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SCREENING OF FUNGICIDES AGAINST *SCLEROTIUM ROLFSII* CAUSING STEM ROT OF GROUNDNUT

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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 *in vitro* condition against *Sclerotium rolfsii*. Among systemic fungicides carboxin, hexaconazole and propiconazole were found 100 % growth inhibitions at all concentrations. While. fosetyl-Al, thiophanate methyl and carbendazim were found least effective 27.78%,16.67% and 11.85%, respectively growth inhibition of *S. rolfsii* at 500ppm. Among non systemic fungicides, mancozeb was found 100 % growth inhibition of *S. rolfsii* at all concentrations, while sulphur, zineb and copper oxychloride were found least effective against *S. rolfsii* even at higher concentrations. Carbendazim 50 WP + mancozeb 75 WP (1:2 manual) gave cent per cent inhibition of fungus at 500 ppm. Cymoxanil 8 % + mancozeb 64 % and carbendazim 50 WP + thiram 75 WP (1:2 manual) were also gave cent per cent growth inhibition of the fungus at 1000, 1500 and 2000 ppm concentrations.

INTRODUCTION

Groundnut (*Arachis hypogaea* L) is an economic important edible oilseed crop. Gropundnt 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 (Reddy, 1992). Among the soil-borne fungal diseases, stem rot caused by *Sclerotium rolfsii* is a potential threat to sucessful groundnut cultivation. This disease causes severe damage near maturity and yield losses over 25% have been reported by Mayee and Datar(1988). 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 (Punja,1985). In India the disease is more severe in Maharashtra, Gujarat, Madhya Pradesh, Andhra Pradesh, Orissa and Tamil Nadu (Krishnakanth *et al.*, 1999). The stem rot caused by *Sclerotium rolfsii* Sacc. has become a major problem in groundnut growing regions. At present all the popular cultivars of groundnut are susceptible to *S. rolfsii*. Chemical conrol strategies remain the major tool in the management of stem rot of groundnut. Keeping this in view study were under taken to test the effectivness of newer fungicides against *Sclerotium rolfsii*.

MATERIALS AND METHODS

The poisoned food technique was employed for evaluating the efficacy of different fungicide. The bioassay experiment was carried out on PDA using poisoned food technique (Dhingra and Sinclair, 1985). Eight systemic fungicides, seven contect fungicides and seven combination product of fungicides were tested *in vitro*. The required quantity of respective fungicide was incorporated in 100 ml of PDA in 250 ml flasks. The medium was shaken well to give uniform dispersal of the fungicides. Each fungicide was tested at four concentrations *i.e.* 50, 100, 250 and 500 ppm. Eight systemic fungicides *viz.* carboxin 75 WP, hexaconazole 5 EC, propiconazole 25 EC, triadimefon 25 WP, difenoconozole 25 EC, fosetyl-Al 80 WP, thiophenate methyl 70 WP and carbendazim 50 WP were tested at 50,100,250 and 500ppm. While seven non-systemic fungicides *viz.* sulphur 80 WP, copper oxychloride 50 WP, zineb 75 WP, captan 50 WP, thiram 75 WP and mancozeb 75 WP were tested at four concentrations *i.e.* ; 1000, 1500, 2000 and 2500 ppm and seven product of fungicides *viz.* cymoxanil 8% + mancozeb 64 % ,72 WP, carbendazim 50 WP + Thiram 75 WP (1:2 manual), carbendazim 50 WP + mancozeb 75 WP (1:2), Iprodine 25 % + carbendazim 25%, 50 WP, carbendazim 12% + Mancozeb 63%, 75WP metalaxyl 8% + mancozeb 64%, 72WP, carbendazim 50 WP + copper oxychloride 50 WP (1:2 manual) and carboxin 37.5% + thiram 37.5%, 75WP were tested at 500, 1000, 1500 and 2000 ppm.

