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Chemical management of Pod rot disease of groundnut

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Pod rot of groundnut has been observed a serious disease of the crop in recent past which affects its quality and yield potentiality to a large extent posing a great threat to the groundnut growers in the state of Odisha. The disease depending on different stages of pod development was broadly grouped into 5 different types of symptoms being associated with five different fungi like *Aspergillus niger, Fusarium oxysporum, F. solani, F. moniliforme, Curvularia lunata* and one bacterium *Erwinia* sp. Carbendazim was the most effective chemical resulting maximum diameter growth inhibition of *F. oxysporum* (94.33%) followed by Propiconazole. Hexaconazole was found to be the best chemical with maximum growth inhibition of *F. moniliforme* (92.67%) followed by Propiconazole (85.67%). Propiconazole, Metalaxyl (8%) + Mancozeb (64%) and Carbendazim proved their efficacy against *F. solani* with growth inhibition of 91.67, 91.10 and 90.67 %, respectively. Metalaxyl (8%) + Mancozeb (64%) could suppress growth of *C. lunata* by 82.63%. Maximum growth inhibition of *A. niger* (75.33%) was observed with application of Metalaxyl (8%) + Mancozeb (64%) @ 0.2%. Carbendazim and Streptocycline applied during flowering stage of the crop could significantly restrict the disease under field condition with higher yield proving their efficacy.

Key words: Groundnut, Pod rot, fungi, bacterium, fungicides

INTRODUCTION

Groundnut (*Arachis hypogea* L.) is a main source of vegetable oil in our country. Groundnut oil is also used in manufacture of soaps, cosmetics, lubricant, butter, poultry and cattle feeds etc. One of the important reasons for low yield of groundnut crop in the state of Odisha is incidence of several infectious diseases caused by bacteria, fungi, virus and nematodes due to frequent change in the cropping systems, cultivation of more number of exotic varieties and indiscriminate use of fertilizer along with reduction in the organic status of soil .The diseases affecting groundnut pod during different stages of its development has been identified as Shell spot disease by Panda (1996) and Pod rot disease by Meher (1997) and Dhal *et al.,* (1997). Disease is prevalent in irrigated as well as rain fed *kharif* groundnut crops and almost all the commercially cultivated varieties of groundnut are affected by these diseases causing heavy yield loss reducing its commercial value and seed quality as well. Due to such alarming situation of Pod rot disease of groundnut in Odisha, attempt has been made to find out its suitable management through chemicals.

MATERIALS AND METHODS

Chemicals namely Mancozeb (0.3%), Tricyclazole (0.1%), Heterocyclic nitrogenous compound (0.3%), Carbendazim (0.2%), Propiconazole (0.15%), Hexaconazole (0.15%), Metalaxyl(8%) + Mancozeb(64%) @ (0.2%), Kasugamycin (0.01%) and Streptocycline (0.01%) were used following poisoned food technique to find out their efficacy

against the isolated fungal pathogens under *'in vitro'* condition. The per cent inhibition of mycelial growth was calculated by using the formula as follows.

$$\text{Inhibition percentage} = \frac{x - y}{x} \times 100$$

where, x= Mean colony diameter of the isolate in control
Y= Mean colony diameter of the isolate in treated plates

The same chemicals were also evaluated for their efficacy against pod rot disease of groundnut under natural conditions. Groundnut field found to be continuously affected by Pod rot disease (Hot spot) was selected and attempt was made to evaluate the chemicals in these plots designing the field experiment continuously for two years during *rabi* season. The experiment was designed with the plot size 5 m x 4 m with all the chemicals used earlier having three replications. The seeds were sown and plant stand was properly maintained following normal intercultural operations and waited up to flowering stage. The chemicals were applied as soil drench in desired concentrations during flowering stage of the crop. The natural incidence of Pod rot disease in the respective treatments along with the pod yield was recorded in both the years after harvest and compared with the untreated control.

RESULTS AND DISCUSSION

Five different fungi like *Aspergillus niger, Fusarium oxysporum, F. solani, F. moniliforme, Curvularia lunata* and one bacterium *Erwinia* sp. were found to be associated with the disease symptom which were isolated in pure culture.

