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SCREENING OF FUNGICIDES AND HERBICIDES AGAINST *SCLEROTIUM ROLFSII*, STEM ROT OF GROUNDNUT UNDER *IN VITRO* CONDITIONS

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ABSTRACT

The effect of herbicides and fungicides was tested by poisoned food technique against soil borne pathogen Sclerotium rolfsii under in vitro conditions. Out of eight fungicides and four herbicides tested, all the fungicides and one herbicide tested showed hundred per cent inhibition of the pathogen except carbendazim, pendimethalin, imazethapyr and oxyflourfen were found highly effective in inhibiting the growth of S. rolfsii.

Introduction

Herbicides may also effect the crop plants in addition to the target weed plants directly by causing phytotoxicity or indirectly by their effects on other organisms which may lead to either beneficial or harmful effects (Walker, 1969). They may cause an increase or decrease in disease due to direct stimulatory effects on growth, reproduction and virulence of the pathogen (Altmann and Campell, 1973; Katan and Eshel, 1973). Many studies have shown fungitoxic effects of herbicides on plant pathogens *in vitro*, as evidenced by inhibition of growth and reproduction of the pathogen (Katan and Eshel, 1973). Herbicides like other biocides have both target and non

target effects (Altmann and Campbell, 1973). Pesticide mixtures are used to broaden the spectrum of activity, or to minimize the selection process of resistant strains, but also to achieve more potent activity by means of synergistic interactions between the components in the mixture. When mixtures are applied, the biological effect may be equal or greater than or smaller than might be expected from the sum of the individual activities of the components used separately. When herbicides and fungicides are applied to control weeds and diseases simultaneously in the same field, it is essential to know if any beneficial or detrimental interactions occur (Pinckard and Standifer (1996)., Robak and Dobrzanski (1978)., Slater and Jones (1978)., Smith and Finch (1978)., Veverka (1979)., Almeida *et al.* (1980) and Kataria and Dodan (1982). Herbicide-fungicide interactions are not as widespread as herbicide-insecticide interactions. Herbicides interact with fungicides as well as the disease causing organisms. Herbicides can increase the efficacy of fungicides via direct synergism. The objective of this research was to determine the effect of some common herbicides and also their compatibility with the fungicides on mycelial growth of *Sclerotium rolfsii, Rhizoctonia solani,* and *Fusarium udum in vitro*.

Material and Methods

Isolation of the Pathogen

Sclerotium rolfsii

Groundnut plants showing typical stem rot symptoms were collected from ARS,Utukur, Kadapa. From the infected stem portion of diseased plants, the adhering soil particles and other debris were removed by thorough washing under running tap water. After that, the infected stem portions were cut into small bits of 1 cm size and were surface sterilized by immersing in 0.1 per cent mercuric chloride for 30 seconds. The bits were washed in three changes of sterile water to remove traces of mercuric chloride and blotted dry on clean, sterile paper towels. These cut pieces were aseptically transferred to PDA petriplates and incubated at 28 ± 2^0C temperature for 3 to 4 days. Fungal growth emerging from diseased stem bits was transferred directly into the petriplates containing PDA medium with the help of sterile needle.

Purification: The culture was purified by hyphal tip method (Rangaswami and Mahadevan, 1999). Pureculture of the organism was maintained on PDA by periodical transfers (Plate 3.1).

Identification of the Pathogen: The pathogen was identified as *Sclerotium rolfsii* based on its mycelial and sclerotial characters shown in Plate 3.2 (Barnett and Hunter, 1972).

***In vitro* evaluation of fungicides and herbicides**

In vitro efficacy of herbicides against test pathogens was evaluated by poisoned food technique (Nene and Thapliyal, 1993). Eight fungicides Mancozeb, propineb, chlorothalonil, zined, carbendazim, hexaconazole, propiconazole, azoxystrobin and four herbicides pendimethalin 30%EC (Stomp), imazethapyr 70%WP (Pursuit): Oxyflourfen (Gold) and quizalofop-p-ethyl 5% were tested at their recommended concentrations. For each treatment, 100 ml of PDA was taken in 250 ml conical flask and autoclaved. To this medium specified concentration of fungicide and herbicide was added to the medium at lukewarm temperature and mixed thoroughly by shaking the flask. Twenty ml of this medium was poured in 9 cm petriplates. A five mm diameter mycelial discs from five days old pathogen culture was inoculated in the centre and then incubated at 28 ± 2^0C for *S.rolfsii* for 7days in BOD incubator. Control was maintained for the test pathogen without fungicide and herbicide. Three replications were maintained for each treatment and per cent growth inhibition was calculated by using the following formula

(Patil and Rane, 1982).

