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RESEARCH ARTICLE

COMPARATIVE APPROACH OF PHYLLOSPERIC MYCOFLORA OF CONVENTIONAL AND ORGANIC COTTON

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ABSTRACT

The present investigation was performed during the season June 2013 to June 2014. In this investigation direct method of study were used, includes isolation and direct observations. During these investigation 16 dominant fungi was isolated. Comparative analysis was done as organic cotton field fungi and conventional cotton fungi field. Fungal pathogen of organic field is higher than that conventional cotton field. Total fungal population was higher in organic cotton fields with the age of cotton plant as compare to conventional cotton fields; While Pathogenic fungal population was higher in conventional cotton field as compare to organic one. *Alternaria alternata, Alternaria macrospora., Aspergillus flavus, Aspergillus niger, Cercospora gossypina, Colletotrichum gossypii, Curvularia lunata, Drechslera tetramera, Helminthosporium gossypii, Penicillium notatum, Penicillium chrysogenum, Rhizoctonia solani, Stemphylium solani, Rhizopus oryzae,Trichoderma harzianum, Trichoderma viride* were reported. It was reported that *Alternaria, Penicillium* and *Aspergillus* were the most common fungi observed in both the farming systems.

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INTRODUCTION

Cotton is an important agricultural crop producing more than 150 many developing and underdeveloped countries. Indian organic cotton continues to make its presence felt. If cotton exportation will not good source for foreign currency earning, but it valuable for significant proportion of their GDP and tax income as well as economic and social development. India would thus emerge as a country with one of the fastest growing markets for apparel, up from four percent of global share to seven percent. Planting of Bt cottons are widely increased worldwide and playing an vital role in modern agriculture as well as textiles industries. New technologies adoption and expansion of the land area under cotton cultivation has given in significant production. It covers all over world 21 million ha in 2010 around the world (James, 2010). Impact of Bt cotton on rhizospheric and phyllospheric microbial communities have been extensively studied now a days. Hence phyllosphere and rhizosphere of cotton in which having large number and diversity of microbes found in organic and conventional field.

Leaf is a part of plant which is maximum exposed to air therefore atmospheric fungi get associated in numerable counts to the leaf surfaces and they have been termed as phyllosphere fungi by (Last, 1955; kerling, 1958).

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During the recent years, there has been increased the interest to study the effect of foliar pathogens on yield of the crop, various researchers have great contributions in the area of phyllosphere of crop plants (Last, 1955; Ruinen, 1961; Dickison, 1965, 1967). It is reported that non-parasitic fungi of phyllosphere of plants fixes the atmospheric nitrogen and also involved in nitrogen economy of the plants to control the disease development and interaction; they also helps to degrade plant waxes and involved in plants growth and development (Ruinen,1965; Sinha,1965; Pugh and Buckley,1971). Phyllosphere include the fungi which are pathogenic to plants, but it also includes the non pathogenic fungi which play an important role in influencing the environment and health of the plants. They also involved in the global processes as carbon and nitrogen cycles. Parasitic fungi cause various diseases to plants while saprophytic fungi present on phyllosphere gives protection to the plant against the pathogens. Many saprophytic fungi show antagonistic activity against the pathogenic fungi (Fokema, 1976).

MATERIALS AND METHODS

Sample collection

Samples were collected from the different localities and different fields of cotton, from Marathwada region. Sample brought in the laboratory of plant pathology, Department of

Botany Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. Sample were randomly collected and used for the isolation by different methods.

Phyllosphere mycoflora of cotton

a. Study of phyllosphere mycoflora by leaf impression method

This method was useful for superficial fungal spores. At the time of isolation fresh leaf were taken and pressed from its dorsal surface momentarily against the agar surface of petriplates at three places. Some leaf was placed from ventral surface against the agar surface in the same way like the first. Same procedure was repeated for other leaf samples. Inoculations of plates were carried out at 26 °C in an inverted position for 7 days.

b. Leaf washing method

This method was established by Dickinson (1945) and described as standard washing method for isolating microflora of leaf. The process involved the cutting of 3 mm diameter uniform discs at random from leaf surfaces samples and washing them in 2-3 changes of sterile water. Aliquots of the final washing were plated out with tap water agar and incubated to determine the efficacy of washing process. The results were taken after 3 days of incubation.

RESULTS AND DISCUSSION

The present study was performed during the *kharip* season. In this investigation direct method includes isolation were done. In this investigation 16 fungal species was observed. (Shamsi *et al*., 2014) reports the nine fungal species from phyllosphere of *Clitoria ternatea* i.e. *Alternaria alternata, Aspergillus flavus, A. fumigatus, A. niger, Cladosporium oxysporum, Colletotrichum gloeosporoides, Curvularia lunata, Fusarium oxysporum, Penicillium sp.,* Chikere and Azubuike, (2014) also shows Phyllospheric microbial composition of guava, hibiscus, mango and pumkin, they reported 13 fungal species belonging to five genera from this vegetables and fruits; i.e. *Aspergillus, Fusarium, Mucor, Penicillium* and *Rhizopus*. In the present study comparative analysis of Phyllospheric mycoflora of conventional and organic cotton fields were shown. From the (Table 1) fungal population is higher in organic cotton field than the conventional cotton fields; whereas the population of pathogenic fungi were higher in the conventional cotton fields as compare to organic cotton fields. (Zhang *et al*., 2010) shows the comparative analysis of phyllosphere microbial community between various vegetable crop plants. They show the rate of microbial community in spinach and rape is higher than the celery, broccoli and cauliflower.

