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EFFECT OF FUNGICIDES AND INSECTICIDES ON *Rhizobium* AND *Rhizobium* - COWPEA SYMBIOSIS *

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ABSTRACT

Among the pesticides tested on the *Rhizobium*-cowpea symbiosis carbendazim+ carbosulfan showed considerable increase on the growth of *Rhizobium*. Interestingly seed treatment with carbendazim, carbendazim + carbosulfan and carbosulfan was compatible with *Rhizobium* and had no inhibition on the nodulation. All the seed dressing pesticides along with *Rhizobium* inoculation exhibited better nodulation than the uninoculated control.

Keywords : Cowpea, Fungicides, Insecticides, *Rhizobium*

In modern agriculture application of fungicides and insecticides is an accepted practice towards managing pests and diseases and some of these chemicals may influence the microbiological processes in soil (Subba Rao, 1977).

Carbendazim 0.2 per cent, carbosulfan 0.4 per cent and carbendazim 0.2 per cent + carbosulfan 0.4 per cent were recommended for cowpea seed treatment (Ramadoss, 1985). In the present study above seed dressing chemicals were tested for the growth of *Rhizobium* and *Rhizobium* - cowpea symbiosis.

MATERIALS AND METHODS

Rhizobium population

In vitro studies were carried out to find out whether carbendazim 0.2 per cent, carbosulfan 0.4 per cent and carbendazim 0 2 per cent + carbosulfan 0.4 per cent recommended for seed treatment have any deleterious effect on *Rhizobium* population. A pure culture of *Rhizobium* sp. *cowpea miscellany* strain A.H.9 was obtained from the culture collection of the Department of Agricultural Microbiology, Tamil Nadu Agricultural University, Coimbatore, and maintained in yeast extract mannitol broth containing mannitoi 10g, yeast extract 1g, dipotassium phosphate 0.5g, magnesium sulphate 0.2g, and sodium chloride 0.1g per litre of water.

The yeast extract mannitol was incorporated with the chemicals to be tested. The medium was sterilized with the chemicals before inoculation of the bacterium.

Inoculum was prepared by transferring a small amount of the culture from slants to yeast extract mannitol broth and incubated on a rotary shaker for 24 hours. The rhizobial inoculum thus prepared was added at one ml into

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Table 1. Effect of seed treatment with fungicides and insecticides on the growth of cowpea *Rhizobium*

Treatment	Population in 10^5/ml of inoculum		
	5th day	10th day	Mean
Carbendazim + *Rhizobium*	50.00 (7.03)	23.67 (4.88)	36.84 (5.96)
Carbosulfan + *Rhizobium*	26.67 (5.19)	0 (0.71)	13.33 (2.95)
Carbendazim + Carbosulfan + *Rhizobium*	33.33 (5 72)	216.67 (14.71)	125.00 (10.22)
Rhizobium (Control)	53.33 (7.23)	6.67 (2.67)	30.00 (4.95)

(Figures in parentheses represent the transformed values)

	C. D. (P=0.05)
Comparison of significant effects	
Treatments	1.27
Days	0.90
Treatment x Days	0.57

the medium and the flasks were incubated on a rotary shaker for 10 days. Samples were drawn at 5th and 10th day and the population of *Rhizobium* determined following the serial dilution plate technique. In each treatment three replications were maintained. The population of *Rhizobium* developed as colonies on petri plates was counted and expressed as number per ml of broth.

Rhizobium - Cowpea symbiosis

Pot culture studies were conducted to understand the effect of application of seed-dressing chemicals on *Rhizobium* - Cowpea symbiosis. Cowpea seed of cv. C152 treated with carbendazim 2g, carbosulfan 4ml and carbendazim 2g + carbosulfan 4ml was inoculated with peat - base rhizobial culture at the rate of 4.4g/kg of seed. The rhizobial count was 108 propagules per g of peat base raised in pots. Each treatment was replicated six times Each pot containing three plants was considered as a replication. Observations on plant growth components and on development of nodules were recorded on all the plants 45 days after planting. The nodules and plants were dried in the oven at 60°C for two days for measuring dry weight.

