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STUDIES ON THE FUNGAL DIVERSITY AND THEIR PREVALENCE ON THE ANTHILL SOIL COLLECTED FROM PONDICHERRY UNIVERSITY CAMPUS

[1]Ramkumar R., [2]Surendra S., [3]*B. K. Nayak and [4]A. Nanda

[1,2,3]Department of Botany, K. M. Govt. Institute for Postgraduate Studies and Research (Autonomous), Lawspet, Pondicherry, India.
[4]Department of Biomedical Engineering, Sathyabama Institute of Science and Technology, Rajiv Gandhi Salai, Chennai, India.

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***Corresponding Author**
B. K. Nayak
Department of Botany, K. M. Govt. Institute for Postgraduate Studies and Research (Autonomous), Lawspet, Pondicherry, India.

ABSTRACT

Studies on fungal diversity of diverse soils mostly trust on its fruitful implication to find bio-compounds for the purpose of bioprospecting. Fungi not only provide pharmaceutical products, such as antibiotics and other valuable substances, but also organic acids, enzymes, pigments and secondary metabolites which are employed in the food and fermentation industry. Many soil fungi are used as biological control agents for plant pathogens and insect pests. In our recent work, anthill soil samples of Pondicherry University campus were studied to record the incidence of fungal composition and their diversity. *Aspergillus niger* was found as the dominant one and it was followed by *Penicillium chrysogenum* and Sterile mycelia. One-gram anthill soil was found to harbor 5000 to 6000 fungal spores in our study. The results obtained clearly indicated that *Aspergillus niger*, *Aspergillus awamori* and *Penicillium digitatum*, *Trichoderma* were of high occurrence in anthill soil and other fungi like *Fusarium*, *Cladosporium* sp., *Curvularia* and *Rhizopus* were isolated with least numbers. Among the isolates, aspergilli, penicilli and white sterile mycelia were dominant in anthill soils due to their high sporulation capacity and high adaptability nature. The frequency of mycoflora in anthill soil were found to be regulated by many factors like humidity, vegetation, temperature, inorganic and organic materials, soil type and its texture.

KEYWORDS: Fungal diversity, Anthill soil, Aspergilli, Penicilli, Sterile mycelia, *Rhizopus*, *Trichoderma*.

INTRODUCTION

Soil is measured as one of the highly multifaceted systems with many machineries playing varied functions in particular with the activity of soil microbes.[1] Soil microbiota acts an essential role in evaluation of soil conditions and in stimulating plant metabolism.[2] Microbes are valuable in growing the soil fertility and plant growth as they are complicated in several biochemical alterations and mineralization events in soils. Cultivation approaches and crop administration performs greater influences on the activity of soil microbiota.[3] Constant usage of biochemical fertilizers over a long period may root the imbalance in soil microbiota and thereby indirectly disturb biological possessions of soil leading to soil deprivation.[4] Mostly soil system is moreover administered by soil fungi which are important microbiota of the soil themselves.[5] Particularly in the soil of forest and agricultural fields, they perform a major role in many essential progressions such as organic matter disintegration and mineralization.[6] Micro-fungi are a significant component of the soil micro biota.[1,7] Moreover, micro-fungi perform a major role in nutrient cycling by modifying soil biological movement.[8] The amounts of inorganic and organic materials present in the soil have a straight effect on the fungal population on the soil. The adherents and kinds of microbes present in soil depend on numerous environmental features viz., soil moisture, soil nutrients, soil aeration, pH and temperature etc. The present study is an attempt to isolate, enumerate and identify different fungal species from a different environmental source i.e., anthill soil samples collected from Pondicherry University campus, Puducherry.

MATERIALS AND METHODS

During the present study period isolation, enumeration and identification of anthill soil fungi were done from different soil samples of Pondicherry University campus, Pondicherry, India.

Collection of soil samples

The anthill soil samples were collected from the University campus site and brought to the Microbiology laboratory, Department of Botany, K. M. Govt. Institute

for Postgraduate Studies and Research (Autonomous), Lawspet, Pondicherry, India with utmost care, stored at 4^{o} C in the refrigerator for further studies. The collection of soil samples is given in Plate I, which shows the physical appearance of the anthill soil samples.

Plate I: Anthill soil samples collected from Pondicherry University campus.

Isolation of fungi from the soil samples

The anthill soil micro-fungi were isolated and enumerated by two methods, namely Soil Dilution,[9] and soil plate method[10] on different media such as Potato Dextrose Agar and Sabouraud Dextrose Agar.

