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© Indian Mycological Society, Department of Botany,
University of Calcutta, Kolkata 700 019, India

Studies on factors affecting *Rhizoctonia bataticola* : V. Herbicide

K. M. JHA AND N. D. SHARMA
Department of Plant Pathology, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur 482004, M. P.

Antifungal properties of alachlor, fluchloralin, metolachlor, pendimethalin, isoproturon, metribuzin and oxyfluorfen were screened *in vitro* against isolates of *Rhizoctonia bataticola* by incorporating the herbicides in molten Asthana and Hawker's medium at 100 and 200 ppm concentrations. Oxyfluorfen and isoproturon inhibited the mycelial growth and affected sclerotial morphology more than the other herbicides tested. Isolates were observed to differ in their sensitivity to the herbicides.

Key words : *Rhizoctonia bataticola,* growth, sclerotial morphology, herbicides

INTRODUCTION

Weed control is an important concern in corp production because weeds interfere with crops plants for space, light, moisture and nutrients, which lead to low productivity. Now a days herbicides are widely used in agriculture for better crop production. These herbicides are applied either to the foliage or to the soil, thus both above ground and soil borne pathogens might have some non target affect. Considering this view some popular herbicides, which are widely used in soybean, cotton etc. are evaluated *in vitro* against *R. bataticola.*

MATERIALS AND METHODS

The herbicides namely, alachlor (lasso 50 EC), metolachlor (dual 50 EC), pendimethalin (stomp 30 EC), isoproturon (arelon 75 WP), fluchloralin (basalin 45 EC), metribuzin (sencor 70 WP) and oxyfluorfen (goal 23.5 EC) were evaluated *in vitro* against the isolates of *R. bataticola,* employing poisoned food technique. Herbicides were incorporated aseptically in sterilized molten Asthana and Hawker's medium so as to get concentration levels of 0, 100 and 200 ppm. The amended medium was poured aseptically in sterilized petri-plates in triplicate for each treatment. Eight-mm mycelical discs of the isolates of *R. bataticola* cut from the margins of seven days old cultures were placed centrally in each of the petri-plates separately and aseptically. Inoculated plates were incubated at 29±1°C and observation for growth and morphological characters were recorded on 3rd and 5th day of incubation.

RESULTS AND DISCUSSION

The results of the investigation shown in (Table 1 and Figs. 1 & 2), indicated that herbicides significantly inhibited mycelial growth and production of sclerotia of the isolates at both the concentrations. No significant inhibition differences on growth and sclerotial formation were observed at the two concentrations tried except in treatment with oxyfluorfen and isoproturon. Alachlor at both the concentrations (100 and 200 ppm) inhibited the hyphal growth of all the isolates. Similar finding was reported by Kulkarni *et al.* (1992), Desai *et al.* (1987) and Russin *et al.* (1995). Considerable growth reduction was also observed in fluchloralin at both concentrations. Kulkarni *et al.* (1992) and Siddaramaiah *et al.* (1980) who reported that fluchloralin was inhibitory to *R. bataticola* at all the concentrations from 25 to 4000 ppm and caused

