



Research Article

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Fungal Biodiversity Study of Varied Soil Samples Collected From Two College Campus of Puducherry City

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ABSTRACT

Soil fungi play an important role as major decomposers in the soil ecosystem and fertile the soil which in turn helps the proper growth of plant communities. They also provide mankind with very useful pharmaceutical products, such as antibiotics and other valuable products, including organic acids, enzymes, pigments and secondary metabolites. In our present study, it was an attempt to isolate and enumerate soil fungi from two different college campuses in order to record their abundance per gram soil as well as to find out their source of origin in the soil. *Penicillium citrinum* was found as the dominant fungus in its abundance among all the fungi isolated from soil samples followed by *Aspergillus niger*, but *Aspergillus niger* was considered as universal since it was recorded from all the soil samples of both the colleges and *Aspergillus* sp., *Fusarium* sp. and *Verticillium* spp were also isolated too. The soil samples clearly indicated the presence of *Aspergillus niger*, *Aspergillus flavus* and *Penicillium* spp and *Mycelia sterilia* forms. Fungi like *Fusarium* sp., *Doratomyces* sp., *Verticillium* sp. and sterile forms were rarely recorded. *Deuteromycotina* fungi were dominant followed by *Zygomycotina* and a few were under *Ascomycotina*, but no fungi were recorded from *Basidiomycotina* group. In fungal composition, the similarity coefficient value between KMCPGS and TAC was found to be the maximum (87.5%) since their common fungi were more in comparison to other soil samples.

Keywords: Soil fungi; Similarity coefficient; College campus; Decomposer; Microflora

INTRODUCTION

The soil environment affords the habitat for a vast number of organisms from all domains of life including a diverse array of macro-fauna, protozoa, prokaryotic microbes and an enormous diversity of microflora, particularly fungi. The environmental studies of soil inhabiting fungi range from the beneficial symbionts of mycorrhizal fungi to the essential organic matter decomposing saprophytes to antagonistic pathogens of plants, animals and other fungi. Crossing all fungal phyla, the diversity of fungal species present in a single gram of soil has been estimated to be in the hundreds or thousands [1,2]. The quality of a high density of species richness in an environment has been termed hyper-diversity. The fructification made by the number of fungi at any given time in an environment is only a small fraction of the total ground species richness, so visual investigations provide limited estimation of ground communities [3]. Numerous fungi fruit at diverse times from one another produce unremarkable fruiting bodies or produce asexually resulting in inherent partialities from visual surveys. Diverse culture methods have been used to explore fungal diversity in soil however they moreover suffer from biases. These culture methods typically select for fast-growing saprophytic fungi and are incapable of detecting most bio-trophic and mutualistic fungi. Further, it is necessary to understand and estimate soil fungi from different soils for the data base of their diversity and

sporulation. The present study deals with the isolation and enumeration of soil fungi from ground soils of two different college campus of Puducherry city, India.

MATERIALS AND METHODS

During the present study period, isolation, enumeration and identification of soil fungi were done from different soil samples collected from two college premises of Pondicherry.

Collection of Soil Samples

The soil samples were collected from two different college campuses i.e., K. M. Centre for Post Graduate Studies (KMCPGS) and Tagore Arts College (TAC), Puducherry city. The soil samples were collected during January 2015 to March 2015 at different intervals from the grounds (up to 15cm depth) into small sterilized polythene bags and brought to the Microbiology Laboratory, Department of Botany, K. M. Centre for Post Graduate Studies (KMCPGS), Pondicherry-605008 with utmost care, stored at 4°C in the refrigerator for further studies.

Isolation of Fungi

The soil microfungi were isolated and enumerated by two methods, namely serial soil dilution [4] and soil plate method [5] on different media such as Potato Dextrose Agar and Sabouraud Dextrose Agar.

Identification of the Soil Fungi

The fungal morphology was studied macroscopically by observing the colony features (colour and texture) and microscopically by staining with lacto phenol cotton blue and observed under compound microscope for the conidia, conidiophores and arrangement of spores. The fungi were identified with the help of available literature and monographs present in the laboratory and with the expertise of the research scholars and teachers [6-11].

Statistical Analysis

Mean and relative occurrence of the isolated soil fungi were carried out between the soil samples.

