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Diversification of Micro-organisms during different seasons of Soil

Sumit Grover[1], Dr. Rajesh Singh[2]
Department of Environmental Science
[1,2]Shri Venkateshwara University, Gajraula (Uttar Pradesh)

Abstract
Soil microorganisms are thought to benefit higher plants according to the direct contact with roots. Soil organisms populations may be able toto rebound swiftly after disruptions. Poor recovery rates and quick declines in bacterial populations are caused by a lack of food availability. On the other hand, fungi have strategies, in which populations are generally stable. The presence of a diverse soil ecosystem is a sign of good soil health and quality. Because of the paucity of knowledge on the importance of soil microbial diversity for the operation of agricultural and natural ecosystems, soil microbial communities might be seen as a mystery. The main aim of the study is to investigating the diverse soil bacteria and fungi in different season. Serial dilution method as well as biochemical characterization is utilized to identify Bacteria and fungi. Gram stainingmethod is used to identify diverse bacterial species. Results depicted that fungi like Aspergillus and Penicillium that were isolated from the soil under various landuse patterns were found to be dominant over other fungal isolates. Colony forming unit is increased in the month of July to October for both bacteria and fungi. Microbiologically mediated activities have a significant influence on soil quality, soil health are essential.

Keywords:*Bacteria, fungidiverse, soil, serial dilution method.*

Introduction

Soil is a medium for the creation of biomass, the storage of water, nutrients, and heat, a natural filter and detoxification and buffering system, a significant gene-reservoir, and the medium of human activity in the past (Blum 2005).Soil microorganisms are thought to benefit higher plants according to the direct contact with roots (microbe organisms), the decomposition as well as generation of elements from other materials found in the soil, and even the destruction and flow of elements and organic matter; and also through boosting the availability of necessary nutrients (Lombard et al., 2011).

Soil microorganisms are particularly important for preserving soil health and dictating many aspects of soil (Reddy and Rao, 1999).Both plants and microorganisms absorb nutrients from the soil and modify its composition via the deposition of organic matter and metabolic activities, respectively. In addition to having other direct effects on plants, microorganisms may affect hormone signalling and protect them against diseases. Plants emit metabolites from their roots in order to interact with microbes. Bioactive materials represents the most significant gaps in our understanding of the mechanisms underlying plant-microbe interactions in the rhizosphere (Jacoby et al., 2017).The mechanism of plant microbe interaction in different season is still unknown. The main aim of the study is to assess the diverse soil bacteria and fungi in different season.

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Material and method

The Study Site

The study location is situated in aDelhiresearch farm. The terrain is mostly steep and mountainous, with some valleys and plains interspersed. The region has a temperate subhumid climate with 500–2000 mm of irregular, strong rainfall per year on average, most of it occurs during the autumn and the rainy.

Bacterial Proceeds as follows and Extraction

Tests were presented to the research lab separately bagged in vinyl for isolation of bacteria.

By successive dispersion mounting on necessarily compatible (LB) agar, fungi bacterial were recovered with 1 g soil securely attaching to the root.

