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Mycofloral Profiling Of Various Crop Cultivated Soil From Karur District, Tamil Nadu, India

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Abstract: In the present study around ten soil samples were collected various agricultural fields of Karur district, Tamil Nadu. The soil samples were collected as per standard procedure. Isolation of fungal species were done by serial dilution and plating on PDA agar followed by microscopic identification by LPCB mount. Totally 30 fungal flora belongs to eight family isolated and profiled. Percentage occurrence includes *Aspergillus sp.* (23%), *Penicillium sp.* (17%), *Mucor sp.* (14%), *Rhizopus sp.* (14%), *Fusarium sp.* (7%), *Curvularia sp.* (17%) and others species (each 3%). The overall finding on soil fungal flora of this research could help the researchers and farmers for a choosing crop growth promoting fungi such as mineral solubilizing fungi in and around the study sites.

Index Terms - Crop cultivated soil, PDA, LPCB mount, Soil fungi.

I. INTRODUCTION

Soil is the crucial soul of infinite living beings. It is also importance for development of crop and nutrient storage. Soil contains numerous microflora and fauna. Among them bacteria and fungus play a major role in soil fertility by protecting soil organic matter and promote crop growth. Fungi are decomposers, they break down dead plants and animals and release essential nutrients back into the soil. They also involved in nitrogen fixation, phosphate and potassium solubilization and mobilization, Soil fungi do important functions in agricultural soil such as nutrient recycling, plant disease suppression and water (Kutateladze, 2016). Fungi can be nurture in almost every environment and can withstand in a wide range of pH and temperature (Frąc *et al.*, 2015). Keeping in view of importance of fungal role, the present research focus on physicochemical and fungal profile of ten soil samples collected from organic and conventional crop cultivated land from Karur District, Tamil Nadu.

II. MATERIALS AND METHODS

Sampling site

The sampling site Karur is one of 38 districts in the Indian state of Tamil Nadu. It is located on the banks of the three rivers Amaravathi, Noyyal and Kaveri and situated at about 395 km southwest of Chennai. Sample site includes the crop cultivated land via Onion, Kadavur (10.7294 – 78.2307), Ground nut, Pulyur (10.93999 – 78.144480), Chilly, Aravakurichi (10.7747 – 77.9090), Seasame, Uppupalayam (11.30145 – 77.91398), Sugar cane, Aravakuruchi (1077412 – 77.907040), Corn, Kuppam (11.00759 – 77.93541), Green gram, Aravakurichi (10.77412 – 77.907040), Water melon, Vettamangalam (11.0386 – 77.9567), Turmeric, Mookanankurichi (10.86462 – 78.075970) and Black gram, Thukkachi (11.02357 – 77.842330). All details regarding the cultivated crop, fertilizer and pesticide used, previous farming history, farmer and land details were manually collected as a consent form from each farmer and recorded for future documentation purpose.

Sample Collection

Around ten soil samples in triplicate were collated from respective crop cultivated land during June 2023 to November 2023. Approximately 100 g of soil was collected from each site at a depth of 0-30 cm. The samples were transferred to clean polythene bags, tagged and transferred to laboratory for fungal isolation.