RESULTS AND DISCUSSION

During the present study period, altogether 618 fungal colony forming units (CFUs) were isolated from the soil samples of the two college campus soils, of which, KMCPGS soil contributed the maximum (61%) fungal population and it was followed by TAC soil (39%) (Figure 1). Growth of soil fungi on agar plates in two different college soils is given in plate 1. In fungal composition, a total of 9 species under 5 genera were recorded from both the soils. Mean, relative occurrence and total number of fungi isolated from K. M. Centre for P. G. Studies and Tagore Arts College, Lawspet, Pondicherry campus soil are given in Table 1 and 2 respectively and the occurrence of soil fungi in KMCPGS and TAC campus soils are given in Figure 2 and Figure 3 respectively, which showed that *Penicillium citrinum* was the dominant soil fungus in KMCPGS soil and *Aspergillus niger* was the dominant fungus in Tagore Arts College soil. Fungal diversity of any soil depends on a large number of factors of the soil such as pH, organic content and the relative humidity prevailing in the soil environment [12]. Nayak and his coworkers also elaborated in their work that the physicochemical parameters like, soil pH and their textures are also determine the fungal population in agricultural fields of Villianur [1-3,13,14]. The soil mycoflora study made by Gaddeyya et al [13] was in agreement with our report that they also isolated 173 fungal colonies under 15 fungal species from the crop fields in Salur, Andhra Pradesh. The maximum fungal species were belonged to Deuteromycotina followed by Zygomycotina and a few were under Ascomycotina, but no fungi were recorded from Basidiomycotina group. Among the fungal isolates, penicilli and aspergilli were the dominant followed by sterile mycelia. In concentration and composition, KMCPGS soil was found to be the good contributor of fungi per gram soil than TAC soil. It may be attributed that the dryness in the latter (KMCPGS) which prevented the growth of fungi in the ground soil. *Aspergillus* was isolated with three species like, *Aspergillus flavus*, *A. niger*, *Aspergillus* sp. *Penicillium citrinum* and *P. fellutanum* were recorded from both the soils but no *Doratomyces* sp. was recorded from KMCPGS college soil at all. White sterile mycelia were recorded in more numbers from both the soils. Other Dematiaceous fungi were isolated sporadically from the soil samples.

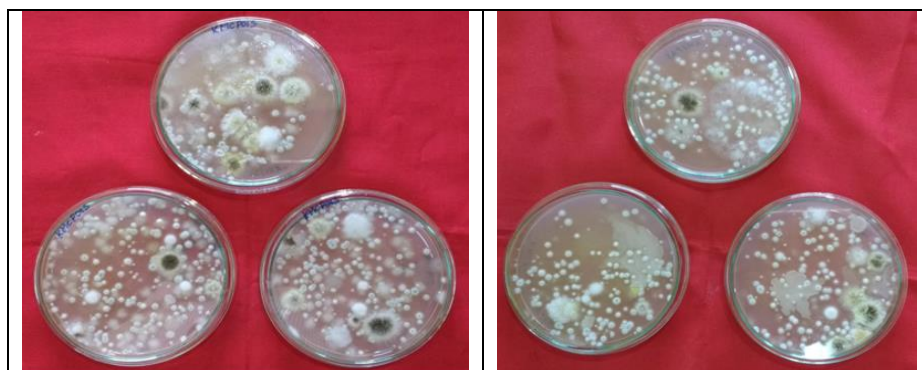


Figure 1: KMCPGS college soil samples and TAC college soil samples

Plate 1: Growth of soil fungi on agar plates in two different college soils.

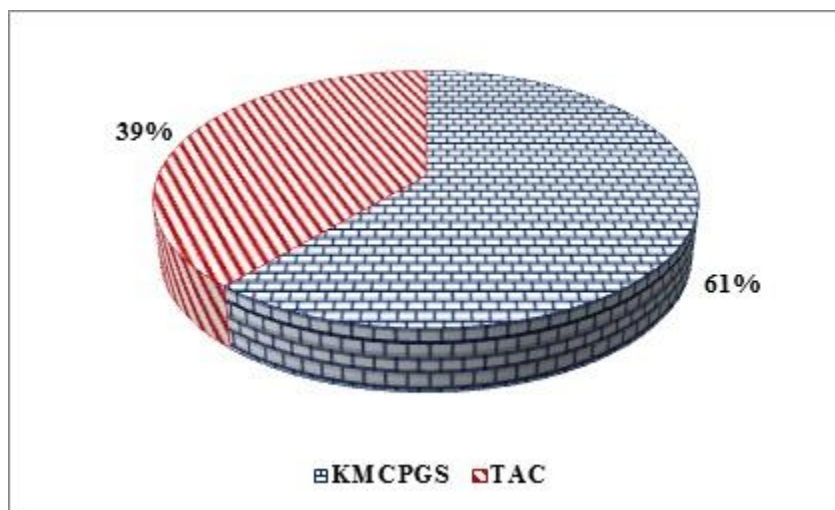


Figure 2: Distribution of soil fungi between two college campuses

Table 1: Mean, relative occurrence and total number of fungi isolated from K. M. Centre for P. G. Studies (KMCPGS), Lawspet, Pondicherry Campus soil

