A STUDY ON MICROBIAL FLORA OF SELECTED INDIVIDUAL TREE CANOPY SOIL

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Abstract: "Soil is a living entity the crucible of life a seething foundry in which matter and energy are in constant flux and life is continually created and destroyed". Soil organic matter (SOM), is often viewed as the thread that links the biological, chemical and physical properties of a soil. It has been associated with numerous soil functions like nutrient cycling, water retention and drainage, erosion contract, disease suppression and pollution remediation. Soil microbes are affected by various abiotic and biotic factors. A soil population by a diverse, active microbial population is less likely to support uncontrolled spread of plant pathogens. Interactions between beneficial soil organisms and plant pathogens create situations in which pathogens are suppressed or inhibited, especially soil-borne pathogens. Lack of earthworms is a fair indicator of compaction; in the case of friable soils, this condition can indicate heavy metal or chemical contamination or extremely low organic matter content. In the present study the individual tree canopy soil was analysed to find out the microbial flora and was compared with barren soil.

Keywords: Microbial Flora, Soil Organic Matter (SOM), Soil Microbes, Tree Canopy.

Introduction: A soil rich in organic matter and regularly supplied with different kinds of soil organic matter will support a rich and varied population of soil organisms. The Soil Organic Matter supplies carbon and energy to soil microbes. Organic matter provides a carbon source for primary producers like *Cyanobacteria.* They can convert atmospheric nitrogen in to a plant available Nitrogen forms. Organic matter is the principle food source for secondary consumers. The most predominant functional group of secondary consumers are the decomposers: bacteria, fungi and *Actinomycetes*. Decomposers quickly colonize newly added organic materials and begin the decomposition process. During this decomposition process that nutrients become available to plants humus is created and soil- building aggregation and channels are formed.

Various aspects of the urban environment (e.g. pavement, bagging leaves, grass clippings, removal of tree branches) prevent the cycling of organic matter and nutrients back into the soil, without decay of plant materials, microorganisms in the soil cannot persist. Soil organic matter is decomposed by microorganisms mainly fungi and *Actinomycetes.* Soil has little or no odour, microbial activity is poor or absent and the amount of organic matter is often low. If soil has an "earthy" odour, microbial activity is good and aerated organic matter is present in the soil. Soil with a putrid or sour odour either has been wet for a long time or has had improperly processed compost applied. The tree canopy provide very good environment for the microbes. The fallen logs, leaves, flowers, fruits and seeds were gradually converted in to litter by microbes. There is an interaction between tree canopy soil and the microbes. These microbes increase the organic matter of the soil. Hence, for the present study the individual tree canopy soil microbes and the barren soil was compared to find out the fertility of the individual tree canopy soil and barren soil.

Materials and Methods: ***Study Area (Plates 1& 2):*** Coimbatore is a city in Tamil Nadu, South India. It is the second largest city and urban agglomeration in the Indian state of Tamil Nadu after Chennai. It is the capital city in Kongu nadu region and is often been referred to as the Manchester of south India. The total area of college campus is 20 acres. The temperature during both summer and winter varies between 28º C. Soil in this area is red loamy soil which is more fertile than sandy soil. Its porosity allows high moisture retention and air circulation.

Study Area - Plate 1

Location Map - Plate 2

Collection of Tree Canopy Soil Samples: For the present study the soil was collected from the individual tree canopy selected in the college campus and was compared with barren soil. The microbial flora of selected individual tree canopy soil was analyzed. The data were then processed and represented both in Tables and charts.

Microbial Analysis: ***Collection of the Selected Tree Canopy Soil Samples:*** The tree canopy soil samples were collected during the year, 2014-2015. Soil with litter formation and ground vegetation from the selected tree canopy of *Albizzia lebbeck,* (L.) Benth.; and *Bauhinia purpurea,* Linn.; were collected separately in sterile bags, air dried and sieved for further analysis. Barren land soil, taken from the same campus was kept as control. Soil was taken from the depth of (0-15 cm depth). Soil samples were packed in sterile bags and used for further analysis.