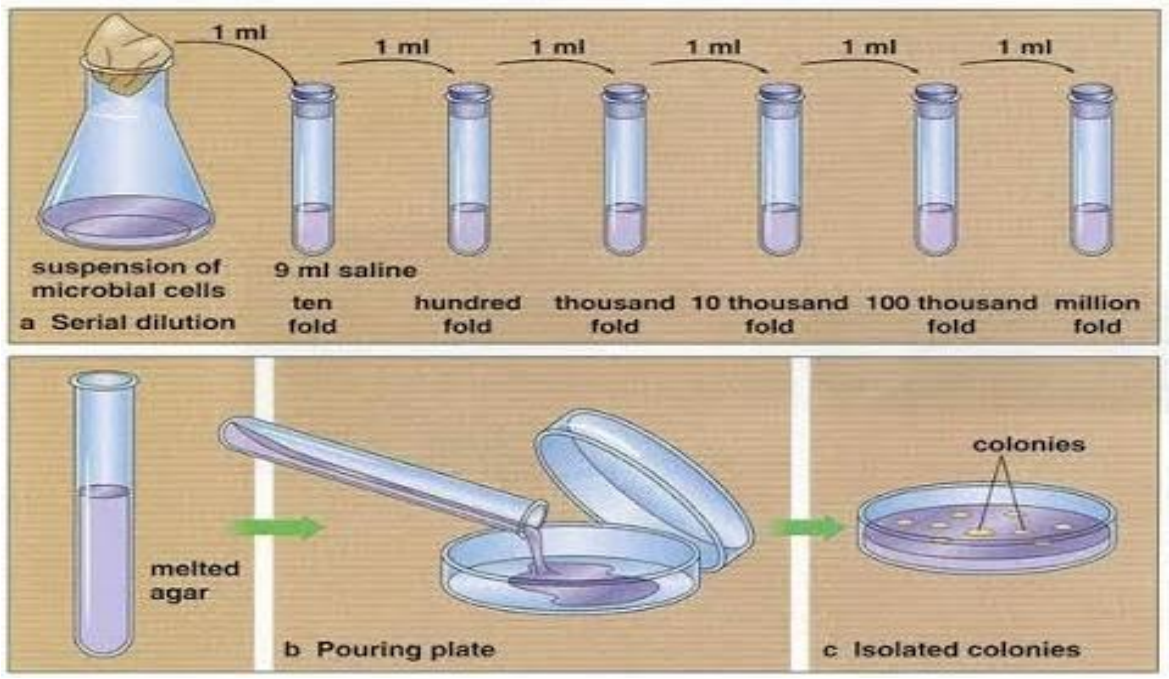

Figure 1: Serial dilution method

By serially dilution of sterilised distilled water with regard on LB agar dishes as indicated, microbes were recovered. By using Gram's staining technique on the culture smear, the morphological properties, including size, shape, the presence or absence of a capsule, and the arrangement of isolates, were examined.

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Biochemical Characterization

Colony topology, size, colour, form, gum release, and changes in the size were observed after three hours after colonization on agar plates containing LB at 28 2°C.

Analytical Statistics

Using only a stata software, the data subsequently submitted to variance analyses. The standard deviation test was used to assess the variances between the various treated groups at a 5% (P 0.05).

Result and Discussion

On agar media, the colonies of bacteria isolated from various cultivation areas were more translucent, crumpled, smoother, creeping mucoid, and that some possessed distinctive detect.Gramstaining response revealed the presence of Gram-positive, Gram-negative, and undetermined bacteria. Under the microscope, their biochemical characteristics and Gram's staining varied. The population of fungi (lx 103cfu/g of soil) found at the research locations. In winter and rainy seasons, the top four centimeters of soil had the greatest number of fungi, however in summer; fields included more microorganisms.Singh et al. (2017) found that the highest fungal and bacterial populations were found in the undisturbed forest site, followed by the moderately degraded site, and the lowest numbers were found in the surface and subsurface layers of the degraded site. In all three research sites, the top layer had a larger fungal population than the underlying layers.

Table 1. List of Soil microbes in different seasons

Name of the organisms	Rainy	Winter	Summer
Gram-positive cocci	+	-	+
G + Cocci	+	+	+
Micrococcus	+	+	-
Staphylococcus	+	-	-
Streptococcus	+	+	-
Sporing gram-positive rods, family Bacillaceae	+	+	+
Streptobacillus	+	-	+
Gram-negative rods, family Bacillaceae	+	-	+
E. coli	+	-	+
G – Bacilli	+	-	+
Pseudomonas	+	-	+
Gram-negative Spirillum, family Spirillaceae	+	-	+
Spirillum	+	-	+
Filamentous Fungi	+	+	+

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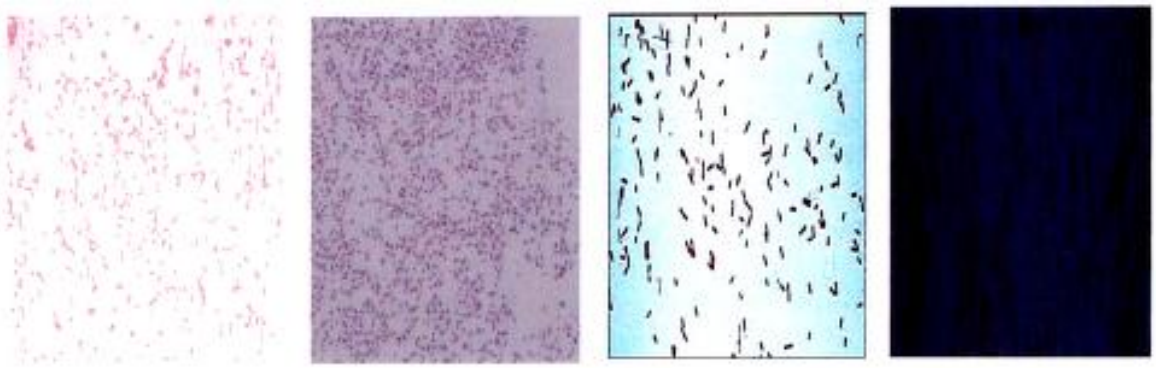
Alternaria	+	+	+
Aspergillus	+	+	+
Aspergillus fumigatus	+	+	+
A. niger	+	+	+
A. flavus	+	+	+
A. flavipies	+	+	+
Cladosporium	+	+	+
Fusarium	-	-	+
Microsporum	-	+	+
Mucor	+	+	+
Penicillium	+	+	+
Rhizopus	+	+	+
Trichoderma	+	-	+
Yeasts	-	-	+
Candida	+	-	+
Saccharomyces	+	-	+



