BIOLOGICAL NITROGEN FIXATION ASSESSMENT IN COMMON BEAN GENOTYPES WITH DIFFERENT VEGETATIVE CYCLE

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INTRODUCTION

Nitrogen (N) is the nutrient absorbed in higher amounts by common bean (*Phaseolus vulgaris* L.) crops, playing an important role on the development and grain yield of most crops (MALAVOLTA, 1989). According to DÖBEREINER and DUQUE (1980) common bean is able to fix atmospheric N when in symbiosis with rhizobia inoculants through biological nitrogen fixation (BNF) process, representing the cheapest way for N obtaining by leguminous crops. However, for common bean crops the BNF is not able to supply all N requirements. This may occur in function of many factors related to the plant genotype and bacterial strains, besides environmental factors (GRAHAM, 1981; MOAWAD et al., 2004). A key strategy for the success of BNF in common bean crops is the development of research with focus in the interaction between both symbioses. This work aimed to evaluate nodulation parameters of common bean cultivars with different vegetative cycle duration in association with different rhizobia strains.

MATERIAL AND METHODS

The assessment of common bean nodulation was carried out under greenhouse condition of the Agronomy and Food Engineering School at Universidade Federal, Goiânia, Goiás, Brazil. The experiment was performed in 5 L pot filled with a sub superficialOxisol on a randomised block experimental design with three replications in a 6X5 factorial arrangement of treatments with six common bean genotypes (CNFC 15873, CNFC 15874, Carioca precoce, IPR Colibri, Pérola and BRS Estilo) and five nitrogen sources (3 rhizobia strains = SEMIA4080, SEMIA4088 and SEMIA4077, 1 nitrogen treatment = 90 kg N ha^{-1} and 1 control treatment). Plants were collected at V4 stage at the soil surface and shoot plants were placed to dry at 65 ºC until constant weight to determine the shoot dry weight (SDW). Roots were carefully taken from the pots, washed and nodules were collected and dried at 65 ºC until constant weight to determine the nodule dry weight (NDW). Values of SDW were divided by NDW to determine the nodule efficiency (NE). Data were submitted to a variance analysis and the means were compared by the Skott-Knott's test at 5% of significance.

RESULTS AND DISCUSSION

The analysis of variance had been shown differences among the cultivars of common bean for the evaluated parameters, besides interaction with the rhizobia strains (Table 1). Regarding NDW, BRS Estilo genotypes showed greater values, followed by Carioca precoce and IPR Colibri; however, rhizobia strains did not differ for NDW. The greater values of SDW were found for BRS Estilo and Carioca precoce genotypes. Among the rhizobia strains SEMIA 4077 and SEMIA 4080 provided equal SDW values as compared to the N treatment. Greater values of NE were found for CNFC 15873, CNFC 15874 and Pérola genotypes and also for these genotypes when inoculated with SEMIA 4080, which showed the greatest value among the rhizobia strains.

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Table 1. Nodule dry weight (NDW), Shoot dry weight (SDW) and Nodule efficiency (NE) of common bean cultivars under different sources of nitrogen.

Cultivars	SEMIA4080	SEMIA4088	SEMIA4077	NT	Control	Mean
	NDW (mg plant $^{-1}$)					
CNFC 15873	2.10 Ca	6.80 Ba	2.63 Ba	0.00 Aa	0.00 Aa	2.31 C
CNFC 15874	1.77 Cb	14.30 Aa	6.77 Ba	0.00 Ab	0.00 Ab	4.57 C
Carioca precoce	24.13 Ba	18.30 Aa	11.50 Bb	0.00 Ac	0.00 Ac	10.79 B
IPR Colibri	21.93 Ba	15.70 Aa	12.50 Ba	0.00 Ab	0.00 Ab	10,03 B
Pérola	1.90 Ca	3.43 Ba	4.63 Ba	0.00 Aa	0.00 Aa	1.99 C
BRS Estilo	43.83 Aa	22.20 Ab	30.76 Ab	0.00 Ac	0.00 Ac	19.36 A
Mean	15.94 a	13.46 a	11.47 a	0.00 b	0.00 b	
	SDW (g plant $^{-1}$)					
CNFC 15873	0.43 Ba	0.30 Aa	0.83 Aa	0.57 Aa	0.31 Ca	0.48 B
CNFC 15874	0.38 Ba	0.40 Aa	0.53 Ba	0.50 Aa	0.24 Ca	0.41 B
Carioca precoce	1.70 Aa	0.61 Aa	0.35 Bb	0.40 Ab	0.74 Cb	0.76 A
IPR Colibri	0.43 Bb	0.33 Ab	0.54 Bb	0.34 Ab	0.97 Ba	0.52 B
Pérola	0.44 Ba	0.28 Aa	0.38 Ba	0.20 Aa	0.55 Ca	0.37 B
BRS Estilo	0.58 Bb	0.46 Ab	0.96 Aa	0.30 Ab	1.45 Aa	0.75 A
Mean	0.66 a	0.40 b	0.60 a	0.70 a	0.38 b	
	NE (g mg^{-1})					
CNFC 15873	0.22 Aa	0.05 Ab	0.30 Aa	0.00 Ab	0.00 Ab	0.11 A
CNFC 15874	0.24 Aa	0.04 Ab	0.08 Bb	0.00 Ab	0.00 Ab	0.08 A
Carioca precoce	0.07 Ba	0.04 Aa	0.07 Ba	0.00 Aa	0.00 Aa	0.04 B
IPR Colibri	0.11 Ba	0.02 Aa	0.04 Ba	0.00 Aa	0.00 Aa	0.04 B
Pérola	0.21 Aa	0.08 Ab	0.09 Bb	0.00 Ac	0.00 Ac	0.08 A
BRS Estilo	0.01 Ba	0.03 Aa	0.03 Ba	0.00 Aa	0.00 Aa	0.01 B
Mean	0.15 a	0.04 c	0.10 b	0.00 d	0.00 d	

NT= nitrogen treatment (90 kg N ha^{-1})

Means within the same column followed by the same capital letter are not significantly different by Skott-Knott's test ($p<0.05$). Means in the same row followed by same lowercase letter are not significantly different by Skott-Knott's test ($p<0.05$).