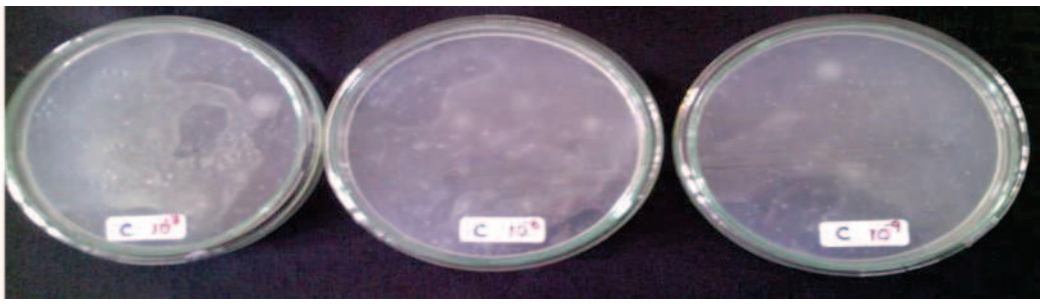
Isolation and Culture of Microorganisms:
Preparation of Nutrient Medium: Potato-Dextrose Agar (PDA): 120 gms of freshly peeled potato is taken in to a flask and 150 ml of water is added to it. It is boiled for 10 minutes. Then the potato extract is taken and its volume is made up to 150 ml by adding distilled water. To this extract, 7.5 gms of Dextrose is added and thoroughly mixed. Then the solutions were poured in a 500 ml flask and stirred thoroughly. This content is heated in a water bath to dissolve the agar. This medium is dispensed in culture petridishes and kept in laminar air flow for solidifation.

Serial Dilution Method: For the enumeration of microbial population a set of selected soil samples (0-15 cm depth) were collected. Soil microbial communities have relied on culturing techniques using PDA (Potato Dextrose Agar) medium. Serially diluted samples were inoculated on petridishes containing PDA medium and incubated in the laboratory for 5 days at 30°C (Kanika Sharma, 2007). The bacterial and fungal colonies were counted using colony counter for three days and the culture was kept in the refrigerator at 4°C for identification.

Identification of Bacteria (Direct Microscopic Examination): 1 gm of 1% Crystal violet is dissolved in 10 ml of 95% ethyl alcohol and final volume is made up to 100 ml with distilled water. Bacterial colony appears blue and violet colour. An average volume of bacterial cell is 1 cubic micron.

Identification of Fungus: The smear was simple stained to study the morphology of the cells. Basic stain for simple staining Safranin is used for identifying microbes and the data's were recorded. For each experiment replicas were repeated (Kanika Sharma, 2007).

Results and Discussion: Microbial count of the selected tree canopy soils of the Bacterial colonies and Fungal colonies were represented in (Table- 1 & 4), (Plates- 3-13), Charts (1& 2).



Distribution of Microbes Present in the Selected Individual Tree Canopy Soil Plate -3 Control (Barren soil)

Plate - 4 Sample 1: *Albizzia lebbeck,* (L,) Benth

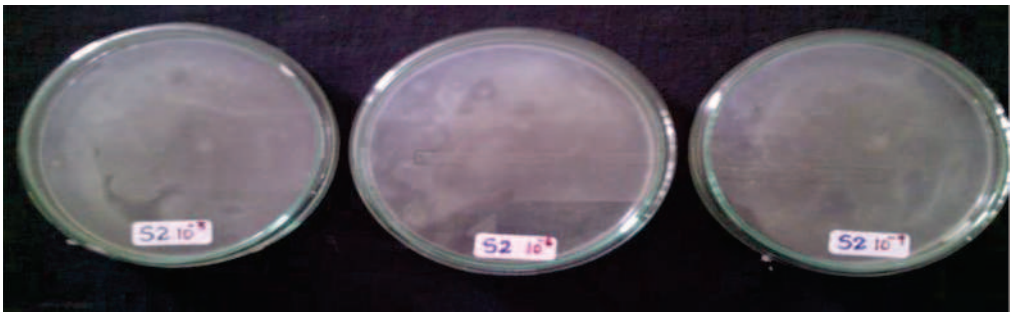


Plate - 5 Sample 2: *Bauhinia purpurea,* Linn

Enumeration of the Bacterial Colony of the Selected Tree Canopy Soil: Enumeration of the Bacterial colony of the selected tree canopy soil were represented in Table-1.

Table 1: Enumeration of the Bacterial Colony of the Selected Tree Canopy Soil

S.No	Sample	Number of Bacterial Colony								
		Day 1			Day 2			Day 3		
		10^{-3}	10^{-6}	10^{-9}	10^{-3}	10^{-6}	10^{-9}	10^{-3}	10^{-6}	10^{-9}
1	Control	3	3	2	5	4	**3**	5	7	6
2	***Albizzia lebbeck***	3	4	6	4	5	7	6	7	**9**
3	***Bauhinia purpurea***	6	4	3	7	5	4	9	7	6

Day 1 Bacterial Count of the Selected Tree Canopy Soil: The bacterial colony was found to be more in *Albizzia lebbeck* (6), followed by *Bauhinia purpurea* (3). The bacterial count was less in control (2) (Table- 1).

Day 2 Bacterial Count of the Selected Tree Canopy Soil: The number of bacterial colony was high in *Albizzia lebbeck* (7) followed by *Bauhinia purpurea* (4). In control the bacterial count was found to be (3).

