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Research Article

Antimycotic activities of some novel antagonistic fungi against *Cercospora sp.*

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Abstract

The ten antagonists i.e. *Aspergillus niger, Aspergillus fumigatus, Aspergillus flavus, Trichoderm aviride, Trichoderma fuscum, Trichoderma harzianum, Trichoderma atrovride, Penicillium oxalicum, Trichoderma sp., Verticillium lecanae* were tested; Antagonists were isolated from groundnut rhizosphere the observation of different antagonists is narrated. The inhibitory effect of various antagonists against *Cercospora sp.*.The inhibitory effect of ten tested antagonistic fungi were recorded in observation *Trichoderm aviride* (80%), *Trichoderma harzianum* (75%), *Trichoderma fuscum* and *Trichoderma atrovride* found highly effective On 3rd day of incubation against the treated pathogen *Cercospora sp.* while fungi like *Aspergillus fumigatus* (55.55) and *Penicillium oxalicum* showed less growth inhibition. The remaining tested antagonists comparatively weak in controlling the mycelial growth of pathogen. All the tested antagonistic fungi were found to be 100 per cent effective against the *Cercospora sp. 7th day of incubation except Penicillium oxalicum* (96.57).

INTRODUCTION

Fungi in the genus *Cercospora* are among the most prevalent and destructive plant pathogens. As a group, they are nearly universally pathogenic, occurring on a wide range of hosts in almost all major families of dicots, most monocot families, and even some gymnosperms and ferns (Pollack F. G. 1987). Groundnut (*Arachis hypogaea* L.) belongs to genus *Arachis* in the sub tribe *Stylosanthinae* of tribe *Aeschynomeneae* of the family *Leguminosae* having origin from South America (Naidu *et al.,* 2006). It is the most important summer, Rain and, winter season cash crop as well as oil seed crop in the world (Mensah and Obadoni, 2007).

Groundnut seed has high protein (25-28%) and oil content (43-55%) (Naeem *et al.,* 2009). Integrated factors affect the groundnut yield i.e. *Cercospora* leaf spot attributable to *Cercospora arachidicola* S. Hori (Early leaf spot) and *Cercosporidium personatum* (Late leaf spot). These wide spread and most drastic foliar diseases cause severe losses in crop (Ijaz *et al.,* 2008). infect groundnut crop directly and indirectly and causes huge losses up to 25-43% as defoliation of the leaves due to photosynthesis process is disrupted and plant produce pods lesser and inferior in quality (Waliyar *et al.,* 2000). Losses are even more when crop is unsprayed (Anonymus, 2000). Mostly Infection and disease development starts from irregular rains during flowering to pods formation. The maximum and minimum temperature ranges for CLS is 31 degree Celsius - to 35 degree Celsius and 18 degree Celsius - to 23 degree Celsius , respectively (Pande *et al.,* 2000).

Biocontrol is modern techniques in agriculture sector; it does not have side effect and it is ecofriendly technique it not produces any hazardous material. It is eco-friendly managements of pathogenic microorganism. The antagonistic fungi it has a potential to restrict other fungi and arrest of pathogen achieved by way of antibiosis.

Therefore, their eco-friendly cost effective management is need of today and the management of diseases of vegetable crops by using biocontrol methods is certainly an inspiring and valuable approach.

The control of these types of pathogen remains a challenge and still base upon multiple applications of fungicides. Chemical control is effective and efficient but, at the same time, can leads to the development of pathogen resistance, chemical residues in fruit, phytotoxicity to other organisms or environmental and public health problems (Adebayo *et al.,* 2013). In order to minimize these factors and to comply with food safety standards, there is an increased interest for bio-ecology studies of this pathogen and a worldwide trend to explore new alternatives to synthetic fungicides (Tatiana Eugenia Şesan*et al.,* 2015). Specific bacterial and fungal antagonists of the rhizosphere can induce this systemic effect in plants (Btissam*et al.,* 2015). There is little investment in the research development of fungal biological control agents compared with that spent on the discovery of chemical pesticides. Two reasons for this is the mycoparasites usually have narrow host range and because they have given inconsistent or poor control in field trials. This has led to a greater emphasis on the search for broader spectrum bio pesticides with improvements in the associated production, formulation and application technologies.

MATERIAL AND METHODS

Collection of different antagonists

Different antagonists were collected and isolated from soil samples of *ground nuts* crops. Antagonistic fungi were isolated by serial dilution agar plating method. Rhizosphere fungi were used for antagonistic analysis. The ten fungi selected for evaluation of its antagonistic properties were- *Aspergillusniger, Aspergillus fumigates, Aspergillus flavus, Trichoderm aviride, Trichoderma fuscum, Trichoderma harzianum, Trichoderma atroviride, Penicillium oxalicum, Trichoderma sp., Verticillium lecanae* All these antagonists were isolated from rhizosphere soil samples ground nuts

Collection and isolation of fungal pathogens

In the present investigation, *Cercospora sp.* foliar pathogenic fungi of ground nuts were selected for antagonistic analysis. PDA medium were selected.

