Diversity Of Fungal Species In Soil Samples Of Ram Niwas, Nehru Park And Sisodiya Garden Areas, Jaipur

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Abstract- *The present investigation aims to isolate different fungal species from the soil samples of 3 park areas/gardens in Jaipur, viz. Ram Niwas, Nehru Park and Sisodiya Garden. The fungal species were obtained by inoculation of soil samples in potato dextrose agar (PDA) medium in vitro. The different fungal colonies obtained after 7 days were identified via slide preparation and microscopic analysis. These were studied in detail using vast literature from the books and internet. The number of fungal species in different garden soils were analysed and their diversity was noticed. The total number of fungal species was enlisted and the maximum diverse fungus was identified.*

I. INTRODUCTION

Fungi can be single celled or very complex multicellular organisms. They are found in just about any habitat but most live on the land, mainly in soil or on plant material rather than in sea or fresh water. A group called the decomposers grow in the soil or on dead plant matter where they play an important role in the cycling of carbon and other elements (Bowman & Free, 2006).

In the new bioeconomy, fungi play a very important role in addressing major global challenges, being instrumental for improved resource efficiency, making renewable substitutes for products from fossil resources, upgrading waste streams to valuable food and feed ingredients, counteracting life-style diseases and antibiotic resistance through strengthening the gut biota, making crop plants more robust to survive climate change conditions, and functioning as host organisms for production of new biological drugs. This range of new uses of fungi all stand on the shoulders of the efforts of mycologists over generations: the scientific discipline mycology has built comprehensive understanding within fungal biodiversity, classification, evolution, genetics, physiology, ecology, pathogenesis, and nutrition (Keller et al., 2005).

II. AIMS AND OBJECTIVES

Based on the above criteria, the aims and objectives of the present research are:

1. Inoculation of soil samples in PDA medium from different garden areas or parks in Jaipur viz. Ram Niwas, Nehru Park and Sisodiya Garden
2. Identification of the obtained fungal colonies by slide preparation and microscopic observation.
3. Calculation of CFUs/ml of different fungal species obtained
4. Comparative analysis of diversity of different fungal species found in different garden areas
5. Isolation of most diverse fungal spp and enumeration of its utilities in biotechnology.

III. MATERIALS & METHODS

The samples were collected from different garden areas in Jaipur as follows:

1. Soil sample from Ram Niwas Garden Area , Jaipur
2. Soil sample from Nehru Park Area , Jaipur
3. Soil sample from Sisodiya Garden Area, Jaipur

Prior sterilization of equipments like petriplates, flasks, media was carried out by autoclave at 20 lb pressure for 15 minutes. Laminar air flow hood was sterilized using 90% alcohol and uv light. The soil samples were diluted to 1/10 dilution. 1 ml of this was inoculated by micro-pippette in 20 ml Potato Dextrose Agar (PDA) medium poured in petriplates. Inoculation procedure was done using spread plate method by L-shaped glass spreader. The petriplates were kept in an incubator at 30C for 7-10 days for complete growth of fungal colonies. The fungi were identified using slide preparation and microscopic identification. Fungal literature was studied using books by eminent authors and internet. The number of species of fungi were recorded and further their diversity was notified by colony counting and CFUs/ml (Colony Forming Units per ml) calculation. The fungus having maximum CFUs/ml in all sites is considered to be most

diverse. Its utilities in biotechnology will be enumerated by literature study and internet.

Colony Forming Units/ml (CFUs/ml) = Colony Count x Dilution Factor

IV. OBSERVATIONS

The soil samples from all garden areas were inoculated and incubated till 8 days. The fungal colonies obtained were studied using microscope and slide preparation, and detailed morphological literature was found using internet and books. These were seen as follows:

The fungal species (as identified by microscopic morphological studies of slides) are provided in the tabulated data and colony forming units were also calculated.

Colony Count of a fungal spp. x Dilution Factor= CFUs/ml or Spore Load/ml of fungal spp. in soil sample.

Table 1: CFUs/ml of fungal species attained after 7 days in soil samples from Ram Niwas Garden, Jaipur

S. No.	Name of the fungus	Colony count	CFUs/ml
	Alternaria tenuis	4	40
	Aspergillus flavus	5	50
	Aspergillus fumigatus	8	80
	Aspergillus niger	20	200
	Aspergillus ochraceous	7	70
	Chaetomium globosum	2	20
	Cladosporium sphaerospermum	3	30
	Curvularia lunata	2	20
	Drechslera halodes	3	30
	Gliocladium roseum	3	30
	Mucor mucedo	2	20
	Penicillium chrysogenum	4	40
	Rhizopus nigricans	9	90
	Trichothecium roseum	2	20

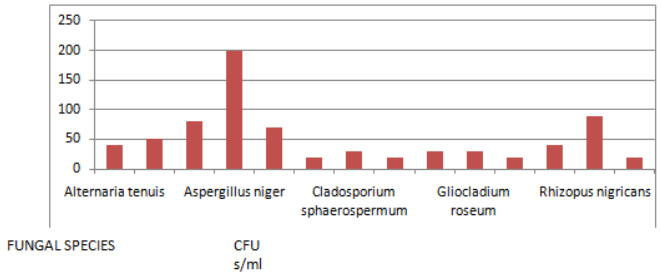

Fig.1. Graphical representation of fungal species diversity of soil sample from Ram Niwas garden area, Jaipur

Table 2: CFUs/ml of fungal species attained after 7 days in soil samples from Nehru Park, Jaipur