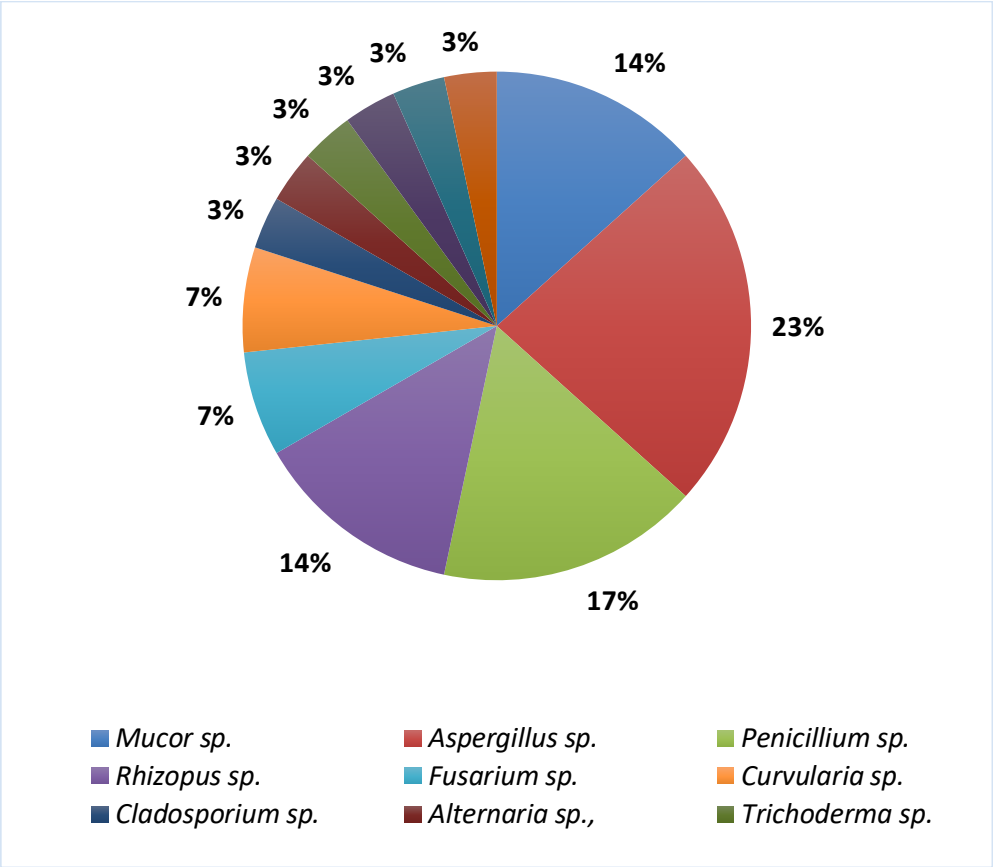
Fungal Profiling

About one gram of soil was added into the tube containing 9 ml of sterile distilled water to obtain 1/10 (10^{-1}) and made serial dilutions up to 10^{-6} by adding 1ml of solution to 9 ml of sterile distilled water respectively. The growth of fungal was raised on PDA plate by spreading 0.1ml diluted sample from 10^{-3}, 10^{-4} and 10^{-5} dilution of each soil samples upon incubation at room temperature up to 48 hours. From each plate one single colony with unique colony morphology were selected and sub-cultured on freshly prepared PDA to obtain pure culture. Each fungus was examined under the microscope for ascertaining the identity using lactophenol cotton blue staining (LPCB mounting).

III. RESULTS AND DISCUSSION

In the present study, fungal profile reveals a total of 30 fungal species were isolated from 10 soil samples collected from various agricultural area of Karur district, Tamil Nadu. They were identified based on cultural and morphological characteristics such as size and colour of colony, nature of hyphae and shape of conidia with help of standard reference manual (Table-1). The identified soil fungi namely *Mucor sp.*-1, *Aspergillus sp.*-1 ,*Aspergillus sp.*-2, *Cladosporium sp., Rhizopus sp.*-1, *Penicillium sp.*-1, *Penicillium sp.*-2, *Alternaria sp., Fusarium sp.*-1, *Penicillium sp.*-3, *Rhizopus sp.*-2, *Mucor sp.*-2, *Aspergillus sp.*-3, *Curvularia sp.*-1, *Mucor sp.*-3, *Aspergillus sp.*-4, *Trichoderma sp., Pythium sp., Penicillium sp.*-4, *Aspergillus sp.*-5, *Fusarium sp.*-2, *Cephalosporium sp., Mucor sp.*-4, *Aspergillus sp.*-6, *Rhizopus sp.*-3, *Aspergillus sp.*-7, *Curvularia sp.*-2, *Penicillium sp.*-5, *Scedosporium sp.,* and *Rhizopus sp.*-4. The percentage occurrence of the identified fungi is shown in Figure-1. Among the identified species *Aspergillus sp.* (23%) found maximum numbers in the soil samples and followed by *Penicillium sp.* (17%), *Mucor sp.* (14%), *Rhizopus sp.* (14%)., *Fusarium sp.* (7%), *Curvularia sp.* (17%) and others species (each 3%).

Figure 1 - Percentage occurrence of the identified fungal genus



Isolated 30 fungal species belongs to eight family namely Mucoraceae, Trichocomaceae, Mucoraceae, Nectriaceae, Pleosporaceae, Cladosporiaceae, Hypocreaceae, Pythiaceae and Microascaceae (Table - 2). Soil mycoflora plays a substantial role in soil bio-geochemical processes which regulate plant productivity. Fungi diversity in soil affects crop plant growth positively as well as negatively (Ratna Kumar *et al.*, 2015,).Our findings are in accordance with the results of Ratna Kumar *et al.*, (2019) who studied soil mycoflora of crop fields in west Godavari district of Andhra Pradesh and recorded genera like *Curvularia, sp., Penicillium sp., Mucor sp., Aspergillus sp., Fusarium sp., and Rhizopus sp*. Similar genera wereisolated during our investigation also. Mycoflora of agricultural soils is affected by various physical and chemical parameters. Organic constituents, pH and moistureof soil have major impact on fungal diversity of a soil (Gaddeyya *et al.*, 2012). Similar to our finding, a comparative study of bacterial and fungi present in different organic and inorganic soils collected from agricultural fields (Ishaq and Khan, 2011). The study also corroborate with other studies who isolated and identified soil mycoflora from agricultural field in central Uttar Pradesh (Pandey et al., 2014), Tilda of Raipur (Sandhya, 2019), Hubli taluk of Karnataka (Ramesh and Mallesh, 2021) and Narmada district of Gujarat (Bhimani and Nikunj, 2021).