Table 1. Percent Phyllospheric fungal population of Conventional and organic cotton fields

Name of fungi	Conventional cotton fields			Organic cotton fields		
	Jalna	Khultabad	Sillod	Jalna	Khultabad	Sillod
	Population per cm^2	Population per cm^2	Population per cm^2	Population per cm^2	Population per cm^2	Population per cm^2
Alternaria alternata	1.5	3.0	4.5	4.5	0.0	1.5
Alternaria macrospora.	4.5	4.5	7.5	1.4	1.5	0.0
Aspergillus flavus	1.5	0.0	0.0	7.5	4.5	4.5
Aspergillus niger	3.0	1.5	4.5	6.0	7.5	4.5
Cercospora gossypina	3.0	0.0	1.7	1.5	0.0	3.0
Colletotrichum gossypii	4.5	4.5	0.0	3.0	1.5	1.5
Curvularia lunata	0.0	3.0	4.5	1.5	0.0	1.4
Drechslera tetramera	0.0	4.5	1.5	7.5	6.0	4.5
Helminthosporium gossypii	7.5	0.0	4.5	0.0	1.5	0.0
Penicillium notatum	1.5	3.0	1.5	3.0	4.5	4.5
Penicillium chrysogenum	0.0	1.5	3.0	7.5	3.0	6.0
Rhizoctonia solani.	0.0	1.5	4.0	0.0	0.0	1.4
Stemphylium solani	3.0	0.0	0.0	1.5	0.0	1.5
Rhizopus oryzae	0.0	1.5	4.5	6.0	3.0	6.0
Trichoderma harzianum	0.0	0.0	0.0	4.5	7.5	4.5
Trichoderma viride	1.5	0.0	1.5	3.0	3.0	7.5

Table 2. Percent Frequency of phyllosphere fungal population of Conventional and organic cotton fields

Name of fungi	Conventional cotton fields			Organic cotton fields		
	Jalna	Khultabad	Sillod	Jalna	Khultabad	Sillod
	Frequency percentage	Frequency percentage	Frequency percentage	Frequency percentage	Frequency percentage	Frequency percentage
Alternaria alternata	1.7	3.4	5.1	5.1	0.0	1.7
Alternaria macrospora.	5.1	5.1	8.5	1.7	1.7	0.0
Aspergillus flavus	1.7	0.0	0.0	8.5	5.1	5.1
Aspergillus niger	3.4	1.7	5.1	6.8	8.5	5.1
Cercospora gossypina	3.4	1.5	5.1	1.7	0.0	3.4
Colletotrichum gossypii	5.1	5.1	0.0	3.4	1.7	1.7
Curvularia lunata	0.0	3.4	5.1	1.7	0.0	1.7
Drechslera tetramera	0.0	5.1	1.7	8.5	6.8	5.1
Helminthosporium gossypii	8.5	0.0	5.1	0.0	1.7	0.0
Penicillium notatum	1.7	3.4	1.7	3.4	5.1	5.1
Penicillium chrysogenum	0.0	1.7	3.4	8.5	3.4	6.8
Rhizoctonia solani.	0.0	1.7	5.1	0.0	0.0	1.7
Stemphylium solani	3.4	0.0	0.0	1.7	0.0	1.7
Rhizopus oryzae	0.0	1.7	5.1	6.8	3.4	6.8
Trichoderma harzianum	0.0	0.0	0.0	5.1	8.5	5.1
Trichoderma viride	1.7	0.0	1.7	3.4	3.4	8.5

Majorly saprophytic fungi were dominated in the organic cotton field as compare to pathogenic fungi. (Schmid *et al.,* 2011) reported impact of organic farming the number of *in vitro* antagonists was enhanced due to an enrichment of *Aureobasidium pullulans* in grapevine. *Alternaria macrospora* and *Helminthosporium gossypii* shows highest percentage of population 7.5% respectively in per cm2 of conventional cotton leaf sample; whereas *Trichoderma harzianum, Trichoderma viride* and *Aspergillus flavus* shows 0.00% of occurrence in conventional cotton leaf samples. In the organic cotton leaf sample *Aspergillus flavus, Aspergillus niger, Trichoderma Harzianum, Trichoderma viride* and *Penicillium chrysogenum* shows highest population in per cm2 area of leaf i.e 7.5%; whereas *Alternaria alternata, Alternaria macrospora, Curvularia lunata, Helminthosporium gossypii* and *Stemphylium solani* shows 0.00% population.

Percent frequency of occurrence of pathogenic fungi is higher in conventional cotton field as compare to organic cotton field. *Alternaria macrospora* and *Helminthosporium gossypii* shows of highest frequency of occurrence in conventional cotton field i.e. 8.5 % while they shows 0.00 % of frequency of occurrence in organic cotton fields (Table 2). *Aspergillus flavus, Aspergillus niger, Trichoderma Harzianum, Trichoderma viride* and *Penicillium chrysogenum* shows the dominancy in organic cotton field. Organic cotton fields show the dominancy of saprophytic fungi as compare to pathogenic fungi.

Conclusion

From the study and results it is concluded that the fungal population were higher in the organic cotton fields as compare to conventional fields. The dominancy of saprophytic fungi in organic cotton field was observed. Pathogenic fungi like Alternaria alternata, Helminthosporium gossypii, and Curvularia lunata shows highest percentage of occurrence in conventional cotton fields as compare to organic cotton fields. While saprophytic fungi like Aspergillus flavus, Aspergillus niger, Penicillium chrysogenum occurred frequently in the organic cotton fields.

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