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Evaluation of Fungicides and Heribicides on *Sclerotium rolfsii*, Incitant of Stem Rot Diseases in Groundnut (*Arachis hypogeal* L.)

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ABSTRACT

Stem rot of groundnut caused by Sclerotium rolfsii Sacc. has a major constraint and potential threat to successful groundnut cultivation. Therefore affords were made to screen the different systemic, contact and combination of fungicides and herbicides in vitro condition against Sclerotium rolfsii. Among systemic fungicides, Propiconazole and Tricyclazole were found 100 % growth inhibitions at all concentrations. Thiophanate methyl was found least effective at 500ppm with growth inhibition of 48.51% . While carbendazim was least effective in growth inhibition of S. rolfsii at all tested concentrations. Among non systemic fungicides, mancozeb and Thiram were found 100 % growth inhibition of S. rolfsii at all concentrations. In combination of fungicides Carbendazim 12%WP + mancozeb 63% WP minimum growth inhibition was recorded at 500ppm(47.40%) followed by 1000ppm(87.03%). Out of three herbicides tested, Pendimethalin and Quizalofop p-ethyl showed hundred per cent inhibition of the pathogen. While in 2,4-D Na salt 65.6% growth inhibition of S. rolfsii was observed.

Key words: *Fungicides, Herbicides, Stem Rot.*

INTRODUCTION

Groundnut (*Arachis hypogaea*. L) is an important edible oilseed crop. Groundnut has a wide range of adaptability to varying agro-climatic conditions and soils, which has made its cultivation possible in most of the tropical and subtropical countries in the world. The major groundnut growing states are Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka and Maharashtra which together account for about 80 per cent of area and 81 per cent of production in India[22]. Among the soil-borne fungal diseases, stem rot caused by *Sclerotium rolfsii* is a potential threat to successful groundnut cultivation. This disease causes severe damage near maturity and yield losses over 25% have been reported by Mayee and Datar. The *Sclerotium rolfsii* has extensive host range, prolific growth rate and ability to produce large number of sclerotia that may persist in soil for several years[20].

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Now a days, fungicides are known to be the most effective method of disease control. Chemical conrol strategies remain the major tool in the management of stem rot of groundnut. Johnson and Reddy[12] reported the fungicides hexaconazole, propiconazole, mancozeb completely inhibited the growth of *S. rolfsii*. Narayana Bhat and Srivastava[15] reported that captan, thiophanate-methyl and propiconazole were effective against *S. rolfsii*. Herbicides are mostly used to control the weeds (non crop plants) but they also have non-target effect on plant pathogens present in the soil. Herbicides were known to increase or decrease some plant diseases especially those caused by soil borne pathogens[2,14,17]. There are a number of reports that herbicides can affect the diseases by altering the virulence of the pathogenic fungi and the level of disease resistance in the host plant. There was an increase in the incidence of various plant diseases like damping off caused by *Rhizoctonia solani* and vascular wilt caused by *Fusarium* spp. due to soil application of herbicides. Application of trifluralin in cotton resulted in an increase in damping off[1,19], decrease in the incidence of stem rot in peanut due to application of dinosab[9]. The decrease in the incidence of various plant diseases due to herbicide application might be due to the effect of the herbicide on the host or pathogen or surrounding microorganisms[11]. On the basis of above information, in the present investigation, fungicides and some available herbicides were evaluated for their efficacy against *S.rolfsii in vitro*. The main objective of present study is to find out the effective fungicides and herbicide to manage the yield losses of Groundnut due to Stem rot pathogen.

MATERIAL AND METHODS

Isolation of the Pathogen

From the infected seeds of Groundnut diseased plants, the adhering soil particles and other debris were removed by thorough washing under running tap water. After that, they were surface sterilized by immersing in 0.1 per cent mercuric chloride for 30 seconds and washed in three changes of sterile water to remove traces of mercuric chloride and blotted dry on clean, sterile paper towels. These seeds were aseptically transferred to PDA petriplates and incubated at 28±2°C temperature for 2 to 3 days. The culture was purified by single hyphal tip method[21] and maintained on PDA by periodical transfer throughout the present investigation.

Identification of the Pathogen: The pathogen was identified as *Sclerotium rolfsii* based on its mycelial and sclerotial characters[6].

In Vitro Evaluation of Fungicides and Herbicides

The poisoned food technique[16] was employed for evaluating the efficacy of different fungicides and herbicides. Seven fungicides viz Mancozeb, carbendazim, propiconazole, Thiram, carbendazim 50 WP + mancozeb 75 WP and three herbicides quizalofop-p-ethyl 5% (Terga super) pendimethalin 30%EC (Stomp), 2,4-D Na Salt were tested *in vitro*. Each fungicide was tested at four concentrations i.e. 500, 1000, 1500 and 2000 ppm. Herbicides 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°C for *S.rolfsii* for 7days. A suitable control was maintained by growing the pathogen on fungicides and herbicides free PDA medium. Three replications were maintained for each treatment and per cent growth inhibition was calculated by using the following formula[27].

