EFFECTS OF INCREASING DOSES OF NITROGEN ON COMMON BEAN GROWTH AND SOIL ACIDITY

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Nitrogen deficiency over the greater portion of tropical and subtropical areas which receive sufficient rainfall to ensure plant development is associated with the climate condition, the crop to be grown, topography and parent material. According Tumble (1952) light or acute widespread nitrogen deficiency has been attributed to the intensity of rainfall, associating a close corelation between level of deficiency with the imbalance between both precipitated and evaporated water.

Nitrogen is an essential element to bean nutrition and one of the nutrient most short supply in cultivated Australian soils. The critical range soil to grow plant has been considered as from, 0.08% to 0.15% varying from 0.01 to 0.05% in drier regions, 0.08% when the rainfall is as high as 150 inches per year and as much as 2% in swamps and fins (Stephen and Donald 1958).

Effects of increasing levels of nitrogen (0, 15, 30, 60, 120 and 240 kg $N.ha^{-1}$ as ammonium nitrate) were studied in one Australian soil (Hapludult) at University of Queensland in an experiment conducted in glasshouse till the beginning of flowering of common bean (*Phaseolus vulgaris* L.). Half of the nitrogen was applied together the liming (12t ha^{-1}) and the basic fertilization (100 kg $P.ha^{-1}$, 100 kg $K.ha^{-1}$, 102 kg $Mg.ha^{-1}$, 0.3 kg $B.ha^{-1}$, 4.0 kg $Zn.ha^{-1}$, 0.1 $Mo.ha^{-1}$, 4.0 kg $Cu.ha^{1-1}$) four weeks before planting. The rest of nitrogen was applied in two times, half at 15 and half 30 days after germination. Water was applied daily to supply the bean needs and maintain the soil humidity at field capacity during the experimentation. Part of the soil incubated with lime was placed in plastic pots to be cultivated and part was set aside to take pH in water and in $CaCl_2$ 0.05M weekly. In both cultivated and non cultivated soils, electrical conductivity (EC) and pH were determined only before planting and after plant harvest.

Soil pH increased till the end of experimentation but smaller pH values were observed under application of the highest level of ammonium nitrate. EC increased with the application of nitrogen. Higher dry weight was obtained by applying 30 to 60 kg $N.ha^{-1}$ (Tabela 1). Nitrogen, P and Ca concentrations in the top tissue increased with the application of high levels of N but the absorption of Mg decreased (Tabela 2).

References

STEPHENS, C.G. and DONALD, C.M. 1958 Australian soils and their responses to fertiliser. In Advances in Agronomy. Vol x. Ed. A.G. Norman pp 168-253.Academic Press Inc, Publisher, New York.

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Table 1. Final pH taken in cultivated pots, electrical conductivity read in presence and in absence of plants and total dry weight.

	pH		EC-mS.cm^{-1}		Dry wt. (g.plant^{-1})
N	water	CaCl2	+ planta	- planta	
N0	7.37	6.53	0.23d	0.32d	3.78c
N15	7.50	6.47	0.24d	0.38c	5.12b
N30	7.63	6.30	0.26c	0.39bc	6.21a
N60	7.30	6.33	0.28c	0.41b	6.08a
N120	7.33	6.50	0.38b	0.43b	5.17b
N240	7.03	6.33	0.55a	0.50a	4.26c
SD	ns	ns	0.20	0.21	0.39

The means followed by same letters are not significantly different (P = 0.05) and ns = non significant.

Table 2. Nitrogen (N), phosphorus (P), calcium (Ca) and Magnesium (Mg) concentrations in top of common been cultivated under increasing levels of nitrogen.

	N (%)	P (%)	Ca (%)	Mg (%)
N0	3.08c	0.15c	2.24c	0.27a
N15	3.08c	0.16c	2.46bc	0.26a
N30	3.27c	0.17bc	2.49bc	0.24b
N60	3.36bc	0.17bc	2.54b	0.24b
N120	3.60ab	0.18b	2.83a	0.24b
N240	3.72a	0.20a	3.14a	0.23b
SD	0.18	0.01	0.15	0.01

OBS.: The means followed be the same letter are not significantly different (P = 0.05).
SD = standard deviation, and EC = electrical inductivity.