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Studies on factors affecting *Rhizoctonia bataticola* : IV. Fungicide

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Five fungicides viz., thiram (TMTD), captan (captan 50% WP), mancozeb (dithane M-45 75% WP), carbendazim (bavistin 50% SC) and carboxin (vitavax 75% WP) were investigated *in vitro* at three concentrations (10, 50 and 100 ppm) against isolates of *R. bataticola* by employing poisoned food technique to find their effect on growth and sclerotial morphology. Bavstin was the most effective and checked growth of all the isolates at all the concentrations, while thiram checked growth at 50 and 100 ppm concentrations. Vitavax caused growth and sclerotial size inhibition at all concentrations but was pronounced at 100 ppm. Dithane M-45 and captan observed to be less effective at 10 and 50 ppm but caused considerable reduction of growth and sclerotial size at 100 ppm. All the isolates exhibited variable effect on different fungicides. The effect of fungicides on growth and sclerotial characters were observed in the decreasing order of bavistin, thiram, vitavax, dithane M-45 and captan.

Key words : *Rhizoctonia bataticola,* growth, sporulation, fungicides

INTRODUCTION

Seed treatment with fungicides is generally recommended to manage soil-borne diseases. As *Rhizoctonia bataticola,* is a soil-borne fungus, such type of recommendation is also prevailing for it. Considering this fact, five fungicides which are generally recommended for seed treatment have been evaluated against seven isolates of *R. bataticola* to find out at what extent the fungicides are affecting the growth and formation of sclerotia of *R. bataticola.*

MATERIALS AND METHODS

The effect of fungicides on the growth and sporulation of *R. bataticola* was evaluated by poisoned food technique.

Standard solutions of fungicides viz., thirm (tetramethyl thiram disulphide), captan (captan-50% WP), mancozeb (dithane M-45 75% WP), carbendazim (bavistin 50% SC) and carboxin (vitavax 75% WP) were prepared just before incorporating in into medium. The standard solutions were separately pipetted out and incorporated aseptically into sterilized molten Asthana & Hawker's medium, so as to get concentration levels of 0, 10, 50 and 100 ppm. The amended medium was poured aseptically into sterilized petri-plates. Eight-mm mycelial discs from the margins of seven days old cultures of the isolates were placed centrally, separately and aseptically on the poured medium. The inoculated petri-plates were incubated at 29±1°C and observations for growth and morphological parameters were taken on 3rd and 5th day of incubation.

RESULTS AND DISCUSSION

All the fungicides were boserved to inhibit the mycelial growth and sclerotial characters of the isolates *in vitro.* Bavistin was the most effective followed by thiram, vitavax, dithane M-45 and captan. (Table 1 and Figs. 1, 2 & 3). Differential responses of the isolates were observed in different fungicides. The growth of all isolates was inhibited by thiram at all the concentrations, but the growth of isolates Rb6 and Rb7 was affected drastically at

Table 1 : Effect of fungicides on the morphological characters of different isolates of *R. bataticola*

