

## ON THE INTERACTION BETWEEN BACTERIAL INOCULATION AND PHOSPHORUS ON SANNHEMP IN A CULTIVATED SOIL

Legumes and nodule organisms in the soil require large quantities of phosphorus for their growth and development. Fellers (1918) reported that phosphorus in the soil improved the motility of inoculated strains of bacteria thereby increasing nodule formation, dry matter production and the grain yield of soya beans. Majumdar (1961) observed that bacterial inoculation in combination with phosphorus improved the growth and yield of peas. Rewari *et al* (1964) obtained profuse nodulation in French beans when the nodule organisms were inoculated into the soil supplied with phosphorus at 60 pounds per acre. After detailed studies with radio active phosphorus  $P^{82}$  along with inoculation on the three legumes, cowpea, *mung* and *urid*, Iswaran *et al* (1969) reported that inoculation would give rise to higher yields of dry matter, total uptake of phosphates and higher uptake of phosphates from the soil. No information is available on the effect of combining bacterial inoculation and phosphorus on legumes in a cultivated soil and hence the present studies were undertaken.

The studies were conducted in pot cultures using sannhemp (*Crotalaria juncea*) and a soil manured with cattle manure at 3.5 tons per hectare. There were three phosphorus treatments, viz. 0 (P0), 17 (P1) and 34 (P2) kg of  $P_2O_5$  per hectare. Superphosphate was used to supply  $P_2O_5$ . There were two inoculation treatments viz., seeds untreated (Bo) and seeds treated with a culture of *Rhizobium* sp. (B1). The organisms were cultured on an agar medium and the sannhemp seeds were well mixed with the culture. The treated seeds were kept overnight before sowing. Sowing was done in pots and observations were recorded on the germination of seeds. On the tenth day of sowing, the seedlings were thinned in each pot to three equidistant plants of uniform growth. The plant height was recorded at intervals of five days from the fifteenth day to the fiftieth day of sowing. Other plant characters studied were the dry weight of the shoot, root and nodules, length of roots, number of nodules and total nitrogen per plant. The nitrogen fixation was also estimated according to the procedure suggested by Albrecht (1920) using the formula

$$\text{Amount of nitrogen fixed} = (\text{Nitrogen content of the plant} + \text{nitrogen in the soil at harvest}) - (\text{Nitrogen in the seed} + \text{nitrogen in the soil} + \text{nitrogen in the manure before starting the experiment})$$

The results of the trial are tabulated in Table 1. Though none of the plant characters under study showed any significant response to the treatments, some definite trends were indicated. In the absence of inoculation, phosphorus at 34 kg per hectare showed a higher germination percentage. Inoculation along with phosphorus at 34 kg per hectare produced insignificant increases in the growth and yield of plants. Similar results were also seen in the dry weight of roots and the green and dry weights of

nodules. The root length, number of nodules and total nitrogen per plant were positively influenced by inoculation and phosphorus. Higher doses of  $P_2O_5$  and inoculation with *Rhizobium* appeared to increase the nitrogen fixation by sannhemp.

Table 1

Effect of bacterial inoculation and phosphorus on the different plant characters and nitrogen fixation of sannhemp

Characters		PO	P <sub>1</sub>	P <sub>2</sub>	Statistical significance
Germination of seeds (per cent)	BO	73.8	66.7	80.8	Not Sig.
	B1	73.8	74.6	74.2	
Plant height in cm.	BO	39.1	37.0	43.7	Not Sig.
	B1	40.2	39.9	45.0	
Dry weight of root in gro/pot	BO	8.36	7.50	10.54	Not Sig.
	B1	8.80	8.75	10.56	
Dry weight of root in gm/pot	BO	1.15	1.40	1.62	Not Sig.
	B1	1.35	1.44	1.66	
Root length in cm.	BO	18.0	18.7	19.7	Not Sig.
	B1	19.4	19.7	19.6	
No. of nodules per pot	BO	136.4	174.4	248.0	Not Sig.
	B1	193.1	201.0	234.0	
Green weight of nodules in gm/pot	BO	1.34	1.30	1.38	Not Sig.
	B1	1.31	1.34	1.43	
Dry weight of nodules in gm/pot	BO	0.83	0.84	0.85	Not Sig.
	B1	0.85	0.85	0.87	
Total nitrogen per plant in mg	BO	89.2	83.5	117.2	Not Sig.
	B1	87.3	99.7	115.2	
Nitrogen fixation in mg/pot	BO	321.0	377.0	423.0	Not Sig.
	B1	391.0	403.0	475.0	

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