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STUDIES ON SEASONAL VARIATION IN SUGARCANE SOIL MYCOBIOTA AT DIFFERENT LOCALITY OF JALNA DISTRICT

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ABSTRACT:

During The survey soil samples were collected at different seasons from four major sugarcane growing localities of Jalna district viz. Badnapur, Ambad, Jalna, Partur. The present study reveals the occurrence of total twenty nine species in which, among them four species belonging to zygomycetes (Rhizopus stolonifer, Rhizopus nigricans, Mucor sp., and Absidia sp.), two species belonging basidiomycetes (Rhizoctoni sp. and Sclerotium rolfsii) and twenty three species belonging to Deuteromycetes viz. Alternaria humicola, Alternaria alternata, Aspergillus niger, A. flavus, A. oryzae, Aspergillus terreus, Aspergillus nidulans, Aspergillus ustus, Cladosporium herbarum, Cercospora sp., Colletotrichum falcatum, Curvularia lunata, Drechslera sp, Fusarium oxysporum, F. moniliforme, F. semitectum, F. dimerum, F.sacchari, Macrophomina phaseolina, Penicillium chrysogenum, P.citrinum, Trichoderma harzianum, and Trichoderma koningii.

Keywords: Sugarcane, Mycobiota, Soil, Zygoomycetes. Euteromycetes, Basidiomycetes

INTRODUCTION:

Soil microbial diversity and activity of microbes play an important role in plant health and soil quality. Functional microbiological analysis of the rhizosphere has given new insights into the role of microbial communities in plant nutrition and plant protection against diseases. The diversity of microbes associated with plant roots is enormous. This complex plant-associated microbial community is decisive for plant health. Recent advances in plant microbe interactions research revealed different cultural practices also influence on their rhizosphere microbiome, as evidenced by the fact that different microbial communities when grown on the same soil. Soil is the most important naturally occurring habitat for all type of living organisms. Soil biota contains a representation of all groups of micro-organisms like fungi, bacteria, algae and viruses as well as the protozoa and nematodes. Among these all micro organisms Fungi are an important and major constituent of the soil micro biota, they constitute more soil biomass as compare to other micro organisms depending on soil depth and nutrition conditions. Soil is the habitat for live of fungi, multiply themselves and after their completion of life cycle they provide the rich

nutritive organic matter which can be recycled as plant nutrition. Large quantities of readily decomposable organic matter are added to agricultural soils every year as crop residues or animal wastes and have a significant outcome on soil microbial population (Prince et. al. 2011-12, Mahalingam et. al 2012). The plant species growing on the soil also equally influence the population and species composition of the soil fungi (Hackel et. al. 2000) Micro fungi play a focal role in nutrient cycling by regulating soil biological activity (Arunachalam, et. al. 1997) However, the rate at which organic matter is decomposed by the microbes is interrelated to the chemical composition of the substrate as well as environmental conditions. Maharashtra is major producer of sugarcane and it was a major cash crop. Considering all these facts we have decide to investigate soil mycobiota different locality of Jalna district were studies on Seasonal Variation in Sugarcane field.

MATERIALS AND METHODS:

Collection of samples:

Soil samples were collected at different seasons from major sugarcane grower fourtaluka localities of Jalna district, viz. Badnapur, Ambad, Jalna, Partur for the analysis of mycoflora. The soil samples were collected from different sugarcane fields (upto10-15cm depth) in sterile polythene zip locked bags. All samples were kept in the laboratory for analysis in the fridge until needed.

Isolation of fungi:

The isolation of fungi is done by the help of soil dilution method Waksman, (1927). Soil samples were collected from different places of the irrigated and non irrigated field at 5 -15 cm depth from each field, 200g soil samples were collected and pooled together to obtain composite sample. The soil samples were collected in sterile polythene bags cleaned with alcohol and labeled after collection. The samples were kept it in the laboratory for further analysis. The soil micro fungi were enumerated by two methods, namely Soil Dilution, Waksman (1922) on different media such as Rose Bengal Agar and potato dextrose agar media. 1 gm of each soil sample is added in each 10 ml of distilled water respectively. Up to 10^{-4}serial dilution was carried out. By using sterile spreader, 0.1 ml sample were spread on the petri-plate containing Rose Bengal Agar and potato dextrose agar medium, One percent streptomycin solution was added to the medium before pouring into petri-plates for preventing bacterial growth only for the isolation of fungi. The Petri dishes were then incubated at 28 ± 2°C in room temperature petri-plates were kept in the room temperature and observed after 7 days.

