

EFFECT OF FUNGICIDES AND INSECTICIDES ON THE LINEAR GROWTH OF *Macrophomina phaseolina* (TASSI) GOID

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The effect of three fungicides viz., carbendazim, quintozone and TMTD 250, 500 and 1000 ppm and two granular insecticides viz., carbofuran and aldicarb at 250, 500, 1000 and 2000 ppm levels were tested on the linear growth of *M. phaseolina*. The linear growth of *M. phaseolina* was inhibited by the fungicides carbendazim, TMTD and quintozone and the granular insecticides, carbofuran and aldicarb. Carbendazim at 10 ppm and TMTD at 500 ppm levels were fungicidal to *M. phaseolina* when compared to the fungicides, the insecticides were less effective and exerted a fungistatic effect against *M. phaseolina*.

Of the several diseases root rot caused by *Macrophomina phaseolina* (Tassi) Goid has been found to cause considerable damage to cowpea. It is assuming very great importance in Tamil Nadu in recent years. Laboratory studies were undertaken to evaluate the efficacy of fungicides and insecticides on the growth of *M. phaseolina* in agar plates and the results are discussed.

MATERIALS AND METHODS

The evaluation was made by poisoned food technique. The test chemicals were carbendazim (2-(Methoxy carbonyl) benzimidazole) Quintozone (PCNB-(Penta Chloro Nitro Benzene) TMTD (Tetramethyl Thiuram disulfide), aldicarb (2 methyl-2(methyl thio) propionaldehyde-O (Methyl carbamoyl) Oxime and Carbofuran (2, 3-dihydro-2, 2-dimethyl 7, benzofuranyl methyl carbamate). The fungicides at 100, 250, 500 and 1000 ppm and granular insecticides at 250, 500, 1000 and 2000 ppm were tried. The concentrations were made on the basis of the weight of the chemical formu-

lation and mixed in potato dextrose medium. Twenty ml of medium was poured into each dish. Inoculum discs of 8 mm diameter were placed at the centre of each petri dish. Suitable controls were maintained without incorporating the chemicals. Treatments were replicated thrice. The diameter of mycelial growth was measured daily upto three days. The percentage of growth inhibition was calculated.

With a view to comparing the inhibition caused by the combination of fungicides and insecticides, another experiment was conducted using the poisoned food technique. The effect of carbendazim at 10 ppm, TMTD at 100 ppm and quintozone at 500 ppm in combination with 1000 and 2000 ppm concentrations of aldicarb and carbofuran on the inhibition of *M. phaseolina* was assessed.

RESULTS AND DISCUSSION

The data revealed that out of five pesticides tested, carbendazim at 100, 250, 500 and 1000 ppm and TMTD at 500 and 1000 ppm were fungicidal

Table 1 : Effect of pesticides on the linear growth of *M. Phaseolina* (per cent inhibition over control)

Sl. No.	Pesticide	Concentration (ppm)	Days after inoculation			Mean
			1	2	3	
1.	Carbandazim	100	100.00 (10.02)	100.00 (10.02)	100.02 (10.02)	100.00 (10.02)
2.		250	100.00 (10.02)	100.00 (10.02)	100.02 (10.02)	100.00 (10.02)
3.		500	100.00 (10.02)	100.00 (10.02)	100.02 (10.02)	100.00 (10.02)
4.		1000	100.00 (10.02)	100.00 (10.02)	100.02 (10.02)	100.00 (10.02)
5.	Quintozene	100	90.39 (9.53)	78.91 (8.81)	88.11 (9.42)	85.80 (9.26)
6.		250	100.00 (10.02)	93.10 (9.67)	92.07 (9.62)	95.06 (9.77)
7.		500	100.00 (10.02)	94.61 (9.75)	92.99 (9.57)	95.87 (9.81)
8.		1000	100.00 (10.02)	93.73 (9.71)	95.73 (9.80)	96.49 (9.84)
9.	TMTD	100	88.88 (9.45)	95.64 (9.81)	95.12 (9.77)	93.21 (9.67)
10.		250	100.00 (10.02)	97.54 (9.99)	97.26 (9.89)	98.27 (9.84)
11.		500	100.00 (10.02)	100.00 (10.02)	100.00 (10.02)	100.00 (10.02)
12.		1000	100.00 (10.02)	100.00 (10.02)	100.00 (10.02)	100.00 (10.02)
13.	Aldicarb	250	1.79 (1.22)	19.25 (4.38)	13.72 (3.73)	11.59 (3.11)
14.		500	0.00 (0.71)	24.99 (5.06)	18.90 (4.40)	14.63 (3.39)
15.		1000	9.06 (2.81)	37.82 (6.16)	29.88 (5.51)	25.59 (4.83)
16.		2000	24.18 (4.95)	43.10 (6.60)	38.72 (6.25)	35.33 (5.93)
17.	Carbofuran	250	1.79 (1.22)	2.95 (1.55)	0.00 (0.71)	1.58 (1.16)
18.		500	1.79 (1.22)	0.98 (1.06)	0.00 (0.71)	0.92 (1.00)
19.		1000	3.57 (1.74)	2.99 (1.70)	0.00 (0.71)	2.19 (1.38)
20.		2000	3.57 (1.74)	12.68 (3.59)	8.54 (2.99)	8.26 (2.77)
	Mean		61.25 (6.74)	64.92 (7.39)	63.65 (7.16)	