Twenty ml medium was poured separately into each sterilized Petri plates, replicated three times and centrally inoculated with 4mm mycelial disc of the pathogen and incubated at 27 + 1ºC for seven days. A suitable control was maintained by growing the pathogen on fungicides free PDA medium. Observations of growth and sclerotia were recorded at seven and fifteen days after inoculation, respectively. Per cent growth

inhibition of the fungus in each treatment of respective experiment was calculated by using fallowing formula (Vincent, 1947).

$$I = \frac{C - T}{C} X\ 100$$

Where,

I = Per cent inhibition. C = Colony diameter (Mm) of control.

T = Colony diameter (Mm) of treatment.

RESULTS AND DISCUSSION

The growth inhibition of *Sclerotium rolfsii* causing stem rot of groundnudt has been tested at various concentration of systemic, non systemic and combination of fungicies *in vitro* recorded in Table 1-3. The perusal of result showed that, among the systemic fungicides, carboxin, hexaconazole and propiconazole reported cent per cent growth inhibition at all concentrations (Table 1). Triadimefon and difenoconazole gave cent per cent inhibition at 100, 250 and 500 ppm

Table 1: Effect of systemic fungicides on growth and sclerotial production of *S. rolfsii*

S. No.	Fungicide	Concentration (ppm)*					Mean
		50	100	250	500		
1	Carboxin 75 WP	A	100	100	100	100	100.00
		B	0.00	0.00	0.00	0.00	00.00
2	Hexaconazole 5EC	A	100	100	100	100	100.00
		B	0.00	0.00	0.00	0.00	00.00
3	Propiconazole 25 EC	A	100	100	100	100	100.00
		B	0.00	0.00	0.00	0.00	00.00
4	Triadimefon 25 WP	A	60.74	100	100	100	90.19
		B	28.00	0.00	0.00	0.00	7.00
5	Difenoconazole 25 EC	A	69.63	100	100	100	92.40
		B	32.50	0.00	0.00	0.00	8.75
6	Fosetyl-Al 80 WP	A	5.19	11.11	22.60	27.78	16.67
		B	248.5	190	178.5	115.5	183.13
7	Thiophanate methyl 70	A	0.00	0.00	14.44	16.67	7.77
		B	183	144	66.50	64.50	89.50
8	Carbendazim 50 WP	A	0.00	0.00	3.52	11.85	3.84
		B	272.5	238	223.5	137	217.5
9	Control	A	00.00	-	-	-	-
		B	175.0	-	-	-	175.00
			Fungicide (F)		Concentration (C)		F × C
	S.Em.±	A	0.198		0.140		0.397
		B	0.321		0.227		0.642
	C.D. at 5%	A	0.551		0.397		1.122
		B	0.907		0.642		1.815

A = Per cent growth inhibition (after 7 days inoculations); B = No. of sclerotia (after 15 days inoculations); * Mean of three replications

Table 2: Effect of non systemic fungicides on growth and sclerotial production of *S. rolfsii*

S. No.	Fungicide	Concentration (ppm) *					Mean
			1000	1500	2000	2500	
1	Wettable Sulphur 80 WP	A	0.00	0.00	15.56	17.04	08.15
		B	108	88	87	46	82.25
2	Copper oxychloride 50 WP	A	0.00	11.11	24.07	20.74	13.98
		B	120	0.00	0.00	0.00	30.00
3	Zineb 75 WP	A	22.78	32.59	34.07	35.00	31.11
		B	71.00	38.00	27.00	27.00	40.75
4	Captan 50 WP	A	36.29	42.60	47.04	48.33	43.57
		B	126.6	120	92.50	77.50	104.15
5	Thiram 75 WP	A	55.95	62.96	65.93	67.40	63.05
		B	100	79	62.50	60.50	75.50
6	Mancozeb 75 WP	A	100	100	100	100	100.00
		B	0.00	0.00	0.00	0.00	0.00
7	Control	A	0.00				0.00
		B	230				230.00
			Fungicide (F)		Concentration (C)		F × C
	S.Em.±	A	0.327		0.267		0.655
		B	0.432		0.352		0.863
	C.D. at 5%	A	0.931		0.760		1.863
		B	1.228		1.002		2.455

A = Per cent growth inhibition (after 7 days inoculations); B = No. of sclerotia (after 15 days inoculations); * Mean of three replications