Fungic -ide	Isolate	Conc. (ppm)	Colony	Hyphae	Sclerotia			
			Pattern / Margin	Pattern / Colour	L × W (μ)	Size / Shape	Pattern / Initiation	Colour
Control	Rb1	Nil	Appr./Even	Dn/LB to B	113.31 × 94.91	Md/R to O	Dn / Ely	B1
	Rb2		Flocc./Wavy	Dn/LB to B	108.38 × 95.81	Md/R to O	Dn / Ely	B1
	Rb3		Flocc./Wavy	Dn/B	86.22 × 75.83	Small/R to O	Sp / Ely	B1
	Rb4		Appr./Even	Sp/LB	128.25 × 114.94	Large/R to O	Dn / Ely	Bl
	Rb5		Flocc./Wavy	Dn/LB	98.22 × 88.81	Md/R to O	Dn / Ely	DB
	Rb6		Appr./Even	Dn/LB to B	119.86 × 110.98	Md/Irre	Dn / Ely	B1
	Rb7		Flocc./Wavy	Dn/LB to B	99.68 × 85.37	Md/R to O	Sp / Ely	B1
Dithane M-45 (Mancozeb)	Rb1	10	Appr./Irre	Dn/B	106.44 × 92.59	Md/E	Dn / Ely	DB
	Rb2		Flocc./Even	Dn/B	99.82 × 85.89	Md/Irre	Dn / Ely	B1
	Rb3		Flocc./Even	Dn/B	54.16 × 43.33	Small/R to O	Sp / Ely	DB
	Rb4		Appr./Wavy	Dn/B	126.75 × 117.00	Large/Irre	Dn / Ely	B1
	Rb5		Flocc./Irre	Dn/B	102.91 × 92.08	Md/R to O	Sp / Ely	B
	Rb6		Appr./Wavy	Dn/B	87.75 × 78.00	Md/R to O	Dn / Ely	DB
	Rb7		Flocc./Wavy	Dn/B	65.00 × 56.87	Small/R to O	Dn / Dly	DB
	Rb1	50	Appr./Irre	Dn/B	103.4o × 90.85	Md/R to O	Dn / Ely	B1
	Rb2		Cottony/Even	Sp/LB	77.76 × 68.09	Small/Irre	Dn / Dly	B1
	Rb3		Flocc./Irre	Dn/B	No Sclerotia			
	Rb4		Appr./Irre	Dn/B	106.36 × 90.96	Md/E	Dn / Ely	DB
	Rb5		Flocc./Wavy	Dn/LB	92.32 × 84.94	Md/R to O	Sp / Dly	B
	Rb6		—	—	—	—	—	—
	Rb7		Cottony/Wavy	Dn/B	59.58 × 54.46	Small/R to O	Sp / Dly	DB
	Rb1	100	—	—	—	—	—	—
	Rb2		Cottony/Even	Sp/H	52.00 × 48.75	Small/R to O	Sp / Dly	B1
	Rb3		Flocc./Even	Dn/B	—	—	—	—
	Rb4		Appr./Even	Sp/LB	86.66 × 73.12	Small/D	Dn / Dly	LB
	Rb5		Flocc./Abrupt	Dn/H to LB	65.00 × 56.87	Small/R to O	Sp / Ely	LB
	Rb6		—	—	—	—	—	—
	Rb7		—	—	—	—	—	—
Thiram (Tetra Methyl Thirum)	Rb1	10	Appr./Irre	Sp/H to LB	59.58 × 48.75	Small/R to O	Sp / Dly	B
	Rb2		Flocc./Wavy	Dn/B	97.50 × 86.6	Md/R to O	Sp / Dly	DB
	Rb3		Flocc./Wavy	Dn/B	63.98 × 54.84	Small/R to O	Sp / Dly	B
	Rb4		Appr./Even	Sp/B	86.66 × 81.25	Md/Irre	Sp / Dly	B
	Rb5		Flocc./Even	Sp/H to LB	70.41 × 61.38	Small/R to O	Sp / Ely	B
	Rb6		—	—	—	—	—	—
	Rb7		—	—	—	—	—	—
	Rb1	50	—	—	—	—	—	—
	Rb2		Flocc./Irre	Dn/B	63.83 × 56.10	Small/R to O	Dn / Dly	DB
	Rb3		—	—	—	—	—	—
	Rb4		—	—	—	—	—	—
	Rb5		—	—	—	—	—	—
	Rb6		—	—	—	—	—	—
	Rb7		—	—	—	—	—	—
	Rb1	100	—	—	—	—	—	—
	Rb2		—	—	—	—	—	—
	Rb3		—	—	—	—	—	—
	Rb4		—	—	—	—	—	—
	Rb5		—	—	—	—	—	—
	Rb6		—	—	—	—	—	—
	Rb7		—	—	—	—	—	—
	Rb1	10	Appr./Irre	Sp/H to LB	88.35 × 80.57	Small/R to O	Sp / Ely	DB
	Rb2		Flocc./Even	Dn/LB	115.2 × 97.88	Md/R to O	Sp / Ely	B1
	Rb3		Flocc./Irre	Sp/LB	56.87 × 49.91	Small/Irre	Sp / Ely	B
	Rb4		Appr./Wavy	Sp/H to Lb	117.4 × 97.50	Md/Irre	Sp / Ely	B1
	Rb5		Flocc./Irre	Dn/B	64.16 × 56.08	Small/R to O	Sp / Ely	B
	Rb6		Appr./Irre	Dn/B	85.89 × 78.92	Small/Irre	Dn / Ely	DB
	Rb7		Flocc./Irre	Dn/B	43.33 × 37.91	V. Small/D	Sp / Ely	B