Sl. No.	Soil Fungi	Soil Sample Replicates / CFUs			Total CFUs	Mean Value $\pm$	Occurrence
		I	II	III			
1	<i>Aspergillus flavus</i>	2	-	-	2	0.6	0.52
2	<i>Aspergillus niger</i>	6	3	4	13	4.3	3.44
3	<i>Aspergillus</i> sp.	-	2	-	2	0.6	0.52
4	<i>Fusarium</i> sp.	3	-	-	3	1	0.79
5	<i>Penicillium citrinum</i>	71	140	137	348	116	92.0
6	<i>Verticillium</i> sp.	2	3	2	7	2.3	1.85
7	White sterile mycelia	3	-	-	3	1	0.79
Total		87	148	143	378	125.8	

Table 2: Mean, relative occurrence and total number of fungi isolated from Tagore Arts College (TAC), Lawspet, Pondicherry Campus soil

Sl. No.	Soil Fungi	Soil Sample Replicates / CFUs			Total CFUs	Mean Value $\pm$	Occurrence
		I	II	III			
1	<i>Aspergillus flavus</i>	-	2	-	2	0.6	0.83
2	<i>Aspergillus niger</i>	53	56	63	172	57.2	71.66
3	<i>Aspergillus</i> sp.	-	2	1	3	1	1.25
4	<i>Doratomyces</i> sp.	1	2	1	4	1.33	1.66
5	<i>Fusarium</i> sp.	5	0	4	9	3	3.75
6	<i>Penicillium citrinum</i>	8	17	6	31	10.3	12.9
7	<i>Penicillium fellutanum</i>	4	3	2	9	3	3.75
8	<i>Verticillium</i> sp.	4	3	2	9	3	3.75
9	White sterile mycelia	-	-	1	1	0.3	0.41
Total		75	85	80	240	79.89	

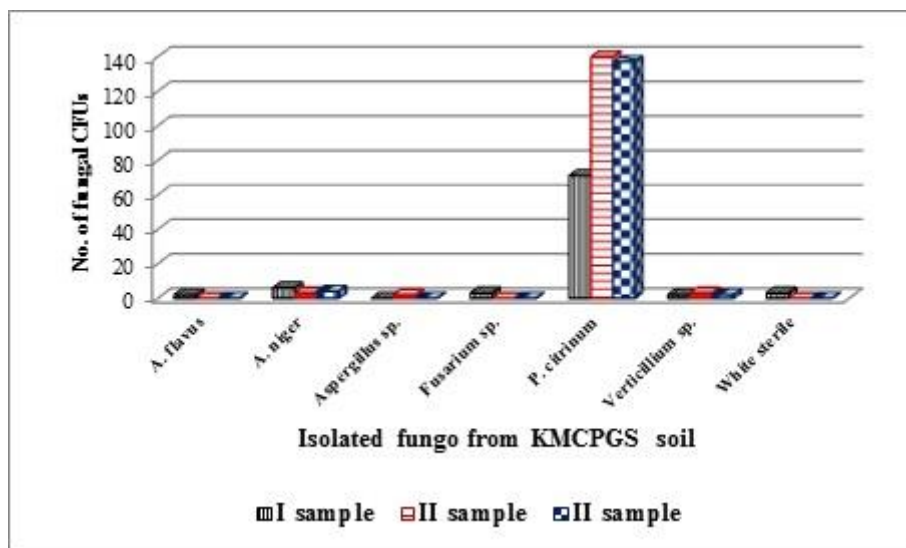


Figure 2: Occurrence of soil fungi in KMCPGS Campus soil

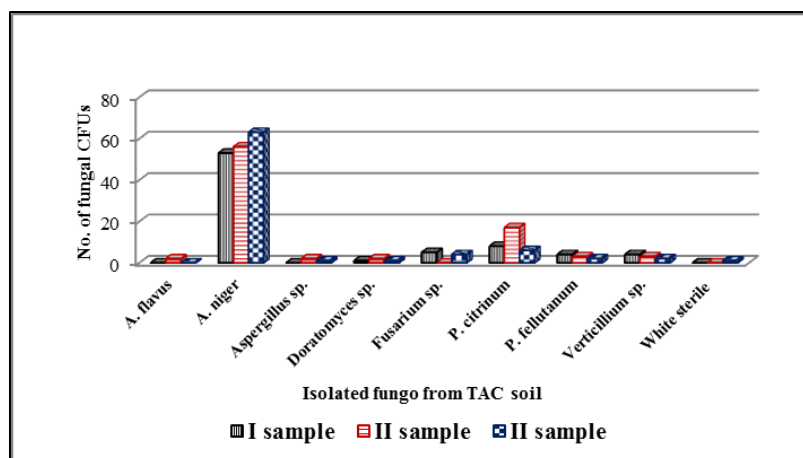


Figure 3: Occurrence of soil fungi in Tagore Arts College Campus soil

CONCLUSION

During the present study it was found that the concentration of soil fungi in both the soil samples were in thousands per gram soil. The present data would be helpful to the people those who deals with fungal taxonomy of soil and other agricultural scientists who has interest in this soil microbiology study in and around Puducherry state.

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