A-*Acenitobacter* sp. B-*Flavobacterium* sp. C- *Pseudomonas* sp. D-*Thiobacillus* sp.

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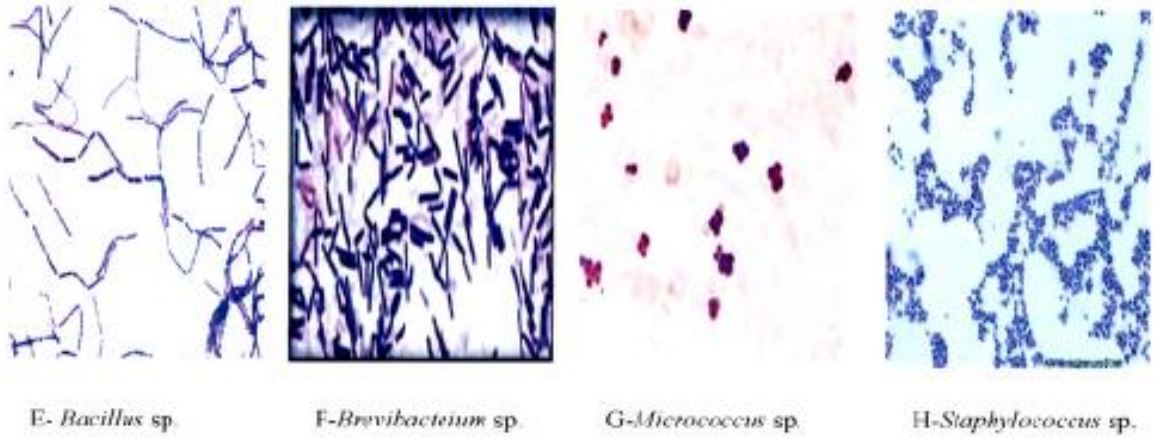

Figure 2: The pictures of gram negatives (A-D) and gram positive (E-H) of bacteria

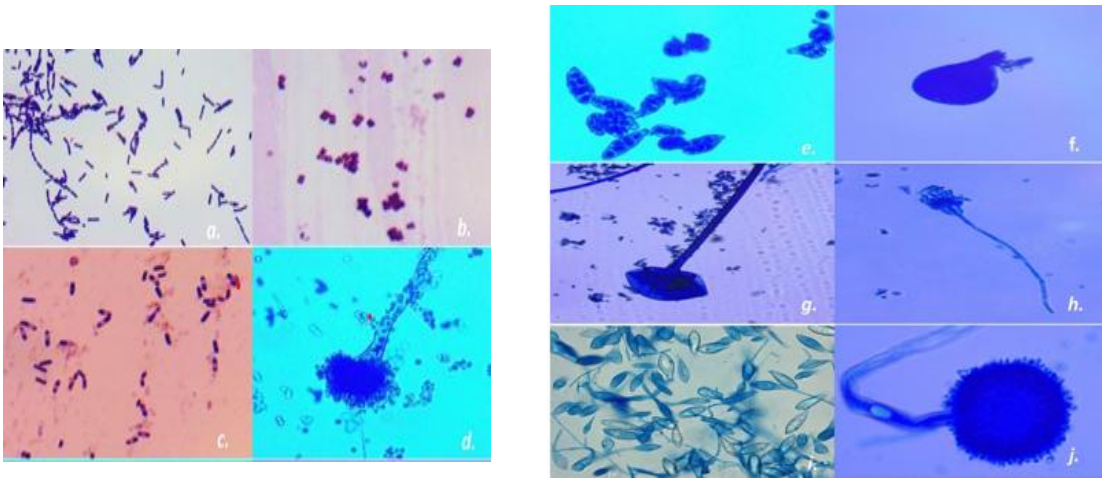

Figure 3: Streptobacillus, Enterococci, Staphylococcus, Aeruginosa, Fusarium, Mycobacterium, Clostridium, Cladosporium, and A. niger are typical distinct bacterial and fungus species