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

Herbi -cide	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	107.99 × 92.08	Md/R to O	Dn / Ely	DB
	Rb2		Flocc./Wavy	Dn/LB to B	116.46 × 93.09	Md/R to O	Dn / Ely	DB
	Rb3		Cottony/Wavy	Dn/B	80.44 × 73.62	Small/R to O	Dn / Ely	DB
	Rb4		Appr./Wavy	Sp/B	132.39 × 110.2	Large/R to O	Dn / Ely	Bl
	Rb5		Flocc./Wavy	Dn/LB	94.41 × 77.51	Md/R to O	Dn / Ely	B1
	Rb6		Appr./Even	Dn/B	117.28 × 107.2	Md/Irre	Dn / Ely	DB
	Rb7		Cottony/Wavy	Dn/B	91.33 × 76.46	Md/R to O	Sp / Ely	B1
Alachlor (Lasso)	Rb1	100	Appr./Irre	Dn/B	91.30 × 84.50	Md/R to O	Dn / Ely	B1
	Rb2		Appr./Wavy	Dn/B	88.47 × 79.44	Small/Irre	Dn / Dly	B1
	Rb3		Flocc./Irre	Dn/H		No sclerotia		
	Rb4		Appr./Even	Sp/H	98.85 × 92.08	Md/R to O	Dn / Ely	B1
	Rb5		Flocc./Irre	Dn/LB	77.18 × 69.06	Small/R to O	Sp / Ely	DB
	Rb6		Appr./Even	Dn/B	95.69 × 88.47	Md/Irre	Dn / Ely	B1
	Rb7		Flocc./Wavy	Dn/B		No sclerotia		
	Rb1	200	Appr./Irre	Dn/B	93.20 × 84.39	Md/R to O	Dn / Dly	B1
	Rb2		Appr./Irre	Dn/B	89.56 × 78.25	Small/Irre	Dn / Ely	B1
	Rb3		Flocc./Wavy	Dn/H		No Sclerotia		
	Rb4		Appr./Wavy	Sp/H	116.07 × 102.1	Md/R to O	Dn / Ely	B1
	Rb5		Appr./Irre	Dn/LB	74.68 × 68.19	Small/Irre	Sp / Dly	DB
	Rb6		Appr./Wavy	Dn/Lb to B	86.12 × 76.37	Small/Irre	Dn / Ely	B1
	Rb7		Flocc./Wavy	Dn/B		No sclerotia		
Fluchloralin (Basalin)	Rb1	100	Appr./Irre	Dn/LB to B	90.25 × 80.68	Md/R to O	Dn / Ely	B1
	Rb2		Appr./Irre	Dn/B	70.41 × 64.16	Small/Irre	Dn / Ely	B1
	Rb3		Flocc./Irre	Dn/H		No sclerotia		
	Rb4		Appr./Wavy	Sp/H	105.62 × 91.0	Md/R to O	Dn / Ely	B1
	Rb5		Flocc./Irre	Dn/B	79.21 × 73.10	Small/Irre	Dn / Ely	DB
	Rb6		Appr./Irre	Dn/B	107.25 × 95.87	Md/R to O	Dn / Ely	B1