Day 3 Bacterial Count of the Selected Tree Canopy Soil: The number of bacterial colony was high in *Albizzia lebbeck* (9). The colony was less in *Bauhinia purpurea* (6) and control. The soil is a large reservoir of

microorganisms. It is good culture medium providing organic and inorganic nutrients, water, gases and physiological conditions for growth of microorganisms. Fertile soils contain a high population density of microorganisms per unit volume (Balkrishna Sandikar, 2013).

Bacteria Present in the Selected Tree Canopy Soil: Bacteria present in the selected tree canopy soil were calculated in Table-2.

Table 2: Bacteria Present in the Selected Tree Canopy Soil

S.No	Sample	Bacteria		
		10^{-3}	10^{-6}	10^{-9}
1	**Control**	*Streptococcus sps*	*Staphylococcus sps*	*Streptococcus sps*
2	***Albizzia lebbeck***	*Mycobacterium sps*	*Pseudomonas sps*	*Mycobacterium sps*
3	***Bauhinia purpurea***	*Pseudomonas sps*	*Staphylococcus sps*	*Steptomycetes sps*

Among the selected tree canopy soil in control *Streptococcus sps* is present. *Mycobacterium sps* is present *Albizzia lebbeck* and *Steptomycetes sps* is present in *Bauhinia purpurea*.

Enumeration of Fungal colony of the Selected Tree Canopy Soil: Enumeration of Fungal colony of the selected tree canopy soil were calculated in Table-3.

Table 3: Enumeration of Fungal Colony of the Selected Tree Canopy Soil

S.No	Sample	Number of Fungal Colony								
		Day 1			Day 2			Day 3		
		10^{-3}	10^{-6}	10^{-9}	10^{-3}	10^{-6}	10^{-9}	10^{-3}	10^{-6}	10^{-9}
1	**Control**	-	-	-	3	3	2	3	3	2
2	***Albizzia lebbeck***	-	-	-	0	1	1	2	2	3
3	***Bauhinia purpurea***	-	-	-	1	1	2	3	2	2

Day 2 Fungal Count of the Selected Tree Canopy Soil: The fungal count was high in *Bauhinia purpurea* (2), control (2) and the fungal colony was (1) in *Albizzia lebbeck* were noted.

Day 3 Fungal Count of the Selected Tree Canopy Soil: The fungal count was found to be (3) in *Albizzia lebbeck* and *Bauhinia purpurea* and control is (2). Several rhizosphere bacteria and fungi are known to produce plant growth promoting substances and stimulate plant growth. Species of *Arthrobacter, Azospirillum, Azotobacter, Bacillus, Brevibacterium, Flavobacterium, Pseudomonas and Rhizobium* (among bacteria); *Alternaria, Aspergillus, Fusarium, Gibberella, Penicillium, Rhizopus,* etc., (among fungi) are known to produce plant growth promoting substances. Among fungi *Pseudomonas* and *Bacillus* among bacteria are the widely studied biocontrol agents in rhizosphere (Balkrishna Sandikar, 2013).

Fungus Present in the Selected Tree Canopy Soil:

Table 4: Fungus Present in the Selected Tree Canopy Soil

S.No	Sample	Fungi		
		10^{-3}	10^{-6}	10^{-9}
1	**Control**	*Aspergillus niger*	*Aspergillus glaucus*	*Aspergillus niger*
2	***Albizzia lebbeck***	*Aspergillus niger*	*Aspergillus niger*	*Aspergillus glaucus*
3	***Bauhinia purpurea***	*Aspergillus glaucus*	*Aspergillus glaucus*	*Aspergillus glaucus*

From the selected tree canopy soil fungal species of *Aspergillus glaucus* is present in both *Albizzia lebbeck* and *Bauhinia purpurea* followed by *Aspergillus niger* in control.

The plants also get benefits from fungi in this association. The fungus facilitates the absorption of water and minerals from soil. The uptake of nitrogen, sulfur, zinc and other essential elements is similarly promoted by the Mycorrhizal fungus in many plant species. In addition, the fungus may protect the roots against infection by a diverse array of soil-borne pathogens (Balkrishna Sandikar, 2013).

Conclusion: Soil microbes are affected by various abiotic and biotic factors. A soil population by a diverse, active microbial population is less likely to support uncontrolled spread of plant pathogens. Interactions between beneficial soil organisms and plant pathogens create situations in which pathogens are suppressed or inhibited, especially soil-borne pathogens. Fertility of the individual tree canopy soil is rich in microbial flora when compared with barren soil. This present study proved the role of microbes in the fertility of the soil and the interaction of tree soil and microbes which results in conservation of beneficial microbial population.

References:

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