$I = C\text{-}T/C \times 100$

Where, I = Per cent inhibition, C = Colony diameter of the test fungus in Control and T = Colony diameter of the test fungus in Treatment

RESULTS AND DISCUSSION

The growth inhibition of *Sclerotium rolfsii* causing stem rot of groundnut was tested at various concentration of fungicides and herbicides *in vitro* and the data recorded is furnished in Table 1. The perusal of result

showed that, among all the fungicides that were tested Propiconazole, Tricyclazole, Thiram, Mancozeb showed 100 per cent inhibition of mycelial growth at all the concentrations of 500,1000, 1500, 2000ppm.where as growth of *S. rolfsii* was observed in carbendazim and Thiophanate methyl even at maximum concentrations (2000 ppm). Among different concentrations of carbendazim maximum inhibition was at 2000 ppm (47.4%) and 1500 ppm (36.29%) showed significant difference between them (Table1), but at 500 and 1000ppm inhibition of pathogen growth was not recorded, with insignificant difference between them. In case of Thiophanate methyl, as the concentration increases the percent inhibition of mycelia growth also increases. Maximum inhibition was at 2000ppm (71.48%) followed by 1500ppm (70.36%). Least inhibition was observed at 500ppm (48.51%). All tested concentrations differed significantly. Result revealed that as the concentration of Thiophanate methyl increased there was a significant reduction in the radial growth of *S. rolsii* when compared with control Fig 1. In combination systemic and non systemic fungicide *i.e* Carbendazim+ mancozeb, as the concentration increases, percent inhibition also increased. Maximum inhibition was at 2000ppm and 1000 ppm (100%) Fig 1.2.The growth of test pathogen was recorded at 500 and 1000 ppm with inhibition of 47.4%and 87.3% respectively. This shows significant reduction of radial growth of pathogen at both concentrations. While among the herbicides tested, quizalofop-p-ethyl and pendimethalin showed cent per cent inhibition followed by 2, 4-D Na salt (65.6%) Table and Fig 2.0. These results are in confirmation with the complete mycelia growth inhibition of *S. rolfsii* was reported with saaf, tebuconazole, captan, contaf, mancozeb, hinosan, thiram, benlate[5,10,13,23,25]. While carbendazim was not effective in growth inhibition of S. rolfsii was oberved by Das and Harichandan[8]; Sharma and Verma[24] and Banyal *et al.*[4]. Tripathi *et al.*[26] who reported that herbicides 2, 4-D and fluchloralin drastically inhibited the growth of *S. rolfsii* and *R. bataticola*. Pastro and March[18] reported tha trifluralin and pendimethalin were the most efficient compounds because they notably reduced the production of viable sclerotia. Awasthi and Dasguptha[3] revealed that herbicides namely Glyphosate, 2,4-D. Ozadiazone and Paraquat were significantly effective against the *S. rolfsii*.

Table 1: Percent inhibition of *Sclerotium rolfsii*

S.No	Fungicide	Concentration(ppm)				
		500	**1000**	**1500**	**2000**	**Mean**
1	Carbendazim 50%WP	0.000 (1.000)	0.000 (1.000)	36.290 (6.105)	47.400 (6.957)	20.923 (3.766) [d]
2	Propiconazole 25% EC	100.000 (10.050)	100.000 (10.050)	100.000 (10.050)	100.000 (10.050)	100.000 (10.050)[a]
3	Thiophanate methyl 70% WP	48.510 (7.036)	68.883 (8.359)	70.367 (8.513)	71.480 (8.448)	64.810 (8.089)[c]
4	Tricyclazole 75% WP	100.000 (10.050)	100.000 (10.050)	100.000 (10.050)	100.000 (10.050)	100.000 (10.050)[a]
5	Thiram	100.000 (10.050)	100.000 (10.050)	100.000 (10.050)	100.000 (10.050)	100.000 (10.050)[a]
6	Mancozeb 75% WP	100.000 (10.050)	100.000 (10.050)	100.000 (10.050)	100.000 (10.050)	100.000 (10.050)[a]
7	Carbendazim 12% WP+Mancozeb 63% WP	47.403 (6.955)	87.030 (9.382)	100.000 (10.050)	100.000 (10.050)	83.608 (9.109)[b]
8	Control	0.000 (1.000)	0.000 (1.000)	0.000 (1.000)	0.000 (1.000)	0.000 (1.000)[e]
		C.D.	SE(d)	SE(m)		
	Factor A(Fungicide)	0.042	0.021	0.015		
	Factor B(Concentration)	0.030	0.015	0.010		
	Factor(A X B)	0.084	0.042	0.030		
	Figure in parenthesis are square root transferred values					
	The figure with similar alphabets do not differ significantly					

