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Studies on factors affecting *Rhizoctonia bataticola* : III Sulphur Compounds

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Seven sulphur compounds viz., potassium sulphate (K_2SO_4), potassium metabisulphate ($K_2S_2O_5$), sodium thiosulphate ($Na_2S_2O_3$ $5H_2O$), sodium sulphite (Na_2SO_3), calcium sulphate ($CaSOa_4$ $2H_2O$), thiourea (NH_2CSNH_2) and elemental sulphur (S) were evaluated against isolates of *R. bataticola* by substituting the amount of sulphur in the basal medium (Asthana and Hawker's medium). Thiourea was most effective in inhibiting mycelial growth and sclerotial morphology followed by sodium sulphite and sodium thiosulphate. Elemental sulphur, potassium sulphate and potassium meta bisulphate had no or negligible effect on mycelial growth and sclerotial morphology. The mycelial growth was observed to be promoted in calcium sulphate.

Key words : *Rhizoctonia bataticola*, sulphur compounds, growth, sclerotial morphology

INTRODUCTION

The importance of sulphur in the nutrition of fungi has been well established. The presence of sulphur in different forms is traced in mycelium and spores of fungi. It has a structural importance as a constituent of proteins and has a metabolic significance in the prosthetic (–SH) group of some enzymes and coenzymes (Lilly and Barnett, 1951). Fungi may be variously affected by different sulphur compounds and the efficiency with which they utilize the different sources varies from organism to organism (Cochrane, 1965). Role of sulphur has also been well established in controlling plant diseases and sulphur also have inhibitory effect on sclerotia formation (Chet and Henis, 1975). In the light of these facts, a study of sulphur utilization and their effects on isolates of *R. bataticola* have been taken up for investigation.

MATERIALS AND METHODS

Seven sources of sulphur viz., potassium sulphate (K_2SO_4), potassium metabisulphate ($K_2S_2O_5$), sodium thiosulphate ($Na_2S_2O_3$ $5H_2O$), sodium sulphite (Na_2SO_3), calcium sulphate ($CaSO_4$ $2H_2O$), thiourea (NH_2CSNH_2) and elemental sulphur (S) were taken to evaluate their effect on the seven isolates of *R. bataticola.* Asthana & Hawker's medium was used as basal medium. The various sources of sulphur were singly substituted in the basal medium for magnesium sulphate ($MgSO_4$ $7H_2O$). Care was taken to supply the same quantity of sulphur that was present in the basal medium. The substituted medium was autoclaved and poured in plates. The poured plates were inoculated after 24 hrs with 8 mm discs from the margins of seven days old cultures of seven *R. bataticola* isolates and inoculated plates were incubated at 29 ± 1°C. Observations for growth and morphological characters were made on 3rd and 5th day of incubation.

RESULTS AND DISCUSSION

The results of the effects of the sulphur compounds on the isolates of *R. bataticola* shown in (Table 1 and Fig. 1) indicated that thiourea was the most effective in which mycelial growth was only around the disc and no sclerotia were observed. Significant mycelial growth inhibition and effect on sclerotial characters were also recorded for sodium sulphite

Table 1 : Effect of sulphur on morphological characters of *R. bataticola* isolates.

