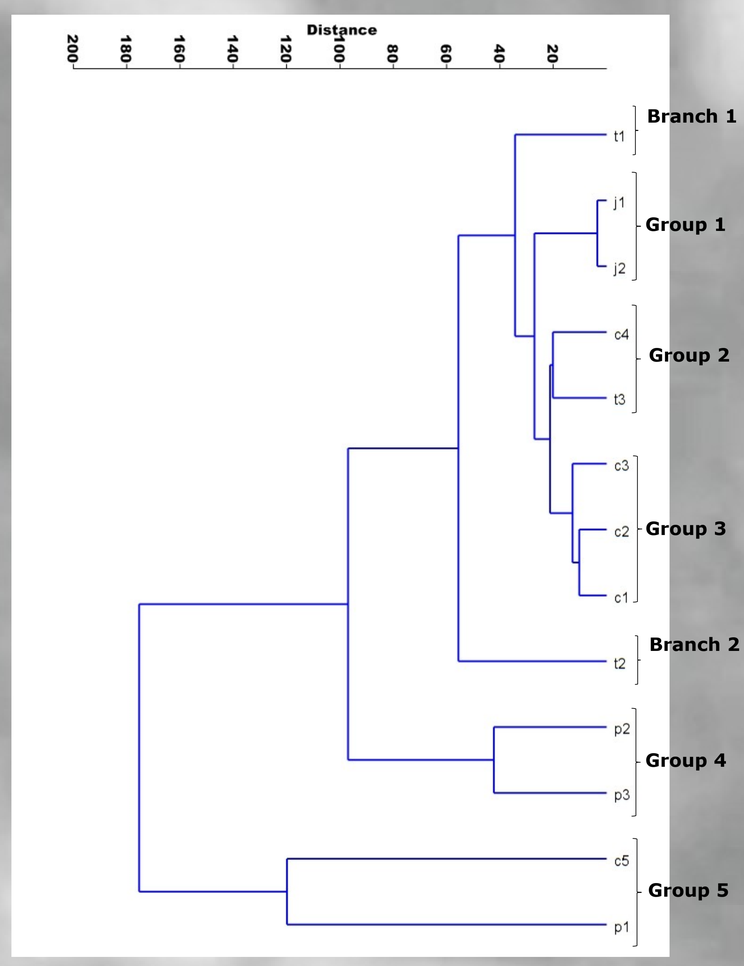

Figure 1 – Grouping of 13 sugarcane growing regions of Brazil Norheast based on soil physical and chemical and meteorological characteristics

Table 3: Autovalue, variance and contribution of soil chemical and physical and meteorological characteristics to principal componentes of 13 sugarcane growing regions of Brazil Northeast.

	PC1	PC2	PC3
Autovalue	6.08	4.44	3.07
Variance	35.75	26.12	18.05
pH	0.02	0.95*	-0.07
P	-0.15	0.64	-0.02
Na^{+}	0.59	0.57	0.52
K^{+}	0.91*	0.28	0.00
Ca^{2+}	0.34	0.83*	0.21
Mg^{2+}	0.52	0.73*	0.21
$Al3^{+}$	-0.02	-0.92*	-0.11
$H^{+} + Al^{3+}$	0.39	-0.85*	0.06
OC	0.87*	0.05	-0.14
Sand	-0.95*	0.18	-0.07
Silt	0.89*	0.13	0.17
Clay	0.89*	-0.28	0.03
PD	-0.18	0.10	-0.06
T max	0.05	-0.41	0.71*
T min	-0.18	-0.47	0.46
Rainfall	-0.08	-0.18	-0.94*
RU	-0.01	-0.13	-0.96*

Table 4: t test between Shannon-Wiener diversity indexes from soil groups of 13 sugarcane growing regions of Brazil Northeast.

Soil group (Shannon-Wiener)	G2 (1.4675)	G4 (1.2935)	G5 (1.0792)	RM1 (1.2304)	RM2 (1.5102)
G1 (1.0703)	*	*	ns	*	*
G2 (1.4675)		*	*	*	ns
G4 (1.2935)			*	*	*
G5 (1.0792)				*	*
RM1 (1.2304)					*

CONCLUSION

Different bacteria groups from a single soil were associated to crotalaria and sunhemp. Soil pH, Na, Ca, Mg, K, Al, CO, sand, silt and clay contents explained half the variation between the soil groups. There was no relation between soil characteristics and morphological characteristics of the isolates.

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