RESEARCH ARTICLE

IN VITRO EFFICACY OF FUNGICIDES AGAINST MAJOR SOIL BORNE PATHOGENS OF GROUNDNUT

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Abstract: Efficacy of two non systemic (thiram and mancozeb) and three systemic fungicides (carbendazim, tebuconazole and carboxin+thiram) each at five different concentrations were tested against *Aspergillus niger*, *Sclerotium rolfsii* and *Rhizoctonia bataticola* under *in vitro* conditions. Among the five fungicides tested mancozeb, tebuconazole and carboxin+thiram gave 100% inhibition against all the three test pathogens. Carbendazim was ineffective against *Sclerotium rolfsii* at 1000 ppm. Thiram showed 100% inhibition against *Rhizoctonia bataticola at* 5000 ppm.

Keywords: *Aspergillus niger*, *Sclerotium rolfsii*, *Rhizoctonia bataticola*, systemic and non systemic

INTRODUCTION

Groundnut is a major legume and important oil seed crop in India. In Rayalaseema region it is grown both under *kharif* and *rabi* seasons. Soil borne diseases have been recognized as one of the major factors limiting groundnut production. Among soil borne pathogens, *Aspergillus niger*, *Sclerotium rolfsii* and *Rhizoctonia bataticola* have been reported to be major limitations. These pathogens attack groundnut plants at all stages and cause pre emergence rotting in seeds, soft rot in emerging seedlings and collar rot, stem rot and dry root rot in mature plants. Keeping in this view an attempt was made to find out the suitable fungicides against three pathogens under *in vitro* conditions

MATERIAL AND METHOD

In vitro efficacy of five fungicides (two contact fungicides *viz.*, mancozeb and thiram, and three systemic fungicides *viz.*, carbendazim, carboxin+thiram and tebuconazole) each with five different concentratons @ 1000, 2000, 3000, 4000, 5000 ppm against *Aspergillus niger*, *Sclerotium rolfsii* and *Rhizoctonia bataticola*. were evaluated by following poisoned food technique (Nene and Thapliyal, 1993).

To 50 ml of sterilized distilled water, required quantity of fungicide was added and mixed thoroughly. This solution was added to 50 ml of sterilized cool molten double strength PDA medium, mixed thoroughly and poured into Petri plates. Six mm discs of four days old culture of pathogen were inoculated at the centre of Petri plates and then incubated at 28 ± 2°C. Three replications were maintained for each fungicide. Medium without fungicide was kept as control. Per cent inhibition of the growth of the fungus over the control was calculated using the formula:

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

where,
I = Per cent inhibition in growth of test pathogen
C = Radial growth (mm) in control
T = Radial growth (mm) in treatment.

RESULT AND DISCUSSION

Against *Aspergillus niger*, all the five fungicides were found equally effective by giving 100 % inhibition at all the concentrations tested. Charitha Devi and Prasad (2009) reported the inhibitory effect of captan and mancozeb on mycelial growth of *A. niger* using poisoned food technique in groundnut.

Table 1. *In vitro* efficacy of fungicides against *Aspergillus niger* in poisoned food technique

S. No.	Fungicides	Concentration (ppm)	Mycelial growth of pathogen (cm)*	Per cent inhibition over control	Mean
1	Mancozeb	1000	0.0	100	100
		2000	0.0	100	
		3000	0.0	100	
		4000	0.0	100	
		5000	0.0	100	
2	Thiram	1000	0.0	100	100
		2000	0.0	100	
		3000	0.0	100	
		4000	0.0	100	
		5000	0.0	100	

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3	Carbendazim	1000	0.0	100	100
		2000	0.0	100	
		3000	0.0	100	
		4000	0.0	100	
		5000	0.0	100	
4	Carboxin+Thiram	1000	0.0	100	100
		2000	0.0	100	
		3000	0.0	100	
		4000	0.0	100	
		5000	0.0	100	
5	Tebuconazole	1000	0.0	100	100
		2000	0.0	100	
		3000	0.0	100	
		4000	0.0	100	
		5000	0.0	100	
	Control	-	9.0	-	-

* Mean of three replications

Against *Sclerotium rolfsii*, except carbendazim, all other test fungicides gave 100% inhibition at all the tested concentrations. Carbendazim was ineffective at 1000 ppm as the pathogen has completely grown (9 cm) like that of control plate. Carbendazim showed increased inhibition of 4.11% to 51.88% with increasing concentration from 2000 ppm to 5000 ppm with a mean inhibition of 25.77 per cent. Patibanda *et al.* (2002) and Rakholia and Jadeja (2010) reported the inhibitory effect of *S. rolfsii* by carboxin using poisoned food method.