Identification of fungi:

The isolation of fungal pure culture was done with PDA medium in the standard petriplates by single spore culture technique. By considering some parameters like colony colours and their appearance, growth pattern, sporulation, etc. identification of fungi were done. Microscopic study was also done. Characters observed like types of hyphae their branching pattern, presence and absence of septa, types of spores, sporangiophore were observed during the study. All microscopic study were done with help of books and manual and most updated keysviz. Raper and Thom (1949), Raper et al., (1965), Nagamani A, Kumar IK and Manoharachary C. (2006), Eills (1976), Mukadam (2006) and Barnett and Hunter, (1998).

RESULTS AND DISCUSSION:

Table No 1. Fungal diversity in soil of sugarcane field

Sr. No.	Name of fungal species	Sr. No.	Name of fungal species
Zygomycota		08	Aspergillus ustus
01	Rhizopus stolonifer	09	Cladosporium herbarum
02	Rhizopus nigricans	10	Cercospora sp.
03	Mucor sp.	11	Curvularia lunata
04	Absidia sp.	12	Colletotrichum falcatum
Basidiomycota		13	Drechslera sp.
01	Rhizoctonia sp.	14	Fusarium oxysporum
02	Sclerotiumrolfsii	15	Fusarium moniliformae
Deuteromycota		16	Fusarium semitectum
01	Alternaria humicola	17	Fusarium dimerum
02	Alternaria alternata	18	Fusarium sacchari
03	Aspergillus niger	19	Macrophominaphaseolina
04	Aspergillus oryzae	20	Penicillium chrysogenum
05	Aspergillus flavus	21	Penicillium citrinum
06	Aspergillus terreus	22	Trichodermaharzianum
07	Aspergillus nidulans	23	Trichodermakoningii

During fungal diversity of sugarcane fields total twelve(12) soil samples were collected at different seasonsfrom four major sugarcane growing localities of Jalnadistrict viz. Badnapur, Ambad, Jalna, Partur. The present study reveals the occurrence of total twenty nine species in which, among them four species belonging to zygomycetes (Rhizopus stolonifer, Rhizopus nigricans, Mucor sp., and Absidia sp.), two species belonging basidiomycetes (Rhizoctoni sp. and Sclerotium rolfsii) and twenty three species belonging to Deuteromycetes viz. Alternaria humicola, Alternaria alternata, Aspergillus niger, A. flavus, A. oryzae, Aspergillus terreus, Aspergillus nidulans, Aspergillus ustus, Cladosporium herbarum, Cercospora sp., Colletotrichum falcatum, Curvularia lunata, Drechslera sp, Fusarium oxysporum, F. moniliforme**,** F. semitectum, F. dimerum, F. sacchari, Macrophomina phaseolina, Penicillium chrysogenum, P. citrinum, Trichoderma harzianum, and Trichoderma koningii.

Total twenty nine (29) species belongs thirteen (13) genera like Aspergillus (Species 06), Fusarium (Species 05), Penicillium (Species 02), Trichoderma (Species 02), Alternaria (Species 02), Rhizopus (Species 02), Cladosporium (01), Curvularia (01), Colletotrichum (01), Drechslera (01), Mucor (01), Rhizoctonia (01) and Sclerotium (01). Among these zygomycetes having three (03) genera belongs to Four (04) species, basidiomycetes having Two (02) Genera, and deuteromycetes having Eleven (11) genera belongs to twenty three (23) species.

Prince et. al. (2011) Totally 49 species isolated belonging 17genera from the soil of sugarcane field. Number of Deuteromycetes were representing by 46 species remaining 3 species are Phycomycetes. The dominant species were Aspergillus niger, A. flavus followed by Botrytis cinera, Trichoderma viride, T. harzianum, Penicillium chrysogenum, T. koeningii, T.glaucum, and P. citrinum from the sugarcane field soils of Orathanadu in various seasons whereas, in Pattukottai soils the dominant species were A. niger, Botrytis cinera followed by A. oryzae, Fusarium oxysporum, Gliocladium virens, P. chrysogenum and T. viride respectively.