Antagonistic analysis

To see the antagonism against different pathogens dual culture method was adopted. Autoclaved medium was poured into the glass petriplate and was allowed to solidify. The 5 mm discs of antagonist from the stored culture were cut using a sterile cork borer under aseptic conditions. In the Petri, plate of solidified medium a disc of pathogen kept in the center and three discs of antagonistic fungi were placed at equidistant from the center. Control plate containing only pathogen was also maintained. The radial mycelia growth of pathogen and antagonists were measured for every 24 hours up to seven days and inhibition per cent was calculated on 3rd, 5th and 7th day. The per cent inhibition by antagonistic fungi was calculated using the following formula.

$$\text{Per cent inhibition} = \frac{T_{FC} - T_{FTr}}{T_{FC}} \times 100$$

T_{FC}- Test fungus in control

T_{FTr}- Test fungus in treatment.

RESULTS AND DISCUSSION:

Cercospora sp. is a common plant pathogen of various economically important plant which causes the serious leaf diseases. The inhibitory effect of ten tested antagonistic fungi were recorded in observation table 1. From the observation table 1 it is clear that, *Trichoderma viride* (80%), *Trichoderma harzianum* (75%), *Trichoderma fuscum*and *Trichoderma atrovride* found highly effective. On 3rd day of incubation against the treated pathogen *Rhizoctonia solani* while fungi like *Aspergillus fumigatus (55.55) and Penicillium*

oxalicum showed less growth inhibition. The remaining tested antagonists comparatively weak in controlling the mycelial growth of pathogen. All the tested antagonistic fungi were found to be 100 per cent effective against the *Cercospora sp. 7th day of incubation* except *Penicillium oxalicum* (96.57).

Table 1.: Effect of different antagonists on radial mycelial growth of *Cercospora sp.*

Sr. No.	Antagonistic fungi	Radial mycelial growth (mm)*			% growth inhibition		
		3DAI	5DAI	7DAI	3DAI	5DAI	7DAI
1	*Aspergillus niger*	16.00	32.00	0.00	20.00	62.35	100.00
2	*Aspergillus fumigatus*	09.00	45.00	6.00	55.00	47.05	92.94
3	*Aspergillus flavus*	13.00	70.00	0.00	35.00	17.64	100.00
4	*Trichoderma viride*	04.00	30.00	0.00	80.00	58.82	100.00
5	*Trichoderma fuscum*	06.00	16.00	0.00	70.00	81.17	100.00
6	*Trichoderma harzianum*	05.00	36.00	0.00	75.00	57.64	100.00
7	*Trichoderma atroviride*	06.00	29.00	0.00	70.00	65.88	100.00
8	*Penicillium oxalicum*	09.00	60.00	3.00	55.00	29.41	96.47
9	*Trichoderma sp.*	13.00	24.00	0.00	35.00	71.76	100.00
10	*Verticillium lecanae*	11.00	65.00	0.00	45.00	23.52	100.00
11	Control	20.00	85.00	85.00	-	-	-

Antagonistic ability of ten non-pathogenic rhizospheric fungi were screened against fifteen pathogenic fungi of four experimented ground nuts plants. The non-pathogenic fungi of ground nuts were undertaken for this study as antagonists are as follows. *Aspergillus niger*, *Aspergillus fumigates*, *Aspergillus flavus*, *Trichoderm aviride*, *Trichoderma fuscum*, *Trichoderma harzianum*, *Trichoderma atrovride*, *Penicillium oxalicum*, *Trichoderma sp.*, *Verticillium lecanae*. In present research work antagonistic effect of different antagonists were assessed by dual culture method and radial mycelial growth of pathogen were measured on 3rd, 5th and 7th day after incubation. The per cent growth inhibitions were calculated by standard formula.

From the observations and results it was calculated that among all antagonists tested for its antagonistic efficiency against the pathogenic fungi of ground nuts, it was found that the various species of ubiquitous soil fungi *Trichoderma* such as *Trichoderm aviride*, *Trichoderma fuscum*, *Trichoderma harzianum*, *Trichoderma atrovride* and *Trichoderma sp.* reported effective against almost all pathogens from 3rd day of incubation. *Trichoderma harzianum* and *Trichoderma viride* found to be highly effective in controlling the radial mycelial growth of pathogen since 3rd day of incubation in dual culture technique. Among various species of *Trichoderma*, *Trichoderma fuscum*, *Trichoderma atrovride* and *Trichoderma sp.* found to be less effective as compared to efficient antagonists *Trichoderma harzianum* and *Trichoderm aviride* (Parbhankar and Mogle, 2017; Mane and Mogle, 2010). The few species of *Aspergillus* such as *Aspergillus niger*, *Aspergillus fumigatus*, *Aspergillus flavus* which have been tested shows less antagonistic efficiency as compare to *Trichoderma*. Among the *Aspergillus*, *Aspergillus flavus* found highly effective followed by *Aspergillus niger and Aspergillus fumigatus*.*Verticillium lecanae* recorded highly effective against *Curvularia lunata*,

Helminthosporium sp. and two species of *Alternaria* i.e. *Alternaria porri* and *Alternaria sp.*The present antagonistic analysis study clearly indicates that *Penicillium oxalicum* found to be the less effective as it fails to inhibits the radial mycelial growth of any pathogen as compared to all tested antagonists. Maximum mycelial growth of pathogen was recorded in control, in which only pathogen was incubated.

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