Gour and Sharma (2010) and Rakholia and Jadeja (2010) reported the significant inhibitory effect of tebuconazole and hexaconazole on mycelia growth of *S. rolfsii*. Similarly Deepthi (2014) showed reduced mycelial growth of *S. rolfsii* by using mancozeb in groundnut.

Table 2. *In vitro* efficacy of fungicides against *Sclerotium rolfsii* in poisoned food technique

S. No.	Fungicides	Concentration (ppm)	Mycelial growth of pathogen (cm)*	Per cent inhibition over control	Mean
1	Mancozeb	1000	0.0	100	100
		2000	0.0	100	
		3000	0.0	100	
		4000	0.0	100	
		5000	0.0	100	
2	Thiram	1000	0.0	100	100
		2000	0.0	100	
		3000	0.0	100	
		4000	0.0	100	
		5000	0.0	100	
3	Carbendazim	1000	9.0	0.0	20.6
		2000	8.6	4.1	
		3000	8.0	11.1	
		4000	5.7	36.0	
		5000	4.3	51.8	
4	Carboxin+Thiram	1000	0.0	100	100
		2000	0.0	100	
		3000	0.0	100	
		4000	0.0	100	
		5000	0.0	100	
5	Tebuconazole	1000	0.0	100	100
		2000	0.0	100	
		3000	0.0	100	
		4000	0.0	100	
		5000	0.0	100	
	Control	-	9.0	-	-
	S. Em ±			0.57	
	C.D (0.05)			1.63	

* Mean of three replications

For *Rhizoctonia bataticola*, mancozeb, carbendazim, carboxin+thiram, tebuconazole showed 100% inhibition at all the five concentrations tested. Thiram showed increased inhibition of 74.44% to 93.33% with increased concentrations of 1000 to 4000 ppm, whereas at 5000 pm it completely inhibited the mycelial growth of pathogen by giving 100% inhibition.

Similar findings were observed by Khan and Gangopadhyay (2008) where carbendazim and thiram were highly inhibitory to the growth of *Rhizoctonia bataticola* causing root rot disease.

Table 3. *In vitro* efficacy of fungicides against *Rhizoctonia bataticola* in poisoned food technique

S. No.	Fungicides	Concentration (ppm)	Mycelial growth of pathogen (cm)*	Per cent inhibition over control	Mean
1	Mancozeb	1000	0.0	100	100
		2000	0.0	100	
		3000	0.0	100	
		4000	0.0	100	
		5000	0.0	100	
2	Thiram	1000	2.3	74.4	85.9
		2000	1.8	79.6	
		3000	1.6	82.2	
		4000	0.6	93.3	
		5000	0.0	100	
3	Carbendazim	1000	0.0	0.0	100
		2000	0.0	0.0	
		3000	0.0	0.0	
		4000	0.0	0.0	
		5000	0.0	0.0	
4	Carboxin+Thiram	1000	0.0	100	100
		2000	0.0	100	
		3000	0.0	100	
		4000	0.0	100	
		5000	0.0	100	
5	Tebuconazole	1000	0.0	100	100
		2000	0.0	100	
		3000	0.0	100	
		4000	0.0	100	
		5000	0.0	100	
	Control	-	9.0	-	-
	S. Em ±			0.46	
	C.D (0.05)			1.25	

* Mean of three replications

CONCLUSION

Among the five fungicides tested mancozeb, tebuconazole and carboxin+thiram gave 100% inhibition against all the three test pathogens. Carbendazim was ineffective against *Sclerotium rolfsii* at 1000 ppm. Thiram showed 100% inhibition against *Rhizoctonia bataticola at* 5000 ppm.

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