$$I= C-T/C \times 100$$

Where,

I = Per cent inhibition,

C = Colony diameter of the test fungus in Control and

T = Colony diameter of the test fungus in Treatment

Design : Completely Randomized Design (CRD)

Treatments : 13

Replications : 3

Results and Discussion

***In vitro* evaluation of fungicides and herbicides**

Out of eight fungicides and four herbicides tested for their efficacy against *Sclerotium rolfsii* under *in vitro* conditions using poisoned food technique (Nene and Thapliyal, 1993) on potato dextrose agar medium. Among the fungicides tested, mancozeb, propineb, chlorothalonil, zineb, propiconazole, hexaconazole, azoxystrobin were significantly superior in inhibiting the radial growth of *Sclerotium rolfsii* by 100 % followed by carbendazim (65.18) while among the herbicides tested, only quizalofop-p-ethyl showed cent per cent inhibition followed by pendimethalin (92.22%), imazethapyr (68.88 %) and oxyflourfen (51.85 %). The results of the present study are in agreement with Tripathi *et al.* (1988) who reported that herbicides 2, 4-D

S.No	Treatment	Concentration	Radial growth (mm)	Per cent Inhibition

and fluchloralin drastically inhibited the growth of *S. rolfsii* and *R. bataticola*. Fungicides tebuconazole and azoxystrobin alone have been reported to reduce the growth of *S. rolfsii* (Gour and Pankaj Sharma (2010) and Brenneman, 1991). Similarly the results of Hari *et al.*, (1989), Girija Ganeshan (1997), Johnson and Subramanyam (2000) and Gupta and Ashu Sharma, 2004 on the reduction in the growth of *S. rolfsii* by mancozeb are in agreement with the results of the

Fungicides				
1	Mancozeb	0.30 %	0.00	100.00(90.00)**
2	Propineb	0.15 %	0.00	100.00(90.00)
3	Chlorothalonil	0.15 %	0.00	100.00(90.00)
4	Zineb	0.25 %	0.00	100.00(90.00)
5	Carbendazim	0.10 %	3.13	65.18(53.81)
6	Hexaconazole	0.20 %	0.00	100.00(90.00)
7	Propiconazole	0.10 %	0.00	100.00(90.00)
8	Azoxystrobin	0.15%	0.00	100.00(90.00)
Herbicides				
9	Pendimethalin	1.7 ml/l	0.70	92.22(73.88)
10	Oxyflourfen	5.0 ml/l	2.80	68.88(56.09)
11	Imazethapyr	2.0 ml/l	4.33	51.85(46.04)
12	Quizalofop-p-ethyl	2.0 ml/l	0.00	100.00(90.00)
13	Control			
	CD 0.05 CV SE(m)			1.62 1.315 0.555

present study.

