A STUDY ON SELECTED INDIVIDUAL TREE CANOPY OF *Peltophorum pterocarpum*, (DC.) k. Heyne.; - IN URBAN GREENING

*Arul Sheeba Rani, M and Mary Josephine, R.
Department of Botany, Nirmala College for Women, Coimbatore, India.

ABSTRACT

Urban greening refers to any vegetation effort including the planting of trees, shrubs, grass or agricultural plots whose design is intended to improve the environmental quality, economics opportunity or aesthetic value associated with a cities landscape. Urban Forestry and Urban Greening contribute significantly to the urban society's physical, social and economical wellbeing. For the present study *Peltophorum pterocarpum,* (DC.) k. Heyne .; tree were selected for the physico-chemical parameters of tree canopy soil, mineral profile of the litter formed by the selected tree canopy, microbial flora of the selected tree canopy soils were analyzed. Hence, the present study the aim is to improve our quality of life in an increasingly densely populated, fast-living world. People have to find then way back to natural and green open spaces that become more and more important for our personal development, wellbeing and recreation due to increasing urbanization.

KEYWORDS

Morphology, tree canopy soil, mineral profile, microbial flora, tree canopy litter

INTRODUCTION

Impervious cover plays an important role in the landscape, particularly in urban areas. These surfaces such as roads, buildings, sidewalks and parking lots facilitate transportation and provide shelter. Trees, forests, open spaces, rivers and streams and associated natural resources improve our quality of life and provide us with a sense of community, improve our individual and community self-esteem and promote our physical and mental well- being. The enhancement of urban green spaces or urban green forests is one of the ways, which has the potential to mitigate the adverse effects of urbanization economic or environmental costs. Urban greening is an integrated approach to the planting, care and management of all vegetation in cities, towns, townships and informal settlements in urban areas. Urban green spaces play a significant role for people to have social contacts or find rest in order to achieve this inner harmony and well being.

MATERIALS AND METHODS

Plate - 1: Location Map

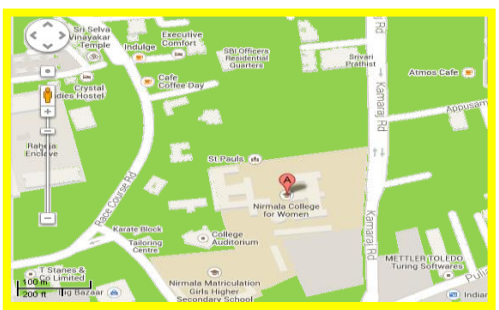

Plate -2 : Study Area

Tamil Nadu is one of the 28 States of India. Its capital is Chennai (formerly known as Madras) the largest city. Tamil Nadu lies in the southern most part of the Indian Peninsula and is bordered by the union territory of Puducherry and the states of Kerala, Karnataka and Andhra Pradesh. Coimbatore is the city in Tamil Nadu, South India. The city is located on the banks of the Noyyal River surrounded by the Western Ghats

and is administered by the Coimbatore Municipal. Nirmala college academic campus is located in the southern parts of the Western Ghats. The total area of the college campus is 20 acres. The temperature during both summer and winter varies between 28º c to 34º 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.

I. Collection of selected tree sample

For the present study *Albizzia lebbeck* (L), Benth.; were selected in the Nirmala college campus to find out the Morphology and propagation of the selected tree, Physico-chemical parameters of the tree canopy soil, mineral profile of the litter formed by the selected tree canopy, microbial flora of the selected tree canopy soils were analyzed.

Taxonomic Position

Division : Phanerogams

Class : Dicotyledons

Subclass : Polypetalae

Series : Calyciflorae

Order : Rosales

Family : Fabaceae

Sub family :Caesalpinieae

Genus : *Peltophorum*

Species : **P. *pterocarpum*, (DC.) Backer ex Heyne.;**

Plate -3 : Habit

Peltophorumpterocarpum(DC.) Backer ex Heyne.;is a native to tropical south eastern Asia and a popularly ornamental tree grown around the world. It is commonly known as copper pod, Golden flamboyant, Yellow Poinciana. This tree is upright, handsome, spreading, semi evergreen rounded canopy and is capable of reaching 50 feet in height with a 35 to 50-foot dense spreading crown bearing contrasting clusters of yellow flowers and reddish brown pods. It is quite variable from tree to tree, unfortunately, eliminating this plant from the palette of many architects. The dark green, delicate, feathery leaflets provide a softening effect for the tree's large size and create a welcoming, dappled shade. From May through September, the entire tree's canopy is smothered with a yellow blanket of flowers, appearing in showy, terminal panicles and exuding a delicious, grape-like perfume. These flower clusters are followed by four-inch-long seed pods which ripen to a brilliant, dark, wine-red. The tree named as the 'kalayaan Tree', Tree of Freedom or siar tree. It is a wonderful shade tree for a large landscape, especially when in full bloom, and it can make a street tree as long as it receives regular pruning to control its weedy. Its large size makes it a natural for the wide open spaces of large lawns or city parks. The Tree is widely grown in tropical regions as an ornamental tree, particularly in India, Nigeria Pakistan, and Florida and Hawaii in the United States. It is suitable for shade tree in Gardens, on streets, roadsides and coffee plantation.