Table No 2. Fungal Diversity Soil Fungi in Sugarcane Fields at Badnapur Locality

Sr. No.	Name of fungi	Season wise distribution		
		Winter	Summer	Monsoon
1.	Absidia sp.	-	-	+
2.	Alternaria alternata	+	+	-
3.	Alternaria humicola	+	-	-
4.	Aspergillus niger	+	+	+
5.	Aspergillus oryzae	-	-	+
6.	Aspergillus flavus	+	-	+
7.	Aspergillus terreus	+	-	-
8.	Aspergillus nidulans	-	+	+
9.	Aspergillus ustus	-	+	-
10.	Cladosporium herbarum	+	+	+
11.	Colletotrichum falcatum	-	+	+
12.	Fusarium oxysporum	-	+	-
13.	Fusarium moniliformae	+	-	+
14.	Fusarium semitectum	-	+	-
15.	Fusarium dimerum	-	+	-
16.	Fusarium sacchari	+	+	-
17.	Rhizopus nigricans	+	-	+
18.	Rhizopus stolonifer	+	+	-
19.	Trichodermaharzianum	+	+	+
20.	Trichodermakoningii	-	+	-

Table No 3. Fungal Diversity of Soil Fungi in Sugarcane Fields at Ambad Locality

Sr. No.	Name of fungi	Season wise distribution		
		Winter	Summer	Monsoon
1.	Alternaria alternata	-	+	-
2.	Aspergillus flavus	+	+	+
3.	Aspergillus nidulans	+	+	-
4.	Aspergillus niger	+	+	+
5.	Aspergillus oryzae	+	-	+
6.	Aspergillus terreus	+	+	+
7.	Cercospora sp.	+	-	-
8.	Curvularia lunata	+	-	-
9.	Colletotrichum falcatum	-	+	+
10.	Drechslera sp.	-	+	-
11.	Fusarium oxysporum	+	-	+
12.	Fusarium moniliformae	-	+	-
13.	Fusarium semitectum	+	-	+
14.	Fusarium dimerum	+	-	-
15.	Fusarium sacchari	-	+	-
16.	Macrophomina phaseolina	-	+	+
17.	Mucor sp.	+	+	-
18.	Penicillium chrysogenum	+	+	+
19.	Penicillium citrinum	-	+	-
20.	Rhizoctoni sp.	-	+	-
21.	Rhizopus stolonifer	+	-	+
22.	Sclerotium rolfsii	-	+	-
23.	Trichoderma harzianum	+	-	+
24.	Trichoderma koningii	-	+	-

During the investigation four fields were selected to study the soil mycobiota of sugarcane field, Badnapur locality shows 20 fungal species were found Zygomycetes having two (02) genera and three (03) species and Deuteromycetes having six (06) genera and seventeen (17) species, among that fungal load is more seen at summer season as compare to monsoon and winter season. Aspergillus niger, Cladosporium herbarum and Trichoderma herzianum were dominant all season occurrence at Badnapur locality, among the 20 fungi 13 fungi were occurred in summer season, 10 fungi were occurred in monsoon and 09 fungi were occurred in winter season. Total 24 fungal species from Two species belonging to Two genera of Zygomycetes, two species from two genera belonging to Basidiomycetes, and Twenty species belongs to Ten(10) genera of Deuteromyceteswere found at Ambad locality. Among that fungal load is more seen at summer season as compare to winter season and monsoon season. The occurrence of Aspergillus flavus, Aspergillus niger, Aspergillus terreus and Penicillium chrysogenum shows the dominance at Ambad locality**.**

Pandey et. Al. (2014) seasonal variations in soil fungal population of traditional sugarcane field 50 different species belonging to Phycomycetes and Deuteromycetes were isolated. Total fungus in two station, they are 37 species belong to 16 genera were identified from Thanjavur station and 35 species belong to 15 genera were identified from Thiruvaiyaru station. The study of soil fungal community in species composition of the inparticular variants of fertilization appeared to be morediversified. The quantitatively more fungal count wasobserved in organic cotton field. In soils subjected to organic fertilization, (Mane and Chavan, 2016).