(Figures in parentheses represent transformed values)

Comparison of significant effects :

	S.E.	C.D. (p=0.05)
Days	0.06	0.16
Pesticides	0.07	0.20
Concentrations	0.07	0.06
Days x Pesticides x Concentrations	0.25	0.18

Table 2: Interaction between days and pesticides

Sl. No.	Pesticide	Days after inoculation			Mean
		1	2	3	
1.	Garbendazim	100.00 (10.02)	100.00 (10.02)	100.00 (10.02)	100.00 (10.02)
2.	Quintozene	97.51 (9.90)	89.56 (9.49)	92.24 (9.63)	93.01 (9.67)
3.	TMTD	97.11 (9.88)	98.30 (9.94)	97.91 (9.92)	97.71 (9.91)
4.	Aldicarb	5.36 (2.42)	30.30 (5.55)	24.20 (4.97)	18.08 (4.31)
5.	Carbofuran	1.69 (1.48)	3.38 (1.97)	1.14 (1.28)	2.00 (1.58)
	Mean	44.93 (6.74)	54.11 (7.39)	50.77 (7.16)	

(Figures in parentheses represent transformed values)

Comparison of Significant effects

	S. E.	C. D. (P=0.05)
Days	0.06	0.16
Pesticides	0.07	0.20
Days x pesticides	0.13	0.35

while the others were fungistatic to *M. phaseolina*. TMTD and quintozene inhibited the linear growth by 97.71 and 93.01 per cent respectively as compared to control. The inhibition caused by aldicarb and carbofuran was 8.08 and 2.0 per cent respectively. Significant differences were also observed for the concentrations of pesticides tested. With increasing concentration of each pesticide, there was corresponding increase in the percentage of inhibition. The highest inhibition was noticed when the fungicides and insecticides were tested at 1000 ppm and 2000 ppm concentrations respectively. At these concentrations per cent inhibition by TMTD, quintozene, aldicarb and carbofuran was 100, 96.49,

35.33 and 8.26 per cent respectively as against 98.27, 95.06, 11.59 and 1.58 per cent at 250 ppm concentrations. The interactions between pesticides, days and concentrations were also significant (Table-1 & 2).

Carbendazim 10 ppm in combination with carbofuran 2000 ppm, carbofuran 1000 ppm, aldicarb 1000 ppm and aldicarb 2000 ppm inhibited the linear growth by 99.70, 99.59, 99.39 and 98.76 per cent respectively as compared to control. Quintozene 500 ppm with aldicarb 1000 ppm recorded maximum inhibition of 86.62 per cent as against 85.35, 84.72 and 81.26 per cent inhibition, when combined with aldicarb 2000 ppm, carbofuran 1000 ppm and carbofuran 2000 ppm respectively. TMTD

Table 3: Effect of combination of pesticides on the linear growth of *M. phaseolina* (per cent inhibition over control)