Table 5 - Cultural and morphological characteristics of isolated 30 fungal species

S. No	Soil code	Dilution	Isolate code	Size and colour of colony	Nature of hyphae	Conidia shape	Name of the species
1	S1	10^{-3}	Isolate 1	Medium, whitetogrey	Non-septate	Globose	*Mucor sp.,*
2	S1	10^{-4}	Isolate 2	Medium, hyaline (colorless)	Septate	Subglobose	*Aspergillus sp.,*
3	S1	10^{-5}	Isolate 3	Medium, hyaline (colorless)	Septate	Irregular	*Aspergillus sp.,*
4	S2	10^{-3}	Isolate 4	Small, blackish-brown	Aseptate	Ellipsoidal	*Cladosporium sp.,*
5	S2	10^{-4}	Isolate 5	Medium,Brown	Non-septate	Globose	*Rhizopus sp.,*
6	S2	10^{-5}	Isolate 6	Large, blue-green	Septate	Oval	*Penicillium sp.,*
7	S3	10^{-3}	Isolate 7	Large, green	Septate	Round to oval	*Penicillium sp.,*
8	S3	10^{-4}	Isolate 8	Large gray to black	Septate	Obclavate	*Alternaria sp.,*

9	S3	10^{-5}	Isolate 9	Medium, white with pink	Septate	Spindle shape	*Fusarium sp.,*
10	S4	10^{-3}	Isolate10	Large, blue-green	Septate	Oval	*Penicillium sp.,*
11	S4	10^{-4}	Isolate 11	Small to medium, Brown	Non-septate	Globose	*Rhizopus sp.,*
12	S4	10^{-5}	Isolate 12	Medium, white	Non-septate	Globose	*Mucor sp.,*
13	S5	10^{-3}	Isolate 13	Medium, Black	Non-septate	Subglobos	*Aspergillus sp.,*
14	S5	10^{-4}	Isolate 14	Medium, Brown	Septate	Lunate	*Curvularia sp.,*
15	S5	10^{-5}	Isolate 15	Medium, Gray	Non-septate	Globose	*Mucor sp.,*
16	S6	10^{-3}	Isolate 16	Medium, gray to black	Non-septate	Subglobos	*Aspergillus sp.,*
17	S6	10^{-4}	Isolate 17	Large, white to green shades	Septate	Ellipsoidal	*Trichoderma sp.,*
18	S6	10^{-5}	Isolate 18	Large gray-white	Aseptate	Spherical	*Pythium sp.,*
19	S7	10^{-3}	Isolate 19	Medium yellow green	Septate	Round	*Penicillium sp.,*
20	S7	10^{-4}	Isolate 20	Medium, Brown	Non-septate	Oval	*Aspergillus sp.,*
21	S7	10^{-5}	Isolate 21	Medium cream, salmon, peach	Septate	Spindle shape	*Fusarium sp.,*
22	S8	10^{-3}	Isolate 22	Medium, pale gray	Non-septate	cylindrical	*Cephalosporium sp.,*
23	S8	10^{-4}	Isolate 23	Medium Gray	Non-septate	Globose	*Mucor sp.,*
24	S8	10^{-5}	Isolate 24	Medium, Brown to dark	Non-septate	Oval	*Aspergillus sp.,*
25	S9	10^{-3}	Isolate 25	Medium yellowish-brown	Non-septate	Angular	*Rhizopus sp.,*
26	S9	10^{-4}	Isolate 26	Medium, dark	Non-septate	Oval	*Aspergillus sp.,*
27	S9	10^{-5}	Isolate 27	Large, dark-brown	Septate	Lunate	*Curvularia sp.,*
28	S10	10^{-3}	Isolate 28	Medium, grayish-green	Septate	Oval	*Penicillium sp.,*
29	S10	10^{-4}	Isolate 29	Medium, greyish-white	Septate	clavate	*Scedosporium sp.,*
30	S10	10^{-5}	Isolate 30	Medium,Brown	Non-septate	Globose	*Rhizopus sp.,*

Table 2 – Number of isolate, percentage and belonging family of the isolated fungi

S.No	Identified Species	No. of Isolate	Occurrence percentage	Family
1	*Mucor sp.*	4	14%	Mucoraceae
2	*Aspergillus sp.*	7	23%	Trichocomaceae
3	*Penicillium sp.*	5	17%	Trichocomaceae
4	*Rhizopus sp.*	4	!4%	Mucoraceae
5	*Fusarium sp.*	2	7%	Nectriaceae
6	*Curvularia sp.*	2	7%	Pleosporaceae
7	*Cladosporium sp.*	1	3%	Cladosporiaceae
8	*Alternaria sp.,*	1	3%	Pleosporaceae
9	*Trichoderma sp.*	1	3%	Hypocreaceae
10	*Pythium sp.*	1	3%	Pythiaceae
11	*Cephalosporium sp*	1	3%	Hypocreaceae
12	*Scedosporium sp*	1	3%	Microascaceae

IV. CONCLUSION

It was concluded that mycoflora profiling from the selected study area clearly showed that the agricultural fields of the selected sites have good diversity of fungal species which provides us to future insight evaluation of the beneficial fungi as phosphate, potassium and other mineral solubilization.

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