Effect of chemicals on growth of fungal isolates

The experimental result of efficacy of different chemicals on diameter growth of the isolated fungal microflora (Table 1) revealed that Metalaxyl (8%) + Mancozeb (64%) @ 0.2% was found to be the best showing 75.33% growth inhibition of the test fungus *Aspergillus niger* followed by Carbendazim (0.2%). These two chemicals were statistically at par and thereby formed the best group of chemicals for growth inhibition of the test fungus (Jacobi and Backman, 1994, Ahir and Maharshi, 2008). The other chemicals also found effective against the test fungus were Heterocyclic nitrogenous compound (0.3%), Hexaconazole (0.15%), Mancozeb (0.3%) and Propiconazole which were also found statistically at par. Tricyclazole (0.1%) and Kasugamycin (0.1%) were the least effective chemicals against *A. niger* showing growth inhibition of only 16.63 and 15.67 %, respectively.

Carbendazim (0.2%) was most effective chemical having maximum growth inhibition (94.33%) against *Fusarium oxysporum* followed by Propiconazole (0.15%) which were found to be statistically at par (Bagga, 2007; Chandel and Tomar, 2007). Heterocyclic nitrogenous compound (0.3 %), Hexaconazole (0.15%) and Metalaxyl (8%) + Mancozeb (64%) @ 0.2% were also found next effective group of fungicides, being statistically at par. Mancozeb (0.3%), Kasugamycin (0.01%) and Tricyclazole (0.1%) were found less effective as compared to others.

The effective chemicals found most prominent against *F. solani* were Propiconazole (0.15%), Metalaxyl (8%) + Mancozeb (64%) @ 0.2%, Carbendazim (0.2%), Heterocyclic nitrogenous compound (0.3%) and Hexaconazole (0.15%) showing maximum growth inhibition of 91.67, 91.10, 90.67, 88.30 and 84.67 %, respectively. All these five chemicals were found statistically at par and thus proved to be the best group of chemicals for growth inhibition of the test fungus (Bagga, 2007; El-Wakil and Ghonim, 2000). Mancozeb (0.3%) and Kasugamycin (0.01%) was found less effective while Tricyclazole (0.1%) was least effective against *F. solani.*

Hexaconazole (0.15%) was found to be the best chemical which inhibited the diameter growth of the fungus *F. moniliforme* by 92.67% and was followed by Propiconazole (0.15%) with 85.67% growth inhibition both being statistically at par (Bagga and Sharma, 2006 and Bagga, 2007). Carbendazim (0.2%), Heterocyclic nitrogenous compound (0.3%), Metalaxyl (8%) + Mancozeb (64%) @ 0.2% and Kasugamycin (0.01%) were other effective chemicals against the test fungus. However, Tricyclazole (0.1%) was least effective in restricting diameter growth of *F. moniliforme.*

Metalaxyl (8%) + Mancozeb (64%) @ 0.2% was found to be quite promising with 82.63% growth inhibition of the test fungus *C. lunata* followed by Propiconazole (0.15%). Carbendazim (0.2%) and Hexaconazole (0.15%) were found to be the next effective group of fungicide. However, Tricyclazole

Table 1 : Effect of chemicals on growth of isolated pathogens

Treatments	Mean per cent inhibition of				
	F. oxysporum	*F. moniliforme*	*F. solani*	*C. lunata*	*A. niger*
Mancozeb (0.3 %)	55.30(48.07)	58.63(52.00)	63.00(52.56)	62.30(52.15)	49.30(44.60)
Tricyclazole (0.1%)	22.33(28.01)	24.67(29.75)	18.37(25.32)	31.63(35.84)	16.63(23.96)
Heterocyclic N compound (0.3%)	82.63(65.93)	72.33(58.32)	88.30(71.48)	57.63(49.41)	63.33(52.76)
Carbendazim (0.2%)	94.33(77.45)	82.63(65.66)	90.67(72.67)	68.67(56.09)	72.33(58.41)
Propiconazole (0.15%)	87.67(70.37)	85.67(68.08)	91.67(74.06)	75.00(60.14)	47.00(43.27)
Hexaconazole (0.15%)	81.30(64.51)	92.67(75.49)	84.67(67.15)	67.30(55.23)	53.00(46.73)
Metalaxyl(8%) + Mancozeb (64%) @ (0.2%)	78.33(62.74)	71.30(57.67)	91.10(74.81)	82.63(65.56)	75.33(60.78)
Kasugamycin (0.01%)	38.63(38.38)	42.33(40.55)	41.33(39.99)	49.00(44.42)	15.67(23.21)
SE(m)±	3.01	2.98	3.07	2.04	2.74
CD(0.05)	9.13	9.05	9.33	6.20	8.31
CV(%)	9.16	9.23	8.91	6.76	10.73