Sulphur	Isolate	Colony	Hyphae		Sclerotia		
		Pattern / Margin	Pattern / Colour	L × W (μ)	Size / Shape	Pattern / Initiation	Colour
Control ($MgSO_4.7H_2O$)	Rb1	Appr./Even	Dn/LB to B	108.29 × 94.66	Md/R to O	Dn / Ely	DB
	Rb2	Flocc./Wavy	Dn/LB to B	112.46 × 90.11	Md/R to O	Dn / Ely	B1
	Rb3	Flocc./Wavy	Dn/LB toB	83.33 × 72.61	Small/R to O	Sp / Ely	B1
	Rb4	Appr./Even	Sp/H. to LB	128.25 × 114.34	Large/R to O	Dn / Ely	Bl
	Rb5	Flocc./Wavy	Dn/LB to B	113.33 × 99.21	Md/R to O	Dn / Ely	DB
	Rb6	Appr./Even	Dn/LB	114.44 × 102.11	Md/Irre	Dn / Ely	B1
	Rb7	Flocc./Wavy	Dn/B	90.53 × 79.70	Md/R to O	Sp / Ely	DB
Sodium sulphite (Na_2SO_3)	Rb1	—	—	—	—	—	—
	Rb2	Cottony/Abrupt	Dn/B	82.26 × 68.72	Small/Irre	Sp / Dly	B1
	Rb3	Flocc./Irre	Dn/LB to B	49.68 × 42.12	V. Small/R to O	Sp / Dly	B
	Rb4	Appr./Irre	Sp/H. to LB	75.83 × 59.58	Small/R to O	Dn / Ely	LB
	Rb5	Cottony/Wavy	Dn/LB	54.84 × 51.45	Small/R to O	Sp / Dly	DB
	Rb6	—	—	—	—	—	—
	Rb7	Flocc./Wavy	Dn/B	66.71 × 54.73	Small/R to O	Sp / Dly	DB
Sodium thiosulphite ($Na_2S_2O_3$)	Rb1	Appr./Irre	Sp/B	85.47 × 70.52	Small/R to O	Dn / Ely	DB
	Rb2	Flocc./Abrupt	Dn/B	111.15 × 96.2	Md/R to O	Dn / Dly	DB
	Rb3	Flocc./Even	Dn/B	40.62 × 38.59	V. Small/R to O	Sp / Ely	B1
	Rb4	Appr./Irre	Sp/LB	119.37 × 99.68	Md /R to O	Dn / Ely	B1
	Rb5	Flocc./Abrupt	Dn/LB	61.61 × 54.50	Small/R to O	Sp / Dly	B1
	Rb6	Appr./Irre	Dn/B	96.63 × 84.22	Md /R to O	Dn / Ely	B1
	Rb7	Flocc./Wavy	Dn/LB	67.03 × 59.58	Small/R to O	Dn / Dly	B
Thiourea (NH_2CSNH_2)	Rb1	—	—	—	—	—	—
	Rb2	—	—	—	—	—	—
	Rb3	—	—	—	—	—	—
	Rb4	—	—	—	—	—	—
	Rb5	—	—	—	—	—	—
	Rb6	—	—	—	—	—	—
	Rb7	—	—	—	—	—	—
Potassium meta bisulphate ($K_2S_2O_5$)	Rb1	Appr./Irre	Sp/B	99.19 × 84.29	Md/R to O	Dn / Ely	DB
	Rb2	Flocc./Irre	Dn/B	111.04 × 99.05	Md/Irre	Dn / Ely	B1
	Rb3	Flocc./Abrupt	Dn/LB to B	58.35 × 50.09	Small/R to O	Sp / Dly	B1
	Rb4	Appr./Irre	Sp/H. to LB	102.23 × 79.89	Md/O to E	Dn / Ely	B1
	Rb5	Flocc./Irre	Dn/B	98.69 × 94.31	Md/R to O	Sp / Ely	B1
	Rb6	Appr./Irre	Dn/LB	94.80 × 89.69	Md/R to O	Dn / Ely	B1
	Rb7	Flocc./Irre	Dn/B	68.63 × 59.23	Small/R to O	Sp / Dly	DB
Calcium sulphate ($CaSO_4.2H_2O$)	Rb1	Appr./Irre	Sp/L B1	109.69 × 91.81	Md/R to O	Dn / Ely	B1
	Rb2	Flocc./Wavy	Dn/LB	112.12 × 96.68	Md/R to O	Dn / Ely	B1
	Rb3	Flocc./Irre	Dn/LB	78.68 × 70.22	Small/R to O	Sp / Ely	DB
	Rb4	Appr./Irre	Dn/LB	143.80 × 116.18	Large/E	Dn / Ely	B1
	Rb5	Flocc./Irre	Dn/LB	95.46 × 84.09	Small/R to O	Sp / Ely	DB
	Rb6	Appr./Even	Sp/LB	95.46 × 84.09	Md/R to O	Dn / Ely	DB
	Rb7	Flocc./Wavy	Dn/H. to LB	92.08 × 81.25	Md/R to O	Sp / Dly	B1
Potassium sulphate (K_2SO_4)	Rb1	Appr./Irre	Dn/LB	103.18 × 88.56	Md/R to O	Dn / Ely	B1
	Rb2	Flocc./Wavy	Dn/LB	100.75 × 89.37	Md/R to O	Dn / Ely	B1
	Rb3	Flocc./Irre	Dn/LB	52.39 × 46.11	Small/R to O	Sp / Ely	B1
	Rb4	Appr./Irre	Dn/LB	99.31 × 82.29	Md/R to O	Dn / Ely	B1
	Rb5	Flocc./Irre	Dn/LB	97.50 × 89.37	Md/R to O	Sp / Ely	DB
	Rb6	Appr./Even	Sp/LB	93.22 × 82.29	Md/R to O	Dn / Ely	DB
	Rb7	Flocc./Wavy	Dn/B	73.40 × 62.47	Small/R to O	Dn / Dly	DB
Elemental sulphur (S)	Rb1	Appr./Wavy	Sp/L B1	104.56 × 88.31	Md/R to O	Dn / Ely	B1
	Rb2	Flocc./Irre	Dn/LB	102.65 × 89.33	Md/E	Dn / Dly	B1
	Rb3	Flocc./Irre	Dn/LB	68.11 × 59.34	Small/R to O	Sp / Dly	B1
	Rb4	Appr./Irre	Sp/LB	128.25 × 114.94	Large/R to O	Dn / Ely	B1
	Rb5	Flocc./Wavy	Dn/LB	89.11 × 78.23	Small/R to O	Sp / Dly	DB
	Rb6	Appr./Even	Sp/LB	94.33 × 83.23	Md/R to O	Dn / Ely	DB
	Rb7	Flocc./Wavy	Dn/B	82.11 × 73.29	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,