Table 2: Efficacy of Herbicides against *Sclerotium rolfsii*

S. No.	Herbicide	Concentration	Percent Inhibition
1	Pendimethalin 30% EC	1.7 ml/l	100 (10.050)
2	2,4-D Na salt 80% WP	2.0 g/l	65.6 (8.159)
3	Quizalofop-p-ethyl 5% EC	2.0 ml/l	100 (10.050)
4	Control		0
	C.D S.E(m) S.E(d) C.V		0.173 0.055 0.708 1.517

Figure in parenthesis are square root transferred values

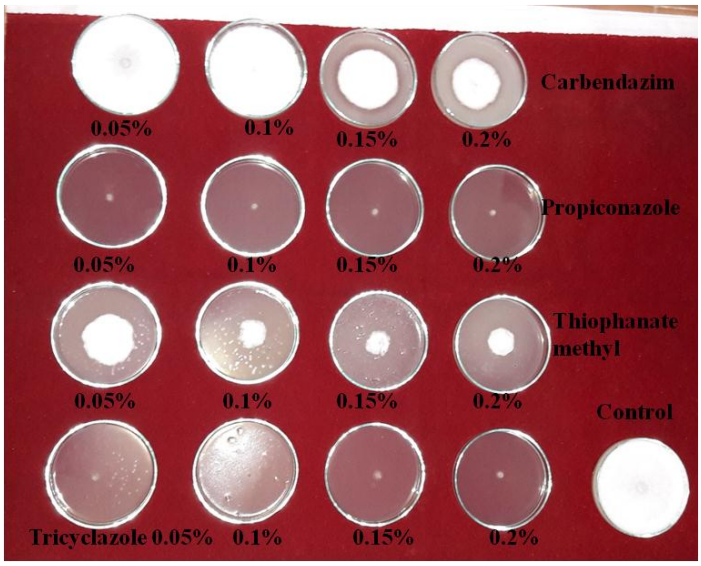


Fig. 1: Bioefficacy of Fungicides against *Sclerotium rolfsii*

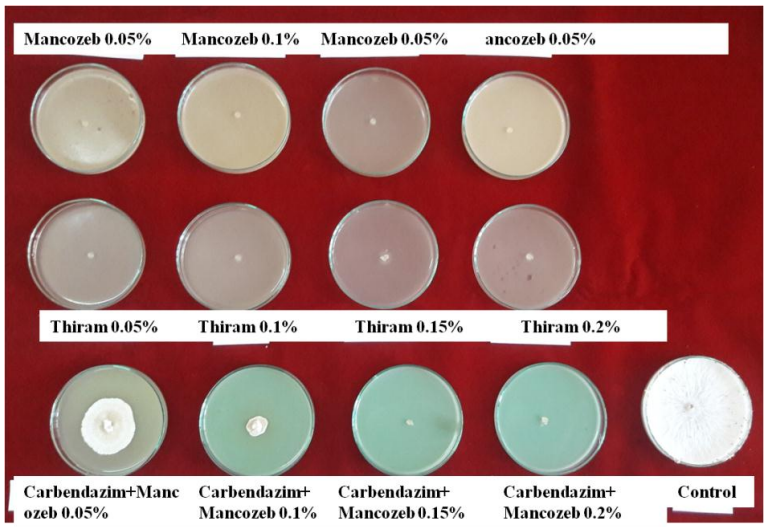
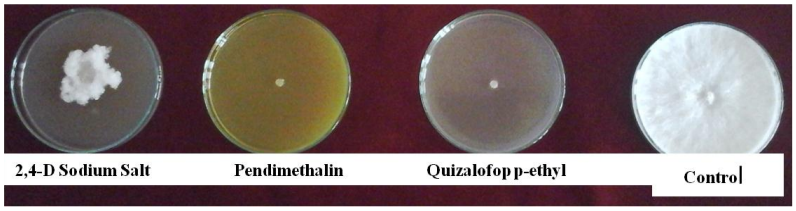


Fig. 1.2: Bioefficacy of Fungicides against *Sclerotium rolfsii*



CONCLUSION

In the present study the effective fungicides *viz.*, propiconazole, Thiram, mancozeb, Tricyclazole and herbicides quizalofop-p-ethyl and pendimethalin were proved most effective on the stem rot causing fungi *S. rolfsii*. They may probably act as antifungal agents and imparts its poisoning effect on metabolic process of pathogen, therefore, the growth of the *S. rolfsii* might be adversely affected.

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