Carboxin (vitavax)	Rb1		Appr./Irre	Sp/LB	72.73 × 68.86	Small/Irre	Sp / Ely	B
	Rb2		Flocc./Even	Dn/LB	96.33 × 86.27	Md/R to O	Sp / Dly	Bl
	Rb3		Flocc./Abrupt	Sp/H to LB	76.25 × 65.36	Small/D	Sp / Dly	B
	Rb4	50	Appr./Irre	Dn/H to LB	107.1 × 101.1	Md/R to O	Dn / Ely	B1
	Rb5		Flocc./Irre	Dn/B	54.68 × 49.65	Small/R to O	Sp / Dly	B
	Rb6		Appr./Irre	Sp/B	78.54 × 67.70	Small/Irre	Dn / Ely	DB
	Rb7		—	—	—	—	—	—
	Rb1		Appr./Even	Sp/H to LB	32.50 × 32.50	V. Small/D	Sp / Dly	B
	Rb2		Flocc./Abrupt	Sp/H to LB	62.36 × 56.94	Small/Irre	Sp / Dly	B1
	Rb3		Flocc./Even	Dn/H				
	Rb4	100	Appr./Irre	Sp/H		No sclerotia		
	Rb5		—	—	—	—	—	—
	Rb6		—	—	—	—	—	—
	Rb7		—	—	—	—	—	—
Carbendazim (Bavistin)	Rb1		—	—	—	—	—	—
	Rb2		—	—	—	—	—	—
	Rb3		—	—	—	—	—	—
	Rb4	10	—	—	—	—	—	—
	Rb5		—	—	—	—	—	—
	Rb6		—	—	—	—	—	—
	Rb7		—	—	—	—	—	—
	Rb1		—	—	—	—	—	—
	Rb2		—	—	—	—	—	—
	Rb3		—	—	—	—	—	—
	Rb4	50	—	—	—	—	—	—
	Rb5		—	—	—	—	—	—
	Rb6		—	—	—	—	—	—
	Rb7		—	—	—	—	—	—
	Rb1		—	—	—	—	—	—
	Rb2		—	—	—	—	—	—
	Rb3		—	—	—	—	—	—
	Rb4	100	—	—	—	—	—	—
	Rb5		—	—	—	—	—	—
	Rb6		—	—	—	—	—	—
	Rb7		—	—	—	—	—	—
Captan	Rb1		Appr./Irre	Dn/LB	96.39 × 81.89	Md/Irre	Dn / Ely	DB
	Rb2		Flocc./Wavy	Dn/B	126.0 × 101.7	Large/R to O	Dn / Ely	DB
	Rb3		Flocc./Even	Dn/B	67.61 × 61.23	Small/R to O	Sp / Ely	DB
	Rb4	10	Appr./Irre	Sp/LB	130.7 × 110.4	Large/Irre	Dn / Ely	B1
	Rb5		Flocc./Irre	Dn/B	95.44 × 85.00	Small/R to O	Sp / Ely	B1
	Rb6		Appr./Wavy	Sp/LB	109.6 × 81.25	Md/R to O	Dn / Ely	B1
	Rb7		Flocc./Even	Dn/B	85.68 × 72.61	Small/R to O	Sp / Dly	DB
	Rb1		Appr./Irre	Dn/LB	103.4 × 87.15	Md/Irre	Dn / Ely	DB
	Rb2		Flocc./Wavy	Dn/B	133.8 × 119.9	Large/R to O	Dn / Ely	B1
	Rb3		Flocc./Wavy	Dn/B	66.21 × 60.93	Small/R to O	Sp / Ely	DB
	Rb4	50	Appr./Abrupt	Sp/LB	147.7 × 120.3	Large/Irre	Dn / Ely	B1
	Rb5		Flocc./Wavy	Dn/B	90.20 × 86.66	Md/R to O	Sp / Ely	B1
	Rb6		Appr./Wavy	Sp/LB	91.40 × 83.28	Md/Irre	Dn / Ely	B1
	Rb7		Flocc./Even	Dn/H. to LB	79.32 × 68.21	Small/R to O	Sp / Dly	DB
	Rb1		Appr./Irre	Sp/LB	84.20 × 74.60	Small/Irre	Dn / Ely	B1
	Rb2		Flocc./Wavy	Dn/B	116.0 × 104.8	Md/R to O	Sp / Dly	DB
	Rb3		Flocc./Wavy	Dn/B	70.68 × 60.93	Small/R to O	Sp / Ely	DB
	Rb4	100	Appr./Wavy	Sp/LB	115.9 × 98.23	Md/Irre	Dn / Ely	B1
	Rb5		Flocc./Wavy	Sp/B	78.38 × 68.26	Small/R to O	Dn / Ely	B1
	Rb6		Appr./Wavy	Sp/B	84.94 × 76.81	Small/Irre	Dn / Ely	B1
	Rb7		Flocc./Even	Dn/H. to LB	73.12 × 65.00	Small/R to O	Sp / Dly	DB