Analysis of soil mycobiota at Jalna locality fungal load is differ during seasonal variation, total 18 fungal species from one genera of Zyogomycetes (one species), and seventeen species belongs to ten (10) genera of Deuteromycetes were occurred, in summer season. Highest fungal occurrence were observed as compare to winter and monsoon. At Jalna locality Alternaria alternata, Aspergillus flavus, Colletotrichum falcatum, Fusarium sacchari and Penicillium citrinum shows the dominance in all seasons. At Partur sugarcane field shows the highest occurrence of 26 species three species belongs to two genera of Zygomycetes, two species belongs to two genera of basidiomycetes and 21 species belongs to Deuteromycetes. Aspergillus flavus, Aspergillus niger, Cladosporium herbarum, Mucor sp., Penicillium chrysogenum and Fusarium moniliforme were seen dominant. Fungal load is more found in summer season as

compare to winter and monsoon. Madhan raj et al., (2010) reported that 45 soil samples were collected from 8 different station along the entire Tamilnadu coast and examined by dilution plating method to access the fungal diversity and their population density. Totally 24 fungal species representing 12 genera recorded Aspergillus was constituted by more number of (9 species) followed by Penicillium (3species) Fusarium and Monodictys (2 species each). Mane et. al. (2016) observed that there age of the crop and season influences on the fungal load. The fungal load will be increased in cotton phyllosphere mycoflora by the soil type also.

Table No 4. Fungal Diversity of Soil Fungi in Sugarcane Fields at Jalna Locality

Sr. No.	Name of fungi	Season wise distribution		
		Winter	Summer	Monsoon
1.	Alternaria alternata	+	+	+
2.	Aspergillus flavus	+	+	+
3.	Aspergillus niger	+	-	-
4.	Aspergillus oryzae	-	+	-
5.	Aspergillus vustus	-	+	+
6.	Cladosporium herbarum	+	-	+
7.	Cercospora sp.	-	+	-
8.	Curvularia lunata	+	-	+
9.	Colletotrichum falcatum	+	+	+
10.	Drechslera sp.	-	+	+
11.	Fusarium oxysporum	+	-	-
12.	Fusarium semitectum	+	+	-
13.	Fusarium dimerum	-	+	+
14.	Fusarium sacchari	+	+	+
15.	Macrophomina phaseolina	-	+	-
16.	Penicillium chrysogenum	-	+	-
17.	Penicillium citrinum	+	+	+
18.	Rhizopus nigricans	+	+	-

Table No 5. Fungal Diversity of Soil Fungi in Sugarcane Fields at Partur Locality

Sr. No.	Name of fungi	Season wise distribution		
		Winter	Summer	Monsoon
1.	Alternaria alternata	+	+	-
2.	Alternaria humicola	-	+	+
3.	Aspergillus flavus	+	+	+
4.	Aspergillus nidulans	+	-	-
5.	Aspergillus niger	+	+	+
6.	Aspergillus oryzae	+	-	-
7.	Aspergillus terreus	-	-	+
8.	Aspergillus ustus	-	-	+
9.	Cercospora sp.	-	+	-
10.	Cladosporium herbarum	+	+	+
11.	Colletotrichum falcatum	+	+	-
12.	Curvularia lunata	-	+	-
13.	Fusarium dimerum	+	+	+
14.	Fusarium moniliformae	+	+	+
15.	Fusarium oxysporum	+	-	-
16.	Fusarium sacchari	+	+	-
17.	Fusarium semitectum	+	-	+
18.	Mucor sp.	+	+	+
19.	Penicillium chrysogenum	+	+	+
20.	Penicillium citrinum	+	-	+
21.	Rhizopus nigricans	-	+	+
22.	Rhizopus stolonifer	+	-	+
23.	Rhizoctonia sp.	-	+	-
24.	Sclerotium rolfsii	-	+	-
25.	Trichoderma harzianum	-	+	-
26.	Trichoderma koningii	+	-	-

CONCLUSION:

During the study of fungal diversity of sugarcane field shows that twenty nine (29) fungal species were observed. In which there is no specificity of fungus to the locality. Environment also influences on fungal diversity. Agricultural practices and irrigation system also impact on the soil mycobiota. It was concluded that fungal occurrence varies in season as well as locality therefore need to more study.

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