In the summer and autumn, there is a significant quantity and fluctuation of fungus, which may be likely owing to high relative humidity, according to seasonal measurements of soil-borne microbial concentration. Soilorganisms populations may be able toto rebound swiftly after disruptions. Fungi like Aspergillus and Penicillium that were isolated from the soil under various landuse patterns were found to be dominant over other fungal isolates. Figure 4 displays the most prevalent isolated fungal and bacterial species. According to research by Pandey and Gupta, The most common microbiological organism in Delhi Municipality is Cladosporium, which is second by Ustilago and Human pathogens. From between April and July, mold level was significantly higher, and from the times of drought to winters, they were lower (Pandey and Gupta, 2020).

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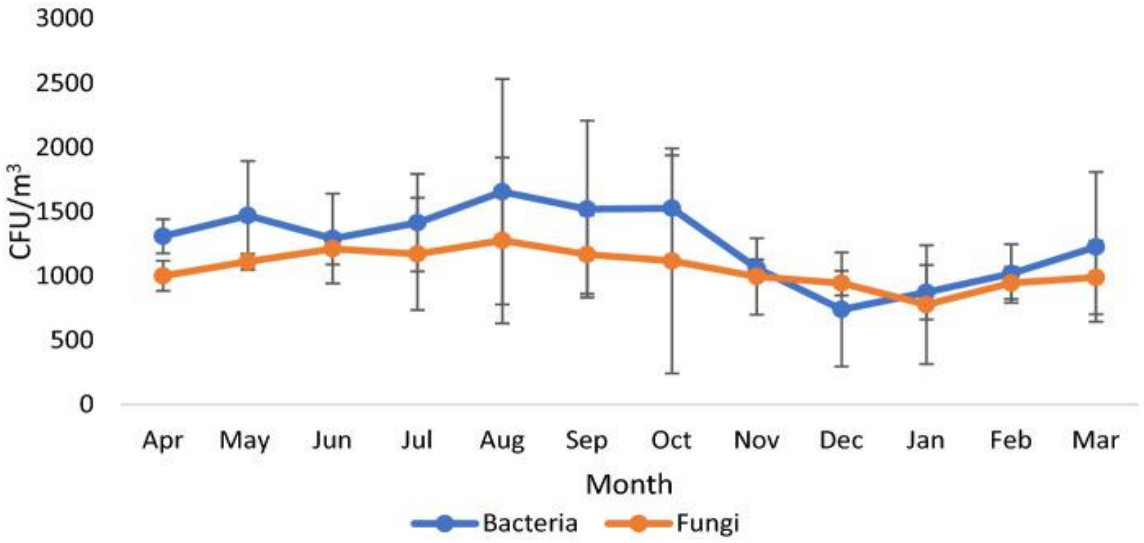

Figure 4: Colony forming Unit (CFU) of Soil microbes in different seasons

Figure 4 describes cultivable seasonal concentrations of soil bacteria and fungus. The quantity of organic organisms is adequate, however the variety of microorganisms is minimal. The quantity of microorganisms fluctuated significantly between months ($p > 0.05$). Bacterial aerosol levels varied from 738 443.59 to 1654 876.87 CFU/m3, while fungal aerosol levels ranged from 776 462.46 to 1275 645.22 CFU/m3 (Figure 4.1). The concentration of soil microorganisms varied with the seasons, for example, it was greater in the summer and wet months and lower in the winter. Beginning in April, the average number of CFU/m3 August was when it peaked. The lowest microbe number (738 443.59 CFU/m3) was recorded in February, that could be attributed to the decrease in the temperature. In June, the number of bacterial types started to grow, most most likely as a consequence of heightened soil moisture contents. August had the maximum average dosage and the most temperature and humidity, that may also help to explain why there was so significant bacteria and fungi population in that monthly. Parallel to microbes, the lowest yeast count ever observed happened in January, which may have been caused by a reduction in the temperature and a decrease in productivity.

Conclusion

The monthly environmental variations have an impact on the soil microorganisms in the elm root exudates. Workable study showed that weather did not drastically alter predicted microbiological biochemical reactions and bacteria and fungi environmental roles, in opposition to variations in diversification. However, it should be remembered that functional gene distributions just hint at the communities' potential for metabolism and ecological functions and do not represent these functions in actuality.

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