	Rb7		Flocc./Wavy	Dn/B		No sclerotia		
	Rb1	200	Appr./Irre	Dn/LB	92.33 × 84.56	Md/R to O	Dn / Ely	B1
	Rb2		Appr./Irre	Dn/LB to B	101.56 × 89.37	Md/Irre	Dn / Ely	B1
	Rb3		Flocc./Even	Dn/H		No sclerotia		
	Rb4		Appr./Irre	Sp/H	102.44 × 92.30	Md/R to O	Dn / Ely	B1
	Rb5		Flocc./Irre	Dn/B	83.11 × 76.28	Small/Irre	Dn / Ely	DB
	Rb6		Appr./Irre	Dn/B	103.50 × 96.24	Md/R to O	Dn / Ely	B1
	Rb7		Flocc./Wavy	Dn/B		No sclerotia		
Pendimethalin (Stomp)	Rb1	100	Appr./Irre	Dn/LB	82.87 × 76.60	Small/R to O	Dn / Ely	B1
	Rb2		Flocc./Wavy	Dn/LB to B	91.92 × 79.46	Md/Irre	Dn / Ely	B1
	Rb3		Flocc./Irre	Dn/H		No sclerotia		
	Rb4		Appr./Irre	Sp/H	100.75 × 91.00	Md/R to O	Dn / Ely	B1
	Rb5		Flocc./Irre	Dn/LB	78.92 × 69.64	Small/Irre	Dn / Ely	B1
	Rb6		Appr./Wavy	Sp/LB	84.86 × 75.83	Small/R to O	Sp / Ely	B1
	Rb7		Flocc./Wavy	Dn/B		No sclerotia		
	Rb1	200	Appr./Irre	Sp/LB	88.35 × 79.66	Small/R to O	Dn / Ely	B1
	Rb2		Flocc./Irre	Dn/B	95.72 × 87.62	Md/Irre	Dn / Ely	B1
	Rb3		Flocc./Wavy	Dn/H		No Sclerotia		
	Rb4		Appr./Wavy	Sp/H	109.10 × 97.50	Md/R to O	Dn / Ely	B1
	Rb5		Flocc./Irre	Dn/LB	71.62 × 65.00	Small/I re	Dn / Ely	B1
	Rb6		Appr./Irre	Dn/B	80.77 × 74.26	Small/R to O	Dn / Ely	B1
	Rb7		Flocc./Wavy	Dn/B		No sclerotia		
	Rb1	100	Appr./Irre	Dn/LB	89.62 × 81.31	Small/R to O	Dn / Ely	B1
	Rb2		Appr./Irre	Dn/B	104.46 × 95.17	Md/R to O	Dn / Ely	B1
	Rb3		Flocc./Abrupt	Dn/H		No sclerotia		
	Rb4		Appr./Irre	Sp/H	99.53 × 85.25	Md/R to O	Dn / Ely	B1
	Rb5		Flocc./Irre	Dn/LB	62.67 × 55.71	Small/R to O	Sp / Ely	B1
	Rb6		Appr./Even	Dn/LB to B	99.82 × 83.57	Md/R to O	Dn / Ely	B1
	Rb7		Flocc./Abrupt	Dn/B	44.68 × 36.56	V. Small/R to O	Sp /-	DB