II. A. Morphological characteristics of the selected tree and propagation

Morphological characters of the selected tree species were recorded. The selected trees total height and width. Leaf, leaflet, flower, fruits - size and colours were measured.

B. Biodiversity of the selected tree

Biodiversity of species such as Ants, Crow, Sparrow, Pigeon, Dragon fly, Mynah, Butterflies, Lac insect, Lizards, Calottes, Chameleon, Spider, Worms, Honey comb, Honey bee, Wasp, Parrots, Grasshopper, Sparrow were observed and recorded during the study period.

C. Average annual litter of dried leaves and logs of the selected tree canopy

The litter of dried leaves and logs of the selected tree canopy were collected throughout the year and the average annual fallings were calculated.

III. Microbial analysis

Collection of the selected tree canopy soil sample

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.;** 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 ten 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. 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 for identification.

Identification of Bacteria (Direct microscopic examination)

An average volume of bacterial cell is 1 cubic micron. They are smallest forms among bacteria. After division the cells may either separate from each other or may remain joined together to form groups of two cells in *Diplococcus*, a tetrad of four cells in *Micrococcus tetragenus* and a chain of cells in *Streptococcus* (Bergey, 1957).

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 (Mani *et al.*, 2004).

IV. Physicochemical parameters

Physicochemical parameters of the select tree canopy, litter and barren soils were analyzed.

1. pH of the soil

Part of the moist soil samples were air dried and sieved to obtain fine soil samples (2 mm). pH = Hydrogen-ion-concentration**,** The H^+ concentration i.e., pH = log $(1/H^+)$

The pH of the medium, if found to be acidic, is brought to the required pH by adding 0.1 (N) NaOH drop wise and testing with pH paper after thoroughly mixing with a glass rod. Conversely, 0.1 (N) HCl is used to get an acidic pH of the medium.

2. Moisture content of the soil

Moisture content is the ratio of the mass of water in the sample to the mass of solids in the sample. Moisture content of the selected tree canopy litter samples were calculated and expressed in percentage (Conventional oven method ASTM, 2001).

3. Water holding capacity and temperature of the soil

Water holding capacity and temperature of the soil were analyzed as per the standard method.

4. Mineral profile of the selected tree canopy soil samples

Mineral like Potassium, Phosphorus, Calcium, Magnesium, Iron and Sodium were analyzed in the standard laboratory by employing Atomic Absorption Spectrophotometer by following the method of Issac and Johnson (1975) and the results were recorded.

Estimation of calcium and magnesium (Jackson, 1967)

5ml of triple acid digested extract was taken in a China dish. To this 10 ml of 10% NaOH and 0.1g of Murexide indicator powder (40 g of potassium sulphate or potassium chloride was ground with 10 g ammonium purpurate) were added and titrated against 0.02 N versenate (19 g of EDTA was dissolved in 5liters of distilled water) and standardized against 0.2 N Na_2 CO_3 solution and adjusted until the colour changes from red to violet.

Calcium and Magnesium

5ml of triple acid digested extract was taken in a China dish, to this 10 ml of ammonium chloride - ammonium hydroxide buffer pH 10 and few drops of Eriochrome Black T indicator (0.1 g of Eriochrome Black T was dissolved in 25ml of methanol containing 1g of hydroxylamine hydrochloride) were added and titrated against 0.02N versenate solution until the colour changes from red to blue.

Calculation

Percentage of calcium = Titre value of calcium*100/5*100/0.5*0.0004

Percentage of magnesium = Titre value of calcium + magnesium – titre value of calcium or
titre value of calcium + magnesium *0.96

Calcium and magnesium contents were expressed as mg/100 g of sample

Estimation of Sodium and Potassium

Sodium and potassium were estimated by using Flame Photometer, Model-EFL. The sodium and potassium contents were calculated by referring to the calibration curves of sodium and potassium, respectively, and expressed as mg/100 g on dry weight basis.