Efficacy of fungicides and herbicides against *sclerotium rolfsii*

All figures are means of 3 replications

*Figures in parantheses indicate angular transformed values

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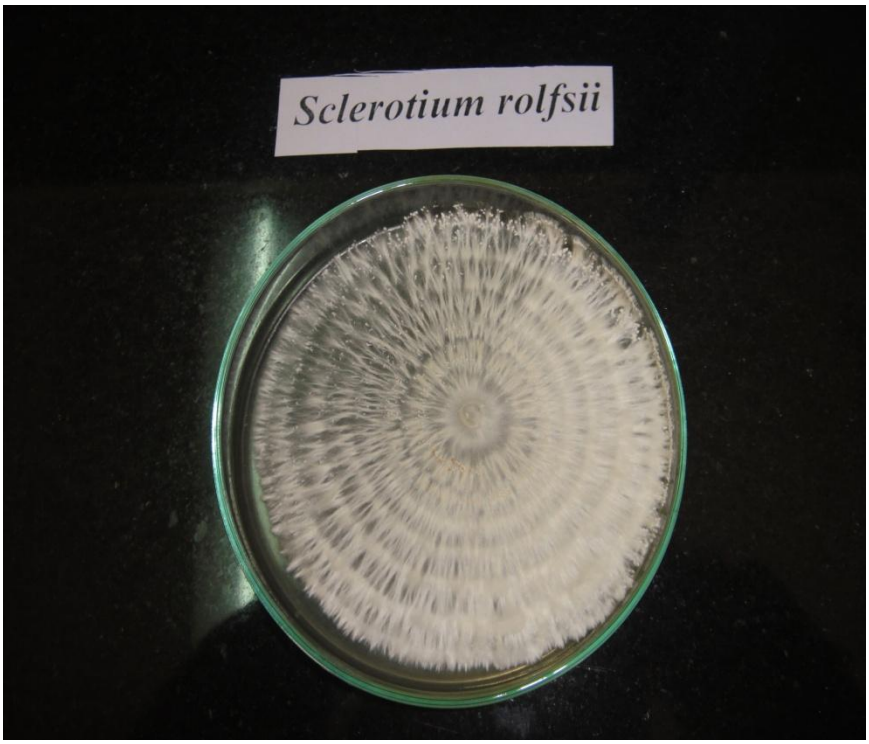
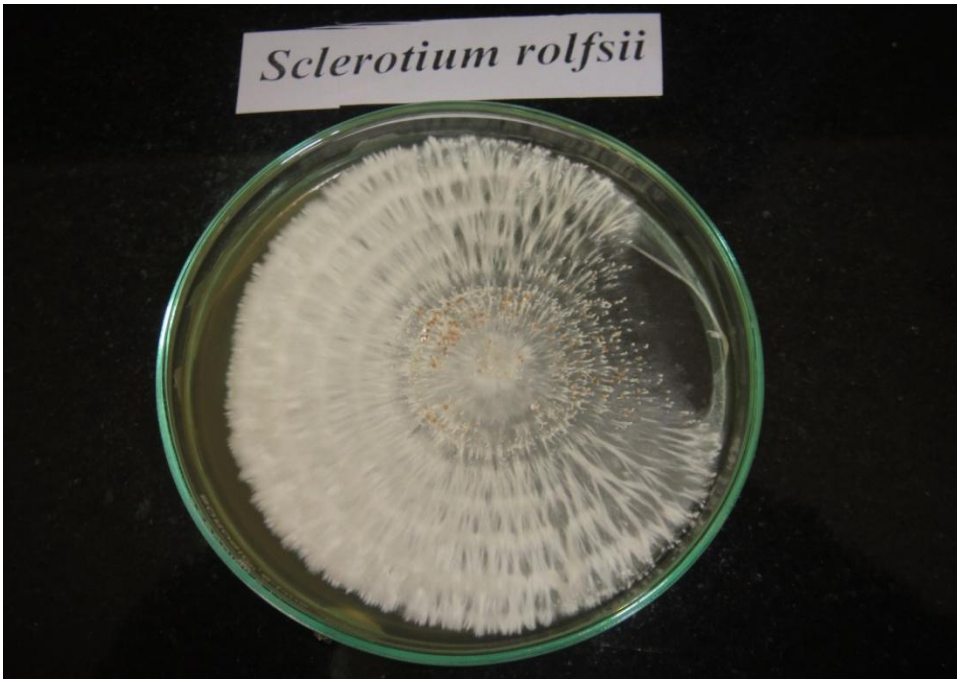
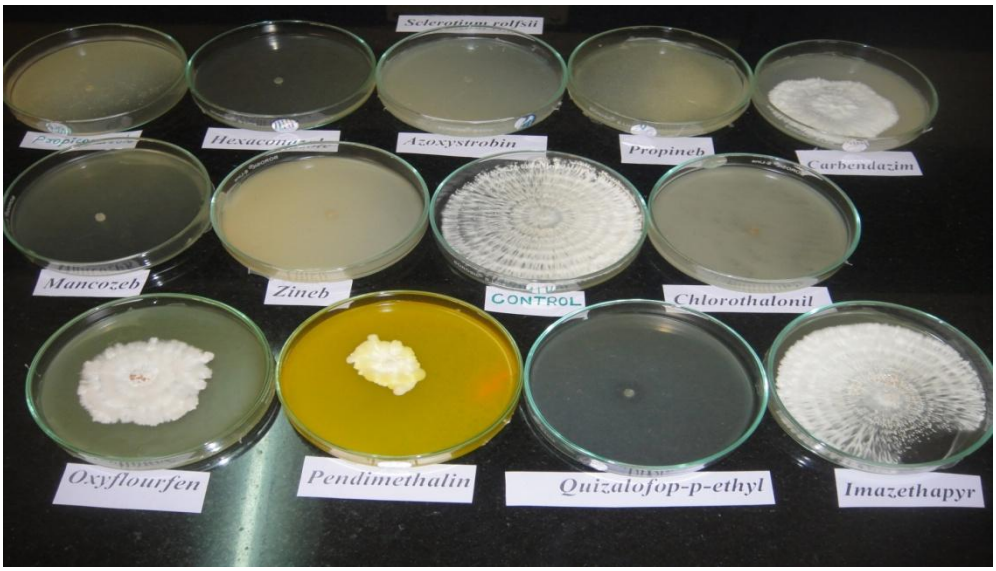

Sclerotium rolfsii


Sclerotium rolfsii


Sclerotium rolfsii
Hexaconazole
Azoxystrobin
Propineb
Carbendazim
Mancozeb
Zineb
CONTROL
Chlorothalonil
Oxyflourfen
Pendimethalin
Quizalofop-p-ethyl
Imazethapyr