Appr. — Appressed, Flocc. — Floccose, Irre — Irregular, Dn — Dense, Sp — Sparse, B — Brown, DB — Dark Brown, Bl — Black, LB — Light Brown, LB1 — Light Black, Md — Medium, R — Round, O — Oval, E — Elongated, Ely — Early, Dly — Delayed, H — Hyaline, V — Very, (c) — Several sclerotia coalesced : individual sclerotia lost the identity.

10 ppm. No or very poor growth and no sclerotia formation were observed at 50 and 100 ppm concentration in all the isolates except Rb2 at 50 ppm. Similar findings were also made by Ramadoss and Sivaprakasam (1987, 1994) and Patel and Patel (1990), who reported inhibitory action of thiram

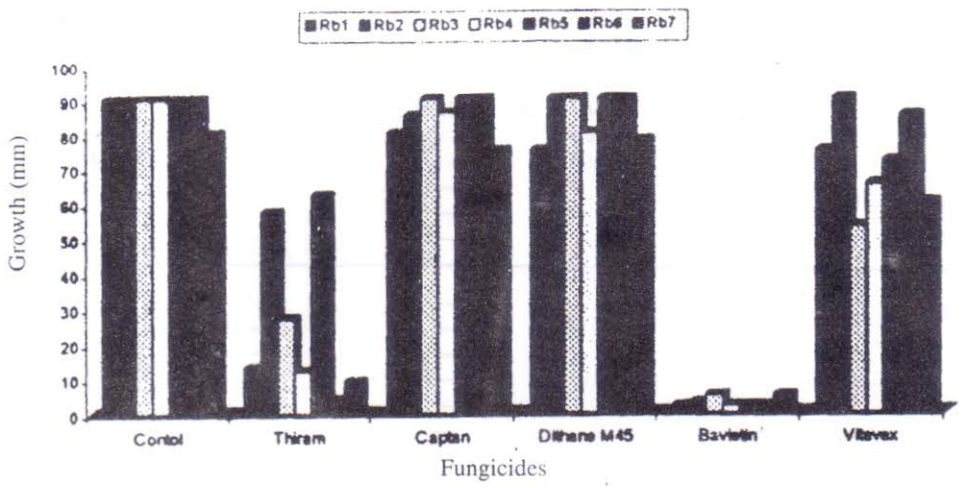

Fig. 1 : Effect of fungicides (10 ppm) on the growth of different isolates of *R. bataticola*

