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Evaluation of Fungicides for the Control of Stem Rot of Sunflower

By

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ABSTRACT

Eleven fungicides were tested for their toxicity to *Macrophomina phaseoli* (Maubl.) Ashby. Benlate was most toxic for mycelial growth. The next best fungicides in soil were wet ceresan and captan. Some of the fungicides which were effective in agar media were not effective in soil. The amount of fungicides required for the inhibition of the fungus in the soil was higher than that required in agar medium.

INTRODUCTION

Of the several diseases, stem rot caused by *Macrophomina phaseoli* (Maubl.) Ashby has been found to cause considerable damage to sunflower and the pathogen also affects roots causing root rot. This disease is assuming very great importance in Tamil Nadu in recent years. Laboratory studies were undertaken to evaluate the efficacy of fungicides to inhibit the growth of *M. phaseoli* in agar plates and soil. The experimental results are presented in this paper.

MATERIALS AND METHODS

The evaluation was made by poisoned food technique. The test chemicals were benlate (methyl 1- (butylcarbamoyl) 2-benzimidazole carbamate), fytolan (copper oxychloride), brassicol (pentachloronitrobenzene), wet ceresan (methoxy ethyl mercury chloride), lonacol (zinc ethylene bisdithio carbamate), cuman (zinc dimethyl dithiocarbamate), captan (n-trichloro-methyl mercapto)-4-cyclohexene-1, 2-dicarboximide), duter (triphenyl stannous hydroxide), thiovit (wettable sulphur as Barium polysulphide, miltox (copper oxychloride + zinc ethylene bisdithiocarbamate) and difolatan (hetero cyclic nitrogen compound). Concentrations of 10, 100, 250, 500, 1000, 2500 and 5000 ppm were tried for all the fungicides. The concentrations were made on the basis of the weight of the fungicide formulation and mixed in Richard's agar medium. Twenty ml. of medium were poured into each dish. Inoculum discs of 4 mm diameter were placed at the centre of each petri dish. Suitable controls were maintained without incorporating the fungicides.

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Treatments were replicated twice. The diameter of mycelial growth was measured after 36 hours. The percentage of growth inhibition was calculated by the equation given by Vincent (1947).

The fungicidal efficacy under laboratory conditions in the soil was tested according to the soil fungicide testing method described by Zentmyer (1955) and Rushdi and Jeffers (1956) with slight modification.

Fine sandy loam soil was air-dried, sifted through a 20 - mesh/inch sieve and autocalaved for 45 minutes at a pressure of 15 lb in conical flasks on two consecutive days. Sterilized soil was placed at the bottom of plastic vials up to a height of two inch. An inoculum disc of 4 mm diameter was placed over the surface, the disc was then covered with half an inch of the sterilized soil. The different fungicidal concentrations were prepared in steri-

TABLE 1. Per cent inhibition of mycelial growth of *M. phaseoli* in culture media

Fungicide	Inhibition per cent							
	Concentration in ppm							
	10	100	250	500	1000	2500	5000	Mean
Benlate	80.5	100	100	100	100	100	100	97.21
Fytolan	2.7	3.7	4.5	5.1	9.2	10.0	18.2	7.63
Brassicol	49.7	93.0	94.8	96.2	100	100	100	90.53
Wet ceresan	4.2	13.7	58.7	68.0	100	100	100	63.51
Lonacol	12.0	85.7	100	100	100	100	100	85.39
Cuman	1.4	66.6	88.0	95.9	97.9	100	100	78.54
Captan	10.0	67.6	82.1	87.0	100	100	100	78.10
Duter	62.8	95.7	100	100	100	100	100	94.07
Thiovit	26.8	29.4	40.4	53.5	56.2	77.1	80.1	51.07
Miltox	30.7	39.0	44.3	55.0	62.7	77.7	89 3	56.96
Difolatan	37.5	40.0	55.0	58.0	60.0	67.0	74 0	55.93
Mean	28.94	57.67	69.80	74.43	80.55	83.25	87.43	...