*Figures in parentheses indicate corresponding Angular values

Table 2 : Effect of chemicals as soil drench on natural incidence of Pod rot of groundnut

Treatments	Mean Per cent Disease Incidence				Yield (Q/ Ha)			
	1st year	2nd year	Two Year Mean	Disease Control (%)	1st year	2nd year	Two Year Mean	Increase in yield (%)
Mancozeb (0.3 %)	19.36 (26.06)	13.68(21.58)	16.52 (23.82)	54.24	15.68	17.28	16.48	21.09
Tricyclazole (0.1%)	32.44(34.67)	25.79(32.63)	30.79 (33.65)	14.71	13.41	16.72	15.06	10.65
Carbendazim (0.2%)	10.19 (18.34)	7.18 (15.14)	8.69 (16.74)	75.93	16.45	20.41	18.43	35.42
Propiconazole (0.15%)	14.45 (22.20)	10.44(18.72)	12.45 (20.46)	65.51	12.75	20.52	17.81	30.86
Heterocyclic N compound (0.3%)	14.63 (22.16)	11.34(19.44)	12.99 (20.80)	64.02	14.43	19.32	16.88	24.03
Hexaconazole (0.15%)	17.53 (24.49)	11.99(19.81)	14.76 (22.15)	59.11	14.62	18.82	16.72	22.85
Kasugamycin (0.01%)	7.47(15.81)	3.96 (11.31)	5.72 (13.56)	84.16	19.44	22.39	20.92	53.71
Streptocycline (0.01%)	8.83 (17.13)	5.13 (12.85)	6.98 (14.99)	80.66	18.54	21.65	20.10	47.69
Metalaxyl (8%) + Mancozeb (64%) @ (0.2%)	13.86 (21.71)	10.41(18.72)	12.14 (20.22)	66.37	16.60	19.62	18.11	33.06
Untreated control	41.14 (39.89)	31.05(33.80)	36.10 (36.85)	-	12.65	14.57	13.61	-
SE(m)±	1.80	2.00	-	-	1.71	2.14	-	-
CD(0.05)	5.34	5.93	-	-	5.08	6.35	-	-
CV(%)	12.85	16.95	-	-	19.15	19.34	-	-

*Figures in parentheses indicate corresponding Angular values

(0.1%) and Kasugamycin (0.1%) were the least effective chemicals against the test fungus.

Effect of chemicals as soil drench on natural incidence of Pod rot of groundnut

The natural incidence of Pod rot was recorded in the untreated plot and was compared with that of the chemical treated plots and the data on disease incidence and yield are presented in Table 2. It is revealed from the data that antibiotic Kasugamycin @ 0.01% was most effective which reduced the disease incidence to the extent of 84.16% with highest pod yield of 20.92 q/ha (53.71% higher) followed by Streptocycline @ 0.01%. The result of the present experiment signify the primary role of bacterium and secondary role of fungi in aggravating Pod rot disease intensity which was effectively checked by application of the above chemicals antibiotic and antifungal effect. The above chemicals not only restricted the disease incidence but also helped in increasing the pod yield as well. Among fungicides, Carbendazim @ 0.2% was most effective which resulted 35.42% higher pod yield (18.43q/ha) and reduced Pod rot incidence by 75.93% (Narain *et al.* 1989 and Reddy *et al.* 1991).

Efficacy of antibiotics like Kasugamycin and Streptocycline against Pod rot disease of groundnut apparently appeared to be a new report. However, all the chemicals tested were found to reduce the pod rot disease incidence significantly with higher yield, except Tricyclazole which was statistically at par with that of untreated control plot.

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