Table 3: Effect of combination of fungicides on growth and sclerotia production of *S. rolfsii*

S.No.	Fungicide	Concentration (ppm)*					Mean
			500	1000	1500	2000	
1	Cymoxanil 8 % + Mancozeb 64 %(Curzate M8, 72 wp)	A	72.78	100	100	100	92.19
		B	272	00.00	00.00	00.00	68.00
2	Carbendazim 50 wp + Thiram 75 wp, 1:2 (Manual)	A	68.15	100	100	100	92.04
		B	138	00.00	00.00	00.00	34.50
3	Carbendazim 50 wp + Mancozeb 75 wp, 1:2(Manual)	A	100	100	100	100	100
		B	00.00	00.00	00.00	00.00	00.00
4	Iprodine 25 % +Carbendazim 25 %	A	34.20	39.26	63.33	70.83	51.91
	(Quental 50 wp)	B	158	112	66	55	97.75
5	Carbendazim 12 % +Mancozeb 63 % (Saaf 75 wp)	A	9.26	15.00	44.44	58.33	31.76
		B	240	215	80	60	148.42
6	Metalaxyl 8 % + Mancozeb 64 %	A	11.11	14.44	48.70	58.33	33.14
	(Ridomil MZ, 72 WP)	B	251	182	118	104.5	163.29
7	Carbendazim 50 wp + Copper oxychloride50	A	0.00	0.00	0.00	58.15	14.54
	wp, 1:2 (Manual)	B	160	128	140.5	95	131.20
8	Control	A	0.00				0.00
		B	280				280
			Fungicide (F)		Concentration (C)		F x C
	S.Em.±	A	0.871		0.659		1.742
		B	0.520		0.393		1.040
	C. D. at 5%	A	2.468		1.866		4.937
		B	2.468		1.114		2.946

A = Per cent growth inhibition (after 7 days inoculations); B = No. of sclerotia (after 15 days inoculations); * Mean of three replications

concentrations. Carbendazim, thiophanate methyl and fosetyl-Al were found least efffective in the present investigation. Sclerotial formation was not observed in carboxin, hexaconazole and propiconazole at all concentrations up to 15 days. While sclerotial production in the plates of carbendazim (217.5) and fosetyl-Al (183.1) were higher than the control (175.00). Among the non systemic fungicides, mancozeb was observed most effective and gave cent per cent inhibition at all concentrations while, thiram, sulphur, zineb and copper oxychloride were found least effective against *S. rolfsii* (Table 2). Sclerotial production was not observed in mancozeb at all concentrations. Among the combinations of fungicides, carbendazim 50 WP + mancozeb 75 WP (1:2 manual) was gave 100% inhibition of at 500 ppm. Similarly cymoxanil 8 % + mancozeb 64 % (Curzate 72 WP) and carbendazim 50 WP + thiram 75 WP (1:2 manual) was gave cent per cent growth inhibition at 1000, 1500 and 2000 ppm concentrations (Table 3). Sclerotial production was not observed at all concentrations of carbendazim 50 WP + mancozeb 75 WP (1:2 manual) even at 500ppm, while no sclerotial formation was observed in cymoxanil 8 % + mancozeb 64 % (Curzate 72 WP) and carbendazim 50 WP + thiram 75 WP (1:2 manual) at 1000, 1500 and 2000 ppm. In the present investigation carboxin, hexaconazole, propiconazole and mancozeb were proved most effective. These results are in confirmation with the complete mycelial growth inhibition of *S. rolfsii* was reported with saff, tebuconazole, captan, calixin, ril f004, tilt, idofil M-45, contaf, mancozeb, hinosan, thiram, antracol., benlate and manzate (Bhat and Srivastava, 2003; Rout *et al.*, 2006; Gupta and Sharma 2004**;** Sunkad, 2012: Kapadiya *et al.*, 2013). Torray *et al.* (2007) reported that tebuconazole and carboxin gave cent per cent growth inhibiton of *S. rolfsii*. While carbendazim was not effective in growth inhibition of *S. rolfsii* oberved by Das and Harichandan (1981); Sharma and Verma, (1985) and Banyal *et al.* (2008).

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