S. No.	Name of the fungus	Colony count	CFUs/ml
	Aspergillus fumigatus	10	100
	Aspergillus niger	35	350
	Fusarium oxysporum	3	30
	Geotrichum candidum	2	20
	Phoma betae	4	40
	Rhizopus nigricans	5	50
	Scopulariopsis brevicaulis	1	10
	Trichoderma harzianum	3	30

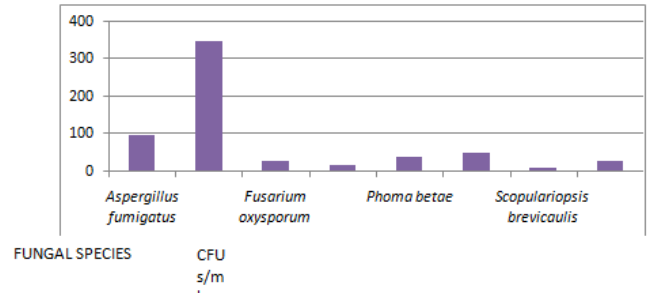

Fig. 2. Graphical representation of fungal species diversity of soil sample from Nehru Park, Jaipur

Table 3: CFUs/ml of fungal species attained after 7 days in soil samples from Sisodiya Garden, Jaipur

S. No.	Name of the fungus	Colony count	CFUs/ ml
	Acremonium atra	4	40
	Aspergillus fumigatus	10	100
	Aspergillus niger	35	350
	Paecilomyces variotii	3	30
	Penicillium chrysogenum	2	20
	Pilobolous crystallinus	3	30
	Rhizoctonia solani	4	40
	Rhizopus nigricans	5	50
	Verticillium dahliae	3	30

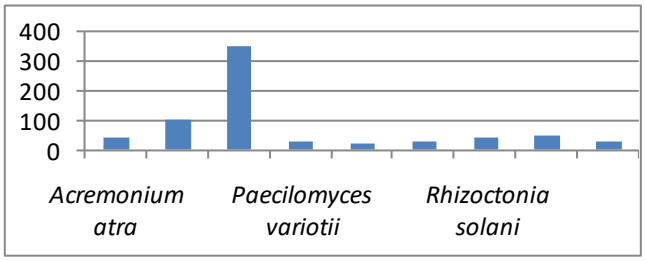

Fig.3. Graphical representation of fungal species diversity of soil sample from sisodiya Garden, Jaipur.

V. RESULTS AND DISCUSSION

Soil fungi

Soil is an oligotrophic medium for the growth of fungi. Nutrients for fungal growth are extremely limited for most of the time. Readily available nutrients are present for short periods in a limited zone. For most of the time, fungi are either dormant, or they metabolise and grow very slowly utilising a range of organic molecules. The presence of a living plant dramatically changes the scenario. Plants exude organic matter directly, and they feed arbuscular mycorrhizal fungi. The fungi distribute organic matter away from the roots. In general, the concentration of microbes is greatest close to the surface of roots (rhizosphere) and hyphae of arbuscular mycorrhizal fungi (mycorrhizosphere), where exudates are extraordinarily important source of organic energy entering the soil.

Maximum diversity of genus *Aspergillus*

In all the 3 types of soil samples from 3 different garden areas viz. Ram Niwas, Nehru Park and Sisodiya Garden, maximum diversity of genus *Aspergillus* was found including different species viz. *A. niger*, *A. fumigatus*, *A. flavus*, *A. ochraceous*. This explains that *Aspergillus* is the most diverse genus in soil samples of Jaipur.

Aspergillus niger holds greatest diversity

The CFUs/ml of *A. niger* was maximum in every soil sample from 3 different garden areas in Jaipur. this shows that *A. niger* exhibits highest diversity and rate of growth.

VI. CONCLUSIONS AND FUTURE SCOPE

Aspergillus being the most diverse fungal genus

Aspergillus is a genus consisting of a few hundred mold species found in various climates worldwide. *Aspergillus* was first catalogued in 1729 by the Italian priest and biologist Pier Antonio Micheli. Viewing the fungi under a microscope, Micheli was reminded of the shape of an aspergillum (holy water sprinkler), from Latin spargere (to sprinkle), and named the genus accordingly. Today, aspergillum is also the name of an asexual spore-forming structure common to all *Aspergillus* species; around one-third of species are also known to have a sexual stage.

Commercial importance of the genus *Aspergillus*

Species of *Aspergillus* are important medically and commercially. Some species can cause infection in humans and other animals. Some infections found in animals have been studied for years, while other species found in animals have been described as new and specific to the investigated disease, and others have been known as names already in use for organisms such as saprophytes. More than 60 *Aspergillus* species are medically relevant pathogens. For humans, a range of diseases such as infection to the external ear, skin lesions, and ulcers classed as mycetomas are found. Other species are important in commercial microbial fermentations. For example, alcoholic beverages such as Japanese sake are often made from rice or other starchy ingredients (like manioc), rather than from grapes or malted barley.

Typical microorganisms used to make alcohol, such as yeasts of the genus *Saccharomyces*, cannot ferment these

starches. Therefore, koji mold such as *Aspergillus oryzae* is used to first break down the starches into simpler sugars. Members of the genus are also sources of natural products that can be used in the development of medications to treat human disease. Perhaps the largest application of *A. niger* is as the major source of citric acid; this organism accounts for over 99% of global citric acid production, or more than 1.4 million tonnes per year. *A. niger* is also commonly used for the production of native and foreign enzymes, including glucose oxidase and lysozyme. In these instances, the culture is rarely grown on a solid substrate, although this is still common practice in Japan, but is more often grown as a submerged culture in a bioreactor. In this way, the most important parameters can be strictly controlled, and maximal productivity can be achieved. This process also makes it far easier to separate the chemical or enzyme of importance from the medium, and is therefore far more cost-effective.