Identification of the soil fungi

Fungal morphology was studied macroscopically by observing colony features (Colour and Texture) and microscopically by staining with lactophenol cotton blue and observed under compound microscope for the conidia, conidiophores and arrangement of spores. The fungi were identified with the help of the available literature in the department and the monographs present in the laboratory as well as the expertise of the research groups.[11-16]

Statistical analysis

The number of colonies per plate in 1gram of soil was calculated.

The percent contribution of each isolate was calculated by using the following formula:

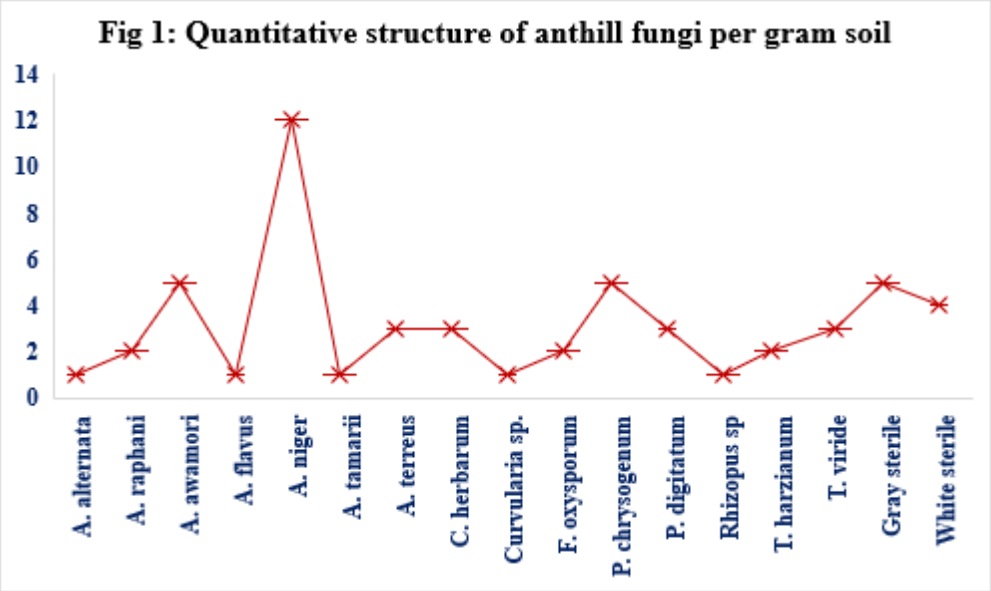
$$\% \text{ contribution} = \frac{\text{Total no. of CFU of an individual species}}{\text{Total no. of CFU of all species}} \times 100$$

RESULTS AND DISCUSSION

During the present study period, altogether 54 fungal colony forming units (CFUs) were isolated from the anthill soil samples of the University campus. In fungal composition, a total of 17 fungal species under 10 genera were recorded from the anthill soil. Fungi like *Alternaria alternata, A. raphani, Aspergillus awamori, A. flavus, A. niger, A. tamarii, A. terreus, Cladosporium herbarum, Curvularia* sp., *F. oxysporum, Penicillium chrysogenum, P. digitatum, Rhizopus* sp., *Trichoderma harzianum, T. viride*, Gray sterile mycelia and White sterile mycelia were enumerated and identified from the anthill soil during the present study period. Qualitative and quantitative occurrence of anthill soil fungi in University campus is given in Table 1 which shows the total number of fungi isolated and their percentage occurrence.

Table 1: Qualitative and quantitative occurrence of anthill soil fungi in University campus.

Sl. No.	Fungi	% incidence
1	Alternaria alternata	1.85
2	Alternaria raphani	3.70
3	Aspergillus awamori	9.26
4	A. flavus	1.85
5	A. niger	22.22
6	A. tamarii	1.85
7	A. terreus	5.56
8	Cladosporium herbarum	5.56
9	Curvularia sp.	1.85
10	F. oxysporum	3.70
11	Penicillium chrysogenum	9.26
12	P. digitatum	5.56
13	Rhizopus sp	1.85
14	Trichoderma harzianum	3.70
15	T. viride	5.56
16	Gray sterile mycelia	9.26
17	White sterile mycelia	7.41