RESULTS AND DISCUSSION

The observations made on the influence of different seed dressing chemicals such as carbendazim, carbosulfan and carbendazim + carbosulfan on the growth of *Rhizobium* and *Rhizobium* — Cowpea symbiosis are presented in Table 1 and 2. Carbosulfan induced considerable reduction on the growth of *Rhizobium* but when combined with carbendazim, was stimulatory. Seed dressing fungicides such as carbendazim, carbosulfan and carbendazim + carbosulfan were not

Table 2. Effect of seed treatment with fungicides and insecticides on plant height, plant weight and nodulation of cowpea inoculated with *Rhizobium* sp.

Treatment	Plant height (cm/plant)	Plant weight		Nodule		
		Fresh weight (g/plant)	Dry weight (g/plant)	Number of nodule/plant	Fresh weight (mg/plant)	Dry weight (mg/plant)
Carbendazim+*Rhizobium*	29.59	14.97	1.78	20 39	128.33	22.44
Carbosulfan+*Rhizobium*	32.91	13.39	1.72	14.94	75.56	13.44
Carbendazim+Carbosulfan+*Rhizobium*	33.09	13.22	1.55	13.78	66.11	12.11
Control-Inoculated	32.71	14.95	1.86	15.17	69.44	12.35
Control-Uninoculated	32.20	9.99	1.14	8.61	42.22	8.06
C. D (P=0.05)	NS	3.40	0.38	5.44	29.42	6.21

inhibitory to plant weight. Plant growth was not significantly altered by various seed - dressing chemicals. Carbendazim was not inhibitory to nodulation and nodule weight. The other treatments such as carbosulfan and carbendazim + carbosulfan also behaved similarly by not inhibiting nodulation.

Interestingly carbendazim, carbendazim+carbosulfan and carbosulfan were not at all inhibitory to *Rhizobium* nodulation. All the seed dressing chemicals along with inoculation exhibited better nodulation than uninoculated control. Fisher (1976) reported that symbiotic nitrogen fixation was affected by TMTD but was unchanged by benomyl. Manicka sundaram and Ramabadran (1976) also reported that spraying of benomyl did not cause any deleterious effect on nodulation in groundnut. However, Ravindran (1930) observed that the *Rhizobium*-blackgram symbiosis varied with the chemical nature of the seed dressing fungicide. Carbendazim and captan showed considerable reduction in growth and nodulation. TMTD, 2 methoxy ethyl mercury chloride and quintozene were compatible with *Rhizobium* and resulted in better growth and nodulation. Rangarajan and Subramaniam (1978) reported the effect of fungicides on *Rhizobium* - blackgram and redgram symbiosis. They found that application of quintozene and carbendazim resulted in increased nodulation over uninoculated control. But, when these fungicides were combined with rhizobial inoculant, there was stimulatory effect on nodulation and yield. Sekar and Balasubramanian (1978) observed that soil application of aldicarb, fensulfothion and disulfoton reduced the number of nodules of cowpea plants. The results obtained on the effect of seed dressing chemicals on nodulation are in conformity with other reports on the compatibility of seed dressing chemicals with rhizobia.

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EVALUATION OF SOIL TESTING PROCEDURES FOR SUGARCANE CROP*

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ABSTRACT

Field experiments were conducted with the primary objective of investigating the soil test crop response relationships of sugarcane crop. Surface soil samples collected from the plots of these experiments were analysed for available nitrogen (alkaline $KMno_4$-N and organic carbon), phosphorus (Olsen's-P and Bray's-P) and potassium (neutral N NH_4OAc-K and 0.1N HNO_3-K). Relationship between soil test values and cane yield/ nutrient uptake was established by simple correlat on studies and multiple regression analysis with linear, quadratic polynomial and square root polynomial functions. The results revealed that the organic carbon, Olsen's-P and 0.1N HNO_3-K are the best indices, respectively of nitrogen, phosphorus and potassium availabilities to sugarcane crop.

Keywords : Sugarcane, Soil testing procedures, Nutrient uptake

Soil fertility research and associated laboratory studies over the past 30 years have established the efficacy of soil testing as a means for predicting the nutrient needs of crops. The success of soil testing and fertilizer prescription

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