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MINERAL NUTRITION REQUIREMENTS OF PIGEON PEA  
(CAJANUS CAJAN) IN RIVER ESTATE LOAM, ST' AUGUSTINE,  
TRINIDAD.

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INTRODUCTION

Assessments of mineral nutrition requirements of pigeon pea (*Cajanus cajan*) have assumed greater significance by placing special emphasis on this crop in the Grain Legume Programme in the Caribbean. To identify the nutrient needs of pigeon pea, a preliminary experiment was conducted wherein the effects of small amounts of several macro- and micro- elements on dry matter production and nitrogen uptake by pigeon pea were investigated.

MATERIALS AND METHODS

The surface soil (0-20 cm) was collected from University Field Station, St. Augustine, Trinidad. It was air-dried and ground to pass through 5 mm sieve. The physico-chemical characteristics of the soil are given in Table 1.

One kg soil was added to each pot. The treatments, in triplicate, were: N, P, K, Ca, Mg, Fe, Mn, Cu, Zn, B, Ni, Co, Cr, Bi, Mo, all added together and none (control). All except Ni, Co, Cr and Bi are essential nutrients for plant growth. Co has been shown to be essential to soybeans (Ahmed and Evans, 1960). Ni, Cr and Bi were investigated for their possible roles in affecting yield and N uptake. The rate and source of macro- and micro- elements added to the soil are shown in Table 1. The nutrient solutions, containing required rate (Table 1) per pot per 10 ml, were sprayed uniformly over the surface after the soil was moistened to 50 per cent WHC (water holding capacity) with deionised water. After 24 hours, the pots were planted with pigeon pea (cv. G127/4A) and were thinned to two plants per pot a week after germination. The pots were frequently watered with deionised water to maintain the soil moisture at 50 per cent WHC.

After 35 days, the plants were harvested, dried for 72 hours at 80° C, weighed and analyzed for N (Linder, 1944).

The experiment was conducted in the greenhouse at 27° 5° C.

Table 1. Physico-chemical properties of the River Estate loam soil used for the experiment.

pH (1:2.5 soil : water)	5.2
Clay content (%)	15
CEC (me/100g soil)	7.50
Exch. Ca (me/100g soil)	2.50
Exch. Mg (me/100g soil)	0.79
Exch. K (me/100g soil)	0.09
Exch. Na (me/100g soil)	0.05
Org. C (%)	0.94
Total N (%)	0.104
Available (Trough) P (ppm)	10

Table 2. Rate and source of macro- and micro- elements added.

Macro- and micro- element	Rate (ppm)	Source
N	10	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>
P	10	NaH <sub>2</sub> PO <sub>4</sub> ·7H <sub>2</sub> O
K	10	K <sub>2</sub> SO <sub>4</sub>
Ca	10	CaCl <sub>2</sub> ·10H <sub>2</sub> O
Mg	10	MgSO <sub>4</sub> ·7H <sub>2</sub> O
Fe	1	FeSO <sub>4</sub> ·7H <sub>2</sub> O
Mn	1	MnSO <sub>4</sub> ·4H <sub>2</sub> O
Cu	0.1	CuSO <sub>4</sub> ·5H <sub>2</sub> O
Zn	0.1	ZnSO <sub>4</sub> ·7H <sub>2</sub> O
B	0.1	Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub> ·10H <sub>2</sub> O
Ni	0.1	NiCl <sub>2</sub> ·6H <sub>2</sub> O
Co	0.1	CoCl <sub>2</sub> ·6H <sub>2</sub> O
Cr	0.1	Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> ·2H <sub>2</sub> O
Bi	0.1	BiCl <sub>3</sub>
Mo	0.01	Na <sub>2</sub> MoO <sub>4</sub> ·2H <sub>2</sub> O

## RESULTS AND DISCUSSION

Dry matter yield was significantly increased by the application of P, Mn, Cu, Zn, Ni and Mo; maximum increase in yield was obtained by the addition of P. But when all the macro- and micro- elements were added together, no response was obtained, possibly because of the toxicity by Cr. Application of Cr depressed the dry matter yield of pigeon pea.

Nitrogen uptake was significantly increased by the application of P, Fe, Mn, Cu, Zn, Ni and Mo; again, maximum increase in N uptake was obtained by the addition of P. Application of Fe significantly increased N uptake but did not increase dry matter yield significantly, possibly because additional Fe was required by the rhizobium in the root nodules to fix atmospheric N and that for plant growth probably sufficient Fe was present in the soil. When all the macro- and micro- elements were added together, N uptake was significantly increased although there was no effect on dry matter yield of pigeon pea, as stated earlier. It indicated that Cr and possibly Bi alone may have little or even toxic effect on plant growth and N uptake. Even in combination with other nutrient elements, Cr and Bi countered the beneficial effect of the addition of other elements on plant growth but these elements, Cr and Bi, had little effect on suppressing the beneficial effects of other nutrient elements in N fixation by rhizobium when these elements are added together.

Therefore, it is suggested that the effects of different rates of P, Mn, Cu, Zn, Ni and Mo on the yield of pigeon pea should be evaluated in the field on River Estate loam. The role of P, Mn, Cu, Zn, and Mo in the mineral nutrition of legumes is well known (E.J. Hewitt, 1958) but Ni has not been shown to be essential for plant growth (Tiffin, 1972) although increases in pea yields on leached chernozem by the application of Ni at the rate of 2 mg/kg soil have been reported (Orlova, 1965).

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