Sl. No.	Pesticide	Concentration (ppm)	Days after inoculation			Mean
			1	2	3	
1.	Carbendazim	10	100.00 (10.02)	100.00 (10.02)	100.00 (10.02)	100.00 (10.02)
2.	Carbendazim + Aldicarb	10	100.00 (10.02)	100.00 (10.02)	98.17 (9.93)	99.39 (9.99)
		1000	100.00 (10.02)	99.02 (9.98)	97.26 (9.89)	98.76 (9.96)
3.	Carbendazim + Aldicarb	10	100.00 (10.02)	100.00 (10.02)	98.78 (9.96)	99.59 (10.00)
		2000	100.00 (10.02)	100.00 (10.02)	99.09 (9.98)	99.70 (10.01)
4.	Carbendazim + Carbofuran	10	84.09 (9.19)	89.59 (9.44)	87.20 (9.37)	86.62 (10.00)
		1000	82.94 (9.13)	89.57 (9.49)	83.54 (9.17)	85.35 (9.25)
5.	Quintozene + Aldicarb	500	81.75 (9.07)	87.95 (9.40)	84.46 (9.22)	84.72 (9.23)
		1000	74.92 (8.68)	85.02 (9.25)	83.85 (9.13)	81.26 (9.04)
6.	Quintozene + Carbofuran	500	90.90 (9.55)	91.79 (9.76)	95.12 (9.73)	93.60 (9.70)
		1000	97.67 (9.91)	97.72 (9.93)	96.04 (9.83)	97.14 (9.89)
7.	TMTD + Aldicarb	100	94.31 (9.74)	95.44 (9.80)	94.21 (9.74)	94.65 (9.73)
		1000	93.17 (9.68)	95.12 (9.76)	94.10 (9.75)	94.15 (9.74)
Mean			91.65 (9.59)	94.44 (9.74)	92.65 (9.65)	

(Figures in parentheses represent transformed values)

Comparison of significant effects:

Days	S. E.	C. D. (p=0.05)
Pesticides	0.01	0.03
Days and pesticides	0.02	0.06
	0.04	0.10

100 ppm in combination with aldicarb 2000 ppm recorded a maximum inhibition of 97.14 percent (Table 3).

The present study on the linear growth revealed that the fungicides and granular insecticides inhibited the growth of *M. phaseolina*. Carben-dazim at 10 ppm level was fungicidal to *M. phaseolina*. However, Arjunan (1981) reported that carbendazim even at 1000 ppm level inhibited the growth of redgram isolate of *M. phaseolina* only upto 87.9 per cent. This difference in inhibition may be due to difference in isolates. The observation on the inhibitory effect of quintozone to *M. phaseolina* is in conformity with the findings of Siva-prakasam *et al* (1974). In the present study TMTD at 500 ppm level inhibited the growth by 100 per cent (Table 1). But TMTD (Hexathir^(R)) even at 1000 ppm level was reported to inhibit the growth of redgram isolate of *M. phaseolina* by 58.6 per cent only (Arjunan, 1981). The lower inhibition reported may be due to the difference in the formulation of the chemical and the fungal isolates from two different hosts. The granular insecticides did not have much inhibitory effect as the fungicides. But granular insecticides were only fungistatic since the fungus was able to grow slowly in the poisoned medium as days passed. Ram *et al* (1971) found that carbofuran at 1000 ppm level inhibited the growth of *M. phaseolina* upto 58 per cent after six days of inoculation. In the present study, inhibition at 1000 ppm level was noted upto the third day of inoculation only. The inhibition caused by aldicarb was 18.08 per cent. There is no report in literature about the inhibition of *M. phaseolina* by al-

dicarb even though aldicarb and phorate are reported to inhibit the growth of *R. solani* (HacsKaylo and Stewart, 1962; Khadeem *et al.* 1977; Tisserat *et al.* 1977).

Carbofuran at 1000 ppm level was reported to inhibit the growth of *Sclerotium rolfsii* and *Rhizoctonia solani* by 100 and 3.65 per cent respectively (Ram *et al.*, 1971; Sankaralingam, 1980). But, in the present study carbofuran at 1000 ppm level inhibited the growth of *M. phaseolina* by 2.19 per cent. This indicates that the effect of pesticide on the three pathogens producing sclerotia does not follow the same trend.

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