Oxyfluorfen (Goal)	Rb1		Appr./Irre	Dn/LB	84.59 × 76.36	Small/R to O	Dn / Ely	Bl
	Rb2		Appr./Irre	Dn/B	110.4 × 100.11	Md/R to O	Dn / Ely	Bl
	Rb3		Flocc./Abrupt	Dn/H		No sclerotia		
	Rb4	200	Appr./Wavy	Sp/H	102.21 × 89.92	Md/R to O	Dn / Ely	B1
	Rb5		Flocc./Irre	Dn/LB	60.59 × 56.24	Small/R to O	Sp / Ely	DB
	Rb6		Appr./Wavy	Dn/LB to B	105.63 × 89.44	Md/R to O	Dn / Ely	B1
	Rb7		Flocc/Wavy	Dn/B		No sclerotia		
Metolachlor (Dual)	Rb1		Appr./Irre	Dn/LB	92.08 × 81.25	Md/R to O	Dn / Ely	B1
	Rb2		Appr./Irre	Dn/LB to B	103.16 × 92.91	Md/Irre	Dn / Ely	B1
	Rb3		Flocc./Wavy	Dn/H		No sclerotia		
	Rb4	100	Appr./Irre	Sp/H	110.5 × 88.50	Md / R to O	Dn / Ely	B1
	Rb5		Flocc./Irre	Dn/LB	58.5 × 48.75	Small / R to O	Sp / Ely	DB
	Rb6		Appr./Wavy	Dn/B	94.25 × 81.25	Md / R to O	Dn / Ely	B1
	Rb7		Flocc./Wavy	Dn/LB		No sclerotia		
	Rb1		Appr./Irre	Dn/LB	90.66 × 83.63	Md/R to O	Dn / Ely	B1
	Rb2		Appr./Irre	Dn/LB to B	105.62 × 97.50	Md/Irre	Dn / Ely	B1
	Rb3		Flocc./Wavy	Dn/H		No sclerotia		
	Rb4	200	Appr./Irre	Sp/H	101.56 × 95.50	Md / R to O	Dn / Ely	B1
	Rb5		Flocc./Irre	Dn/LB	55.79 × 46.25	Small / R to O	Sp / Dly	DB
	Rb6		Appr./Wavy	Dn/B	90.37 × 80.66	Md / R to O	Dn / Ely	B1
	Rb7		Flocc./Wavy	Dn/LB		No sclerotia		
Isoproturon (Arelon)	Rb1		Appr./Abrupt	Dn/H to LB	94.25 × 78.25	Md/R to O	Dn / Ely	B1
	Rb2		Appr./Irre	Dn/H to LB	107.87 × 98.68	Md/R to O	Sp / Ely	B1
	Rb3		Flocc./Wavy	Dn/H		No sclerotia		
	Rb4	100	Appr./Irre	Sp/H to LB	122.28 × 106.7	Large/R to O	Dn / Ely	B1
	Rb5		Flocc./Wavy	Dn/H to LB	51.40 × 46.04	Small/R to O	Sp / Ely	DB
	Rb6		Appr./Wavy	Sp/H to LB	90.27 × 79.44	Md/Irre	Dn / Ely	B1
	Rb7		Flocc./Wavy	Dn/B		No sclerotia		
	Rb1		Appr./Abrupt	Dn/H to B	96.50 × 81.25	Md/R to O	Dn / Ely	B1
	Rb2		Appr./Abrupt	Dn/B	97.50 × 89.37	Md/R to O	Dn / Ely	B1
	Rb3		Flocc./Wavy	Dn/H		No sclerotia		
	Rb4	200	Appr./Irre	Dn/H to LB	118.39 × 102.1	Md/R to O	Sp / Ely	B1
	Rb5		Flocc./Wavy	Dn/H to LB	50.56 × 46.23	Small/R to O	Sp / Dly	DB
	Rb6		Appr./Wavy	Dn/H to LB	100.25 × 91.00	Md/Irre	Dn / Ely	B1
	Rb7		Flocc./Wavy	Dn/B		No sclerotia		
Metribuzin (Sencor)	Rb1		Appr./Irre	Dn/LB	84.50 × 81.25	Small/R to O	Dn / Ely	B1
	Rb2		Flocc./Wavy	Dn/LB1	32.65 × 30.22	V. Small/R to O	Dn / Ely	DB to B1
	Rb3		Flocc./Irre	Dn/H		No sclerotia		
	Rb4	100	Appr./Irre	Sp/H to LB	102.91 × 92.08	Md/R to O	Dn / Ely	B1
	Rb5		Flocc./Wavy	Dn/H to LB	39.46 × 27.85	V. Small/R to O	Sp / Ely	DB
	Rb6		Appr./Wavy	Dn/B	77.18 × 69.06	Small/R to O	Dn / Dly	B1
	Rb7		Flocc./Wavy	Dn/B		No sclerotia		
	Rb1		Appr./Irre	Dn/LB	80.59 × 75.36	Small/R to O	Dn / Dly	B1
	Rb2		Appr./Irre	Dn/LB1	74.28 × 65.00	Small/Irre	Dn / Ely	DB
	Rb3		Flocc./Wavy	Dn/H		No sclerotia		
	Rb4	200	Appr./Irre	Dn/H to LB	108.33 × 89.37	Md/R to O	Dn / -	B1
	Rb5		Flocc./Irre	Dn/H		No sclerotia		
	Rb6		Appr./Wavy	Dn/B	73.11 × 65.00	Small/R to O	Dn / Ely	B1
	Rb7		Flocc./Wavy	Dn/B		No sclerotia		