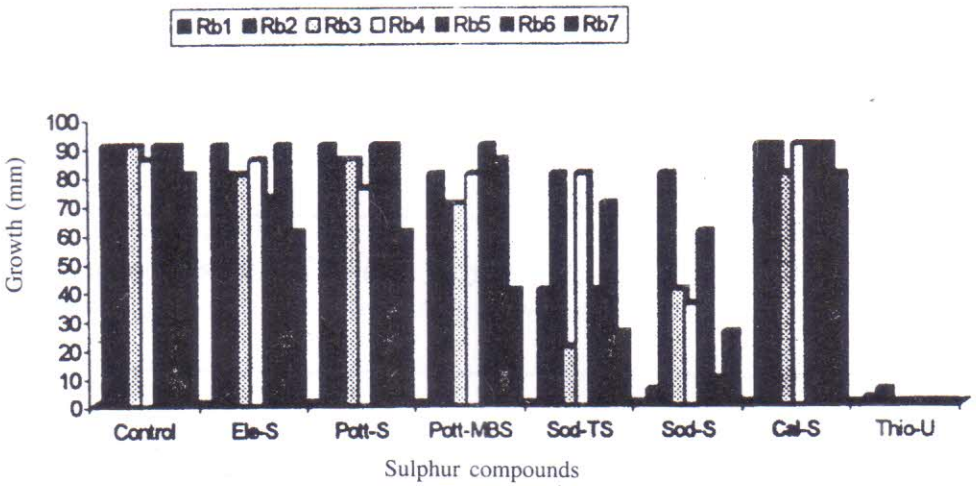

Fig. 1 : Effect of different sources of sulphur nutrition on the growth of different isolates of *R. bataticola*

and sodium thiosulphate. These findings are in accordance with Rai and Srivastava (1977) who showed poor utilization of sulphur from thiourea and sodium bisulphite by *M. phaseolina* isolates which resulted in poor mycelial growth and sclerotia formation. In elemental sulphur, potassium sulphate and potassium metabisulphate, and calcium sulphate. no or negligible growth was observed. Mostly delayed sclerotial initiation was observed in isolates Rb_2, Rb_3, Rb_5 and Rb_7, with sodium sulphite, elemental sulphur and sodium thiosulphate.

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