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INTRODUCTION: No publications were found regarding liquid inoculation in the planting furrow of dry bean, which indicates a demand for investigations to assist the producer in deciding which method of inoculation to adopt. Thus, the aim of this study was to evaluate the viability of liquid inoculation in the planting furrow and determine the best application rate of inoculant, using the dry bean cultivar IAC Alvorada.

MATERIALS AND METHODS: A field experiment was conducted in a no-till planting system in the 2014/2015 crop season in a *Latossolo Vermelho distrófico* in the municipality of Lambari, MG, Brazil. The experimental design was randomized blocks with three replications and eight treatments, involving five application rates of liquid inoculant in the planting furrow (0, 120, 240, 480, and 720 mL ha^{-1}), liquid seed inoculation (40 mL kg^{-1}), and two controls without inoculation: one with N-urea (80 kg ha^{-1} N, ½ at sowing and ½ in topdressing, between the V3 and V4 stages of the crop cycle) and another without mineral N.

The experimental unit (14.4 m^2) consisted of six four-meter-length rows, spaced at 0.6 m, and the area effectively used was the four central rows. All the plots received base fertilization of 110 kg ha^{-1} of P_2O_5 (simple superphosphate) and 40 kg ha^{-1} of K_2O (potassium chloride), mechanically applied during furrowing. In addition, all levels of inoculation received 20 kg N-urea ha^{-1}, so as to meet the recommendations of Soares et al. (2016). Sowing was manual at the density of 15 seeds per meter and the cultivar used was IAC Alvorada, of semi-upright plant architecture and moderate resistance to anthracnose (Carbonell et al., 2008).

The strain used was CIAT 899 of *Rhizobium tropici.* The inoculant was prepared in liquid medium "79" (Fred & Waksman, 1928). Inoculant quality was monitored by counting the number of colony forming units (CFU), respecting the legal minimum of 10^9 CFU per mL of inoculant. Seed inoculation occurred shortly before sowing, whereas application in the planting furrow was immediately after sowing. In the latter case, distribution in the furrow was performed with a manual backpack sprayer and the spray volume was equivalent to 20 L ha^{-1}.

At full flowering (R6 stage) a sample of 10 plants (rows 2 and 3) was removed at random from each plot for determination of the number of nodules (NN) and nodule dry matter (NDM), shoot dry matter (SDM), and shoot nitrogen concentration (SNC) and shoot nitrogen accumulation (SNA). All the data were subjected to analysis of variance through use of the software Sisvar 4.0, after having been subjected to tests of normality and homocedasticity of variances, using the R software. The variables NN and NDM were first transformed into $(x+1)^{0.5}$. In the cases of significant effect of treatments, grouping of means was performed by the Scott-Knott test at the level of 5% probability.

RESULTS AND DISCUSSION: Contrary to expectations, the application rate of 80 kg N-urea ha^{-1} did not have a negative effect on dry bean nodulation (Table 1), indicating that other factors are involved in this effect and that the definition of application rates cannot be generalized. Moreover, the expressive nodulation of the non-inoculated treatments (Table 1) also indicates the presence of native rhizobia populations efficient in nodulating dry bean, which certainly contributed to obtaining SNC and SNA values similar to those obtained from the maximum nitrogen fertilization (Table 1). The good performance of these symbionts on these and other variables of dry bean had already been reported in the studies of Figueiredo et al. (2016) and Oliveira et al. (2016). Regardless of the application rates, inoculation in the planting furrow had the same effect as seed inoculation. This result, however, should be carefully analyzed because there was good activity of the native population. New studies are recommended, above all in areas with native rhizobia less efficient in biological nitrogen fixation.

Table 1. Number of nodules (NN) and mean nodule dry matter (NDM), shoot dry matter (SDM), and shoot nitrogen concentration (SNC) and shoot nitrogen accumulation (SNA) of dry bean cv. IAC Alvorada under different treatments. Lambari, MG, Brazil, spring/summer crop season 2014/2015.

Treatment	NN[1] (plant unit $^{-1}$)	NDM[1] (mg plant^{-1})	SDM (g plant^{-1})	SNC (%)	SNA (mg plant^{-1})
No inoculation in furrow (0 mL ha^{-1})	27 a	400 a	9.6 a	2.7 a	256 a
½X rate inoculation in furrow - ISu (120 mL ha^{-1})	30 a	361 a	10.4 a	2.6 a	268 a
1X rate ISu (240 mL ha^{-1})	22 a	310 a	10.4 a	2.6 a	268 a
2X rate ISu (480 mL ha^{-1})	17 a	337 a	10.2 a	2.5 a	256 a
3X rate ISu (720 mL ha^{-1})	23 a	378 a	9.9 a	3.3 a	318 a
Seed inoculation	36 a	645 a	10.9 a	2.5 a	274 a
Control with N	27 a	362 a	11.1 a	3.4 a	369 a
Control without N	19 a	397 a	4.8 b	3.1 a	160 a
Overall mean	249	399	96.8	2.8	271

Mean values followed by the same lowercase letters in the columns belong to the same group by the Scott-Knott test ($P \leq 0.05$). [1]Mean values compared according to transformed data $(x+1)^{0.5}$.

It should also be noted that both the inoculated treatments (furrow and seed) and the treatment without inoculation in the furrow that received 20 kg N-urea ha^{-1} exhibited growth (SDM) that did not differ from the control fertilized with 80 kg N-urea ha^{-1} (Table 1). The only treatment that proved to be inferior was the control without inoculation and without N, confirming that, in this soil, the application of mineral N, even at a small rate, was fundamental for the initial start and growth of dry bean.

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