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.

complete inhibition of the fungus at 4000 ppm.

Growth inhibition was also observed in pendimethalin, metolachlor and metribuzin but drastic growth inhibition in all the isolates was noticed at both the concentrations of oxyfluorfen and isoproturon. Herbicides were observed to affect the sclerotial characters. Sclerotial size number of sclerotia were found to decrease. No sclerotia were observed in isolates Rb3 and Rb7 in all the treatments except at 100 ppm concentration of oxyflurofen in isolate Rb7. This confirmed the high

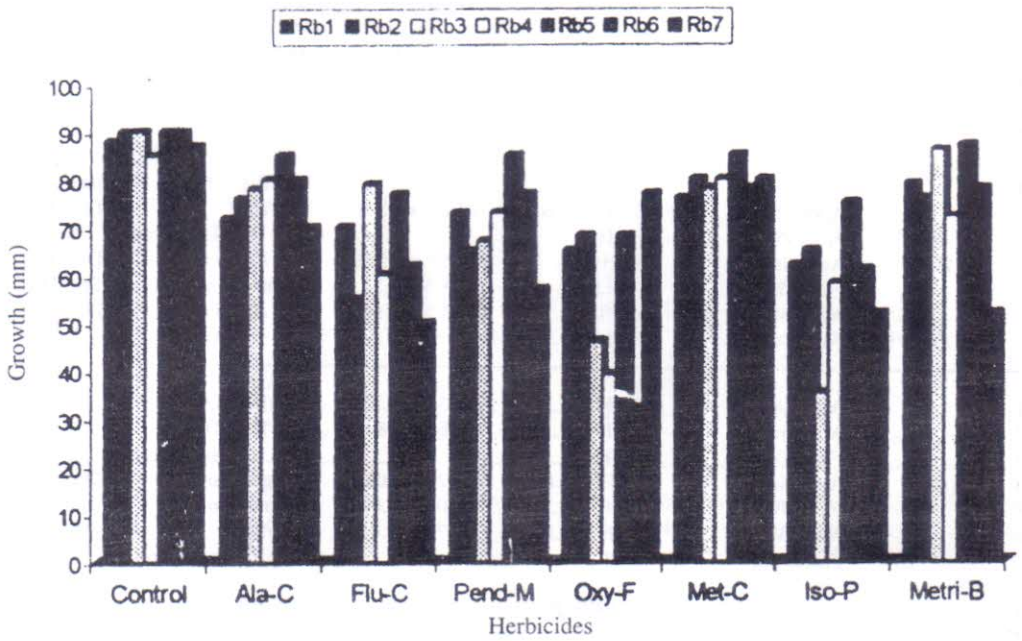

Fig. 1 : Effect of herbicides (100 ppm) on the growth of different isolates of *R. bataticola*

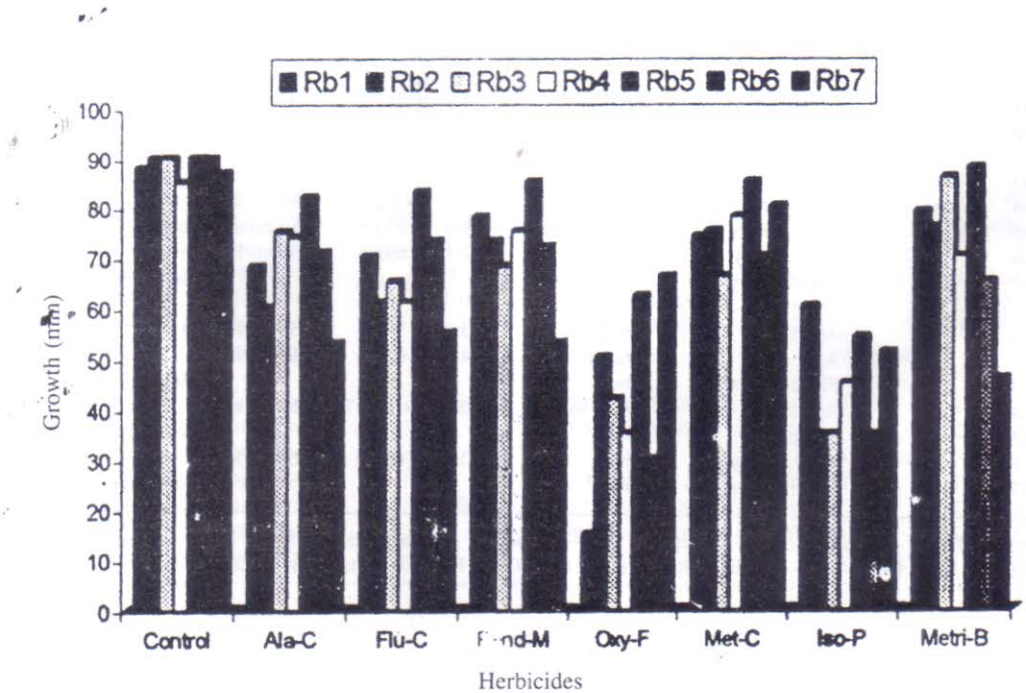

Fig. 2 : Effect of herbicides (200 ppm) on the growth of different isolates of *R. bataticola*

sensitively of isolates Rb3 and Rb7 towards herbicides. Similar findings were also made by Vyas *et al.* (1982) for *Sclerotium rolfsii.*

Differences in the sensitivity of the isolates to herbicides were also observed. Such differences may be due to direct toxic actions of the herbicides that caused interference with the fungal physiological and biochemical processes differently. Herbicides act as mitotic poison, an uncouplar or an agent, which affects essential metabolic processes such as protein and nucleic acid synthesis. Bain (1961) showed *M. phaseolina* inoculum density was reduced by dinoseb which might have resulted from a direct toxic effect on fungus.

Trifluoralin end EPTC at 10, 25, 25 and 100 µg/ml decreased the utilization of glucose, nitrate nitrogen and inorganic phosphate (Rodriguez-Kabana *et al.*, 1970). Bozarth (1966) showed that paraquat interfere with electron transport system in certain fungi and bacteria.

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