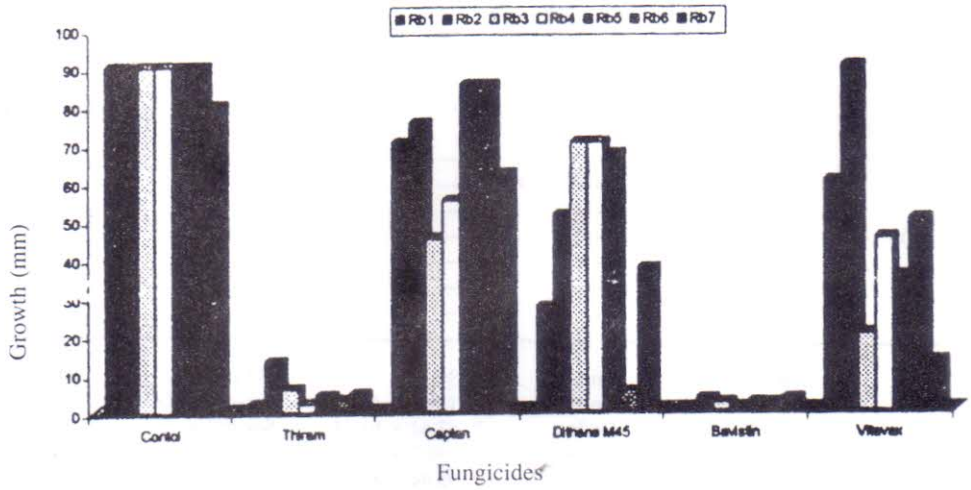

Fig. 2 : Effect of fungicides (50 ppm) on the growth of different isolates of *R. bataticola*

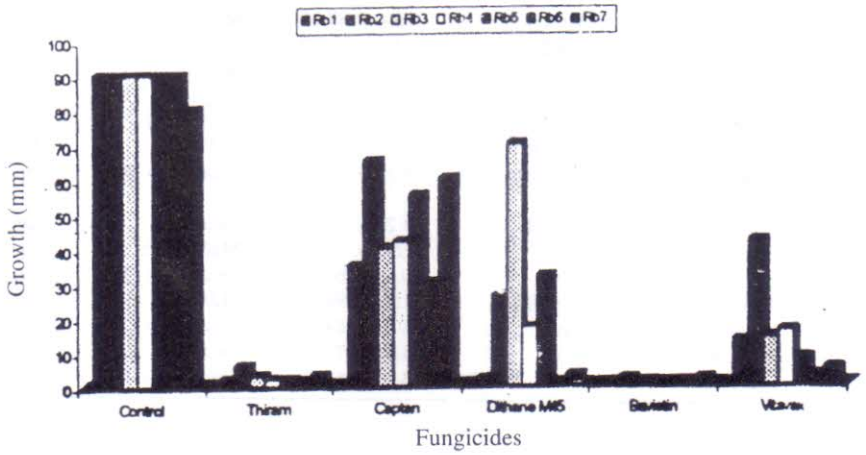

Fig. 3 : Effect of fungicides (100 ppm) on the growth of different isolates of *R. bataticola*

against *R. bataticola.* In captan, pronounced growth inhibition of isolates was recorded at higher concentrations as it had been reported by Lambhate *et al.* (2002).

At 50 and 100 ppm concentrations of dithane M-45 considerable growth and sclerotial characters inhibition were observed in all the isolates but drastic growth inhibition was recorded in isolates Rb1 and Rb7 at 100 ppm and in isolate Rb6 at both 50 and 100 ppm concentrations. No sclerotia were observed in isolate Rb3 at 50 and 100 ppm concentrations. Chhatannavar *et al.* (1988) stated the inhibitory effect of mancozeb on *R. bataticola.*

No or very poor growth and no sclerotia were observed in the isolates at all the concentrations of bavistin. The results are in agreement with the findings of Ramadoss and Sivaprakasam (1987, 1994) who reported at 100 ppm concentration, carbendazim was fungicidal to *R. bataticola.* Prashanthi *et al.* (2002) reported 100% inhibition of mean mycelial growth at 250, 500 and 1000 µg/ml concentration of carbendazim. Carbendazim prevented growth of fungus at 1-5 ppm (El-Habbaa *et al.,* 2002). Singh and Kaisar (1995) observed complete inhibition of growth of *R. bataticola* at low concentration of bavistin (30 ppm). Patel and Patel (1990) reported inhibitory action of bavistin to *R. bataticola.* In vitavax, poor growth was observed at 10 and 50 ppm in isolates. Isolates Rb3 and Rb7 were found very sensitive to vitavax even at 50 ppm concentration. At 100 ppm concentration vitavax was found fungicidal to isolates Rb5, Rb6 and Rb7. Sclerotia formation, shape and size also inhibited or varied with concentrations and isolates. This was further supported by Rauf *et al.* (1998) who reported growth inhibition of *R. bataticola* at 5 µg/ml of vitavax. Chhatannavar *et al.* (1988) observed vitavax at 1000 ppm inhibited growth of *R. bataticola in vitro* and Prajapati *et al.* (2002) noticed carboxin completely inhibited growth of *R. bataticola.*

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