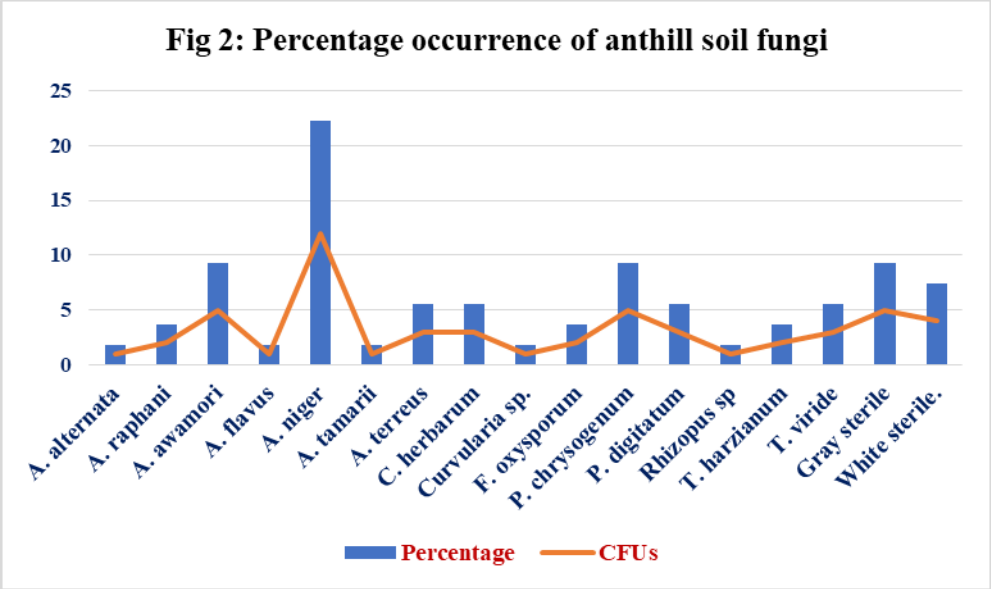


Fig 1 shows the amount of fungal colony forming units found in the anthill soil and Fig 2 depicts the percentage occurrence of anthill fungi in University campus. Aspergilli contributed with a greater number of species (5) viz., *Aspergillus awamori*, *A. flavus*, *A. niger*, *A. tamarii* and *A. terreus* and it was followed by *Alternaria*, *Penicillium*, *Trichoderma* with two each and two sterile mycelial forms. *Aspergillus* was contributed with more percentile (23%) followed by *Penicillium chrysogenum* and *Aspergillus awamori* (10% each). *Cladosporium herbarum*, *Curvularia* sp., *Fusarium oxysporum* and *Rhizopus* sp. were isolated with one species each. Diversity of fungal community in any soil depends on different factors of the soil viz., bioorganic content, pH, relative humidity and prevailing temperature in the soil environment.[18] They also expounded in their effort that the physicochemical constraints like, soil pH and its texture also define the fungal population in soil samples. The soil fungal flora study made by Gaddeyya and his coworkers[19] was in agreement with our report since they isolated 173 fungal colonies under15 fungal species from the crop fields. But our work deviates since it was made on different environments than crop field soil. In our study the maximum fungal species belonged to Deuteromycotina followed by Zygomycotina and a few were under Ascomycotina, but no fungi were recorded from Basidiomycotina. Among the fungal isolates, aspergilli were the dominant followed by sterile mycelia and penicilli. In qualitative and quantitative analysis, anthill soil was found to be the good contributor of fungi per gram soil. White sterile and gray sterile mycelia were recorded in more numbers from the anthill soils. Other Dematiaceous fungi were isolated sporadically from the soil samples. *Curvularia* and *Trichoderma* were isolated from the anthill soil samples.

In a recent study, Ramkumar et al,[1] analyzed soil samples of two different fields viz, Paddy field and

Garden land and recorded the incidence of fungal composition and their diversity. *Aspergillus terreus* was found as the dominant one in paddy field soil but *Penicillium citrinum* was the dominant one in garden soil. Their results indicated that *Aspergillus terreus, Aspergillus niger, Aspergillus flavus* and *Penicillium digitatum, Trichoderma* were of high occurrence in both the land soils and few fungi like *Fusarium, Chaetomium, Curvularia* and *Paecilomyces* were negligible. They also opined that isolates of *Aspergillus* and white sterile mycelia were dominant in the agricultural fields due to high sporulation capacity.[1]

CONCLUSION

During our present study of anthill soil mycoflora, aspergilli were found as common fungal flora in the anthill soil followed by penicilli and sterile mycelia. A average total of 5000 to 6000 fungal spores were recorded from one-gram of anthill soil. *Alternaria, Cladosporium, Curvularia, Fusarium* and *Trichoderma* were also recorded from anthill soil. Plant pathogenic forms like *Alternaria, Fusarium* and *Curvularia* as well as biological controlling agents like *Trichoderma* were isolated from the soil. More work pertaining to soil mycoflora study of different anthills of varied places would be promoted to analyze their community structure and composition, further the factors who are generally involved in promoting fungal population in the anthill soils would be analyzed.

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