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In vitro evaluation of agrochemicals, plant extracts and biological antagonists against sclerotial wilt of sunflower caused by *Sclerotium rolfsii*

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A field survey on sunflower disease in Orissa condition revealed that *Sclerotium rolfsii* was the causal pathogen of wilt of the sunflower oil seed corp. A study was undertaken *in vitro* for control of said isolated pathogen. Altogether nineteen formulations of different fungicides, bioagents and botanicals were taken up to test their efficacy in restricting the growth of *Sclerotium rolfsii*. Among the fungicides Captan, Thiram, Blitox 50, Benlate, Manzate, Topsin-M were used at different concentrations. Similarly *Trichoderma harzianum, Trichoderma viride, Gliocladium virens, Streptoverticillium* sp. were tested against the isolated pathogen as bioagents. Certain botanicals likel *Azadiracta indica, Allium sativum, Curcuma longa, Ocimum sanctum* and *Rauwolfia serpentina,* were also tried for control of the *Sclerotium rolfsii*.

Among the fungicides hundred per cent inhibition was noticed in case of Contaf, Captan, Thiram, Benlate and Manzate. *Streptoverticillum* gave the best result against the pathogen. *Rauwolfia serpentina* as one of the botanicals effectively controlled *Sclerotium rolfsii*.

Key words : *Helianthus annus*, *Sclerotium rolfsii*, plant extract, agro chemicals, biological anatagonists

INTRODUCTION

Sunflower (*Helianthus annus*) is one of the major oil seed crops of India. In Orissa, the production of sunflower with average seed yield of 551 kg/ha is very low as compared to the other states. One of the main reasons for such low productivity of the corp is due to the damage caused by the pests and diseases which causes extensive damage to the sunflower crops. The occurrence of Sclerotial wilt/ root rot of the crop was reported in India by Kolte and Mukhopadhyay (1973). The disease is found to be predominant in almost all the sunflower growing districts of Orissa.

Six fungicides have been tested against *Sclerotium rolfsii* (Chakraborty and Bhowmik, 1985). Earlier Thiram has shown best inhibiting effect against sclerotial germinationn, mycelial growth etc. followed by Ceresan wet. Reports of better performance has been shown by Vitavax, Thiram and Emisan-6 against control of *Sclerotium rolfsii* in sunflower in pot experiments when used as seed dressing (Dalvi and Raut 1987). *Sclerotium viride* has been found to be highly effective against *Sclerotium rolfsii* in culture followed by *Bacillus subtilis* (Chakraborty and Bhowmik, 1985). Keeping this in view, an attempt has been made to screen 19 different formations against *Sclerotium rolfsii* causing sclerotial wilt of sunflower in Orissa. Formulations include eight agrochemicals, six plant extracts and five biological antagonists.

MATERIALS AND METHODS

Sclerotium wilt which affected planted parts of susceptible sunflower veriety, 'Sungold Double' was collected during July 2002 and the causal organism, *Sclerotium rolfsii* was isolated. Cultures were purified by agar plate method, tested for pathogenecity and maintained in potato dextrose agar (PDA) slants. Poison food media were prepared using selected concentrations of eight different fungicides. Five plant extracts (neem, garlic, turmeric, tulsi, patalgaruda) were prepared by crushing 200 g fresh leaves, bulbs, as the case may

by, using sterilized water. Solutions were filtered and centrifuged at 5,000 rpm for five minutes. Clear supernatant solution thus obtained were used in preparation of poison food PDA media. Equal sized core disc (5.0 mm) of seven days old cultures of biological antagonists *Tricho-derma harzianum, T. viride, Gliocladium vireus* (two strains) and *Streptoverticillium* sp. was used (placed in two corners) to study the growth inhibition of test fungus (placed in center) by dual culture method. Efficacy of the formulations was measured as percentage of growth inhibition using the formula adopted by Vincent (1947). Mean percentage inhibition was calculated using the following formula e.g. C – T/C × 100, where C = colony diameter in control, T = colony diameter in treatment.

Inoculated plates were incubated at room temperature (28 ± °C). Observations of colony diameter were taken at an interval of 24 h till there was full growth in control plates.

RESULTS AND DISCUSSION

The per cent growth inhibition of eight fungicides were assayed *in vitro* against *Sclerotium rolfsii* and the data are presented the Table 1. Captan, Thiram, Manazate, Contaf and Benlate showed hundred per cent inhibition but Contaf was found to be the best at low concentration i.e. 0.1%. Bavistin and Topsin-M showed least inhibition of growth at a concentration of 0.15%.

Table 1 : Efficacy of different fungicides against *S. rolfsii in vitro*

Fungicides (Trade name)	Concentration used (%)	Mean dia. of fungal growth in (mm)	% of inhibition over control
Captan	0.3	0	100
Thiram	0.3	0	100
Blitox-50	0.5	30	66.7
Bavistin	0.15	73	18.9
Manzate	0.3	0	100
Contaf	0.1	0	100
Benlate	0.2	0	100
Topsin-M	0.15	78.67	12.6
Control	—	90	0
SEM		0.38	0.015
C.D. (0.05)		1.13	0.15

Five plant extracts were evaluated against *Sclerotium rolfsii* (Table 2). Out of five, *Rauwolfia serpentina* was found to be best at different concentration. Among the biological antagonists (Table 3). *Streptoverticillium* (SVNR7) inhibited the growth of the test fungus (*Sclerotium rolfsii*) to the maximum extent closely followed by *Gliocladium virens* (GV_3). *Trichoderma viride* could inhibit the growth of test fungus though not as satisfactory as $SVNR_7$ and GV_3. *Trichoderma harzianum* and *Gliocladium virens* were at per and lowest in the order with respect to inhibition of growth of the test fungus.

Table 2 : Efficacy of some botanical against *S. rolfsii in vitro*

Plant extract	% of inhibition over control		
	Effective concentration (V/V)		
	1 : 5	1 : 10	1. 20
Neem (*Azadiracta indica*)	35.6	27.9	22.5
Garlic (*Allium sativum*)	38.9	27.6	23.1
Turmeric (*Curcuma longa*)	30.3	23.0	13.8
Tulsi (*Ocimum sanctum*)	38.4	20.4	16.3
Patalagaruda (*Rauwolfia serpentina*)	55.6	50.1	38.3
E.M.S.	0.23	0.21	0.26
C.D. (0.05)	0.73	0.65	0.81

Table 3 : Growth inhibition of *S. rolfsii* by antagonists in dual cultures

Antagonists	Mean dia. of test fungus in (mm)	% inhibition
Trichoderma harzianum (TH)	69.25	23.1
Trichoderma viride (TV8)	64.50	28.5
Gliocladium virens (GV2)	69.00	23.4
Gliocladium virens (GV3)	59.25	34.2
Streptoverticilium sp. SVNR7	58.75	34.7
SEM	2.03	
C.D. (0.05)	6.25	NS

The results indicated that Contaf can be tried as soil drench for reducing disease intensity and increasing yield. The crude plant extracts of *Rauwolfa serpentina, Allium sativam* and *Ocimum sanctum* can be tried for control of this disease under field conditions. Among fungal antagonists tested, *Streptoverticillum* sp. was the most efffective in inhibiting growth of the fungus. These two factors, live plant extracts and fungal antagonists provide scope for inclusion in integrated management of sclerotial wilt of sunflower.

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