		C. D. (P = 0.05)
Treatments	...	18.3
Concentrations	...	14.5
Concentrations and treatments	...	48.2

TABLE 2. Per cent inhibition of mycelial growth of *M. phaseoli* in soil

Fungicide	Inhibition per cent							
	Concentration in ppm							
	10	100	250	500	1000	2500	5000	Mean
Benlate	0	52.9	67.1	85.6	100	100	100	72.23
Brassicol	0	0	0	6.7	23.3	36.7	50.0	16.67
Wet ceresan	0	0	12.7	31.7	63.5	78.0	100	40.84
Lonacol	0	0	0	21.6	27.0	49 3	87.3	26.46
Cuman	0	0	0	0	20.0	61.7	90.0	24.53
Captan	0	0	0	10.0	30.0	73.0	100	30.43
Du-ter	0	0	0	0	22.2	26.4	41.5	12.87
Mean	0	7.56	11.4	22.23	40.86	60.73	81.2(	...

	C. D. (P = 0.05)
Treatments ...	0.08
Concentrations ...	0.08
Concentrations and treatments ...	0.23

ized water. Ten ml of fungicidal solution were added on to the surface of the soil. Suitable controls were maintained by adding sterilized water. The vials in each test were emptied after 48 hours of incubation into a wire net, the soil removed by washing with sterilized water and the discs of mycelium picked up with sterile forceps and placed on Richards' agar medium in petri dishes to determine viability of the fungus. The amount of growth inhibition was calculated as in the previous experiment.

RESULTS AND DISCUSSION

The inhibition of growth of *M. phaseoli* in culture medium is given in Table 1. Benlate was highly effective and even at 100 ppm, complete inhibition of growth was observed. Duter, brassicol, lonacol, cuman, captan and wet ceresan were also effective. Among the fungicides fytolan, thiovit, difolatan and miltax were less effective even at 5000 ppm.

In order to find out the difference in toxicity of fungicides in soil from those observed in poisoned food

technique, an experiment was carried out with seven fuugicides, eliminating the fungicides which were less effective in poisoned food technique (Table 2) It was evident that the toxicity of the fungicides was much reduced under soil condditions. Benlate was highly effective among the fungicides tested and at 1000 ppm complete inhibition of growth was observed. The next best fungicides were wet ceresan and captan, the percentages of inhibition being 63.5 at 1000 ppm and 73.0 at 2500 ppm, respectively. The other fungicides viz., duter, brassicol, cuman and lonacol were less effective. In general the fungicides at higher concentrations were more effective in inhibiting the growth of *M. phaseoli* than at lower concentrations.

The relative efficacy of several fungicides for inhibiting the mycelial growth of *M. phaseoli* in culture media and in soil was investigated. Only benlate was highly effective. The other fungicides like wet ceresan and captan were moderately effective. Some of the fungicides which were effective in media were not effective in soil. Benlate was also reported to be effective in reducing the incidence of root rot on groundnut incited by *M. phaseoli* besides inhibiting the growth *in vitro* (Shanmugam and Govindaswamy, 1973).

It was further observed that the amounts of the fungicides required for inhibition of the fungus in the soil were higher than those required for inhibition in the culture media under the poisoned food technique e. g., complete inhibition of mycelial growth by benlate was obtained at 1000 ppm in soil as against 100 ppm in culture media and likewise the respective figures for wet ceresan were 5000 ppm in soil and 1000 ppm in culture media. Similar differences were observed in case of *Rhizoctonia soloni* (Rushdi and Jeffers, 1956) and *Sclerotium oryzae* (Misra and Das, 1967) and have been attributed to the solubility of fungicides, chemical reactions and the unfavourable pH of the soil. The results are of considerable value as it becomes evident that the laboratory method of evaluating fungicides by the poisoned food technique is not always adequate to find out their effectiveness against *M. phaseoli*, which is soil borne.

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REFERENCES

MISRA, A P. and P. K. DAS. 1967. Laboratory evaluation of fungicides for the control of stem rot of paddy. *Indian Phytopath.* 20 : 36–41.

RUSHDI, M and W F. JEFFERS. 1966. Effect of some soil factors on efficacy of fungicides in controlling *Rhizoctonia solani*. *Phytopothology* 46 : 88

SHANMUGAM, N. and C. V. GOVINDASWAMY. 1973. Control of *Macrophomina* root rot of groundnut. *Madras agric. J.* 60 : 500–3.

VINCENT, J M. 1947. Distortoin of fungal hyphae in the presence of certain inhibitors. *Nature*, 159 : 850.

ZENTMYER, G. A. 1955. A laboratory method for testing soil fungicides against *Phytophthora cinnamomi*. *Phytopathology* 45 : 398.