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EFFECT OF PHORATE ON RHIZOBIAL NODULATION IN COWPEA*

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Application insecticide granules in soil is a common method used for pest management. Insecticides introduced into the soil have been reported to modify the functicning of nitrogen fixing rhizobia in pulses (Kulkarni *et at.* 1974; Oblisami and Balaraman, 1976 and Oblisami *et al.* 1976). Phorate [0. 0—Diethyl S—[ethyl thiomethyl] phosphorodithioate] is widely used as granules which are applied in soil for pest control. As very little is known about the effect of this inseciicide on *Rhizobium,* studies were undertaken in the College of Agriculture, Vellayani, Kerala, on the effect of the toxicant on *Rhizobium* in cowpea, *Vigna sinensis* L.

Materials and Methods

Cowpea seeds (Philippines variety) were treated with *Rhizobium* culture received from the Tamil Nadu Agricultural University and sown in pots [30 cm x 30 cm] using 20 kg of red soil per pot. Another set of seeds was sown without the *Rhizobium* treatment. The soil in each pot was mixed with 200 g of farmyard manure and one seed was sown in each pot. Phorate was applied around the seed at the time of sowing. There was a control having no insecticide treatment for both the *Rhizobium* treated and untreated series. The treatments were replicated thrice. The nodule counts were taken from the second week of sowing under different grades of their diameter such as 0.5 to 1.5, 1.6 to 2.5, 2,6 to 3.5, 3.6 to 6.5 6.6 to 7.5 and 7·6 to 13.5 mm measured on graph paper. The data were analysed as per methods given by Finney [1952]. The total weights of nodules were also recorded.

Results and Discussion

The effects of phorate on the inoculated *Rhizobium* with respect to nodulation, size of nodules and fresh and dry weights of the nodules was significant (Table 1).

The dosages of 1 and 3 kg ai/ha caused significant reduction in the number of nodules in the adventitious roots, while the dosages of 2 and 3 kg ai/ha caused reduction in nodule number in the tap root The nodule formation was, however, suppressed in all the three dosages both in adventitious and tap roots, except 2 kg ai/ha in adventitious roots where it was on par with control,

As regards the size of noduies, in general, the effect was one of increase in trend in all the three dosages both in adventitious and tap roots, the increase being highly significant excepting the 3 kg ai/ha dosage in adventitious roots. In the case of fresh weight of nodules phorate at a dose of 2 kg ai/ha significantly

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Table 1

Effect of phorate on nodulation in Cowpea. (Mean values of ten weeks' observations)

Phorate dosage kg ai/ha	No. of nodules on		Size of nodules on		Fresh weight (g)	Dry weight (9)
	Adventitious roots	Tap root	Adventitious roots	Tap root		
(A) Inoculated *Rhizobium*						
0	14.87	3.99	2.45	3.62	5.91	1.26
1	13.51	3.88	2.61	4.15	5.74	1.25
2	14.87	3.27	2,51	4.34	7.54	1.51
3	13.02	2.68	2.49	4.12	6.06	1.30
CD	0.98	0.63			0.86	0.05
(B) Native *Rhizobium*						
0	10.46	3.52	2.79	4.42	4.13	0.83
1	10.62	2.96	2.49	6.84	4.69	0.88
2	7.22	2.55	2.79	5.09	3.54	0.66
3	9.11	3.50	2 67	5.79	5.86	1.11
CD (p-0.05)	2.08	0.55	—	—	1.58	—

increased the weight over untreated control. At 4 kg ai/ha also, there was an increase in fresh weight though not significant. The trend of effects on the dry weights of the nodules is similar to that seen with fresh weight.

Native *Rhizobium* also was significantly affected by phorate treatment with regard to nodule formation, nodule size and fresh and dry weights of nodules. The nodule formation of the adventitious roots was suppressed at the higher doses of phorate by 30.98 and 12.9 per cent respectively. The number of nodules on tap root also was suppressed by 15.91 and 27.56 per cent by the two lower doses, viz, 1 and 2 kg ai/ha, The dry weight of the nodules was not affected by phorate application.

The two strains of *Rhizobium,* the native and inoculated were thus seen to respond differently to phorate with reference to the pattern of nodule formation on cowpea roots. The difference in response of nodulation to phorate reported by earlier workers may be due to differences in such factors as rhizobial strains. Chelliah (1972), Gawaad *et al.* (1972) and Swamiappan and Chandy (1972) have also reported such stimulatory effect on nodulution while Kulkarni *et al.* (1974) reported suppression in nodulation.

Summary

Studies were made on the effect of phorate granules applied along withs seeds at the time of sowing on nodulation in cowpea treated with *Rhizobium* a

compared to nodulation in untreated seeds. In *Rhizobium* treated plants, phorate caused suppression of nodule development and increase In nodular size, fresh weight and dry weight. In plants untreated with *Rhizobium*, phorate suppressed nodule formation in the roots and stimulated nodule size and fresh wieght.

സംഗ്രഹം

പയർ വിത്തിന്റെ കൂടെ ഫോറേറ്റ് തരികം മണ്ണിൽ പ്രയോഗിച്ചപ്പോൾ റൈസോബിയം ബാക്ടീരിയ പുരട്ടിയ വിത്തുകളിൽ നിന്നും ഉണ്ടായ 6) ചടികളുടെ വേരുകളിലുള്ള ബാക്ടീരിയ ഗ്രന്ഥികളുടെ (നോഡ്യൂളുകൾ) എണ്ണം കുറയുകയും വലിപ്പവും തൂക്കവും കൂടുകയും ചെയ്തു. റൈസോബിയം പുരട്ടാത്ത വിത്തുകളിൽ നിന്നും വളരുന്ന ചെടികളിലും ഇതേ ഫലങ്ങളാണ് കണ്ടത്.

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