Phosphorus estimation (Dickman and Bray, 1940)

One ml of triple acid digested extract was pipetted into 100 ml volumetric flasks. To this 50 ml glass distilled water was added, followed by 5 ml of ammonium molybdate sulphuric acid reagent (Solution A: 25 mg of ammonium molybdate was dissolved in 100 ml of distilled water. Solution B: 280 ml of conc. H_2 SO_4 was diluted to 800 ml). Solution A was added slowly with constant stirring to solution B and the volume was made up to 100 ml with glass distilled water). Blue colour was developed by adding six drops of 2.5% stannous chloride solution. The total volume was made up to 100 ml. The intensity of the blue colour was measured at 650 nm in a spectrophotometer. The phosphorus content present in the sample was calculated by referring to a standard curve of phosphorus and expressed as mg/100 g on dry weight basis.

Estimation of iron by atomic absorption spectrophotometer (Issac and Johnson, 1975)

Estimation

By feeding the sample to an Atomic Absorption Spectrophotometer the iron content was estimated at 246.8 nm wavelength and the readings were expressed in mg/100g of sample on dry weight basis.

V. Analysis of the selected tree canopy litter formed by the selected samples

Collection of tree canopy litter samples

From a composite of litter fall, the fallen fresh/dried leaves, wood logs, flowers, fruits and seeds were collected under the canopy of the ten trees separately and shade dried, packed in sterile bags then powdered and lumped in a composite of sample for chemical analysis. The maximum litter fall of various seasons during the year 2014 (January-March, April-June, July-September, October-December) were analyzed.

1. pH and moisture content

pH and moisture content of the litter were analyzed as per the standard methods.

2. Mineral analysis of the selected tree canopy litter samples

Mineral analysis of Potassium, Phosphorus, Calcium, Magnesium, Iron and Sodium minerals were analyzed in the recognized laboratory by employing Atomic Absorption Spectrophotometer. Mineral profiles of the litter formed by the selected tree canopy, the fallen fresh/dried leaves, wood logs, flowers, fruits and seeds were powdered and kept in airtight container then the mineral profiles were analyzed and the mineral profile of the selected tree canopy soil and litter samples were experimented and recorded by following standard methods of (Association of Official Agricultural Chemists) AOAC, (1990).

RESULTS AND DISCUSSION

Comparative morphology of the selected trees, leaves, inflorescence, flower, fruit, pod (dehiscent/indehiscent) and its propagation, Micro and Macrobial biodiversity were observed and represented in the following Tables.

Table - 1 Comparative morphological characters, Propagation and the biodiversity of the selected tree sample

Sample	Tree	Height in (m)	Breadth in (m)	Leaf		Inflorescence	Flower colour	Fruit		Seed shape and colour	Propagation	Biodiversity
				Type	Shape							
Peltophorum pterocarpum	Deciduos	15.00	02.04	Compound	Large, Oblong	Brown-tomentose, panicles terminal spike	Orange-yellow	Reddish brown pods	Flat, thin, winged	Reddish Brown Seeds	Seeds, cuttings or branch stakes	Ants, Crow, Dragon fly, Honey comb

Table - 2 Morphology of the Leaf/ Leaflet length

Sample	Simple/ compound	Leaf length in (cm)	Leaflet length in (cm)	Leaf/ Leaflet of the selected trees
Peltophorum pterocarpum	Compound	45.05	15.00	

Table - 3 Morphology of the inflorescence and flower of the selected tree

Sample	Inflorescence	Flower		Inflorescence and flower of the selected trees
		Colour	Length in (cm)	
Peltophorum pterocarpum	Brown-tomentose, panicles terminal spike	Orange-yellow	03.00	

Table - 4 Morphology of the fruits

Sample	Fruit				Fruit of the selected trees
	Type	Colour	Shape	Length in (cm)	
Peltophorum pterocarpum	Reddish brown pod	Brown	Flat, thin, winged	***Peltophorum pterocarpum***	

Table - 5 Dehiscent and indehiscent seeds of the selected trees

Sample	Pod
	Dehiscent / Indehiscent
Peltophorum pterocarpum	Dehiscent

Table - 6 Biodiversity of the selected trees

Sample	Biodiversity of the selected trees
Peltophorum pterocarpum	Ants, Crow, Dragon fly, Honey comb.

Table - 7 Average annual litter of dried leaves and logs of the selected tree canopy

Sample	January-March (gm)	April - June (gm)	July-September (gm)	October-December (gm)	Average annual litter of the selected tree canopy in (%)
Peltophorumpterocarpum	570.00	189.20	512.58	527.45	4.49

Table – 8 Enumeration of the Bacterial colony of the selected tree canopy soil

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}

Control	3	3	2	5	4	**3**	5	7	6
Peltophorum pterocarpum	4	4	3	7	6	4	9	9	**7**

Table - 9 Bacteria present in the selected tree canopy soil

Sample	**Bacteria**		
	10^{-3}	**10^{-6}**	**10^{-9}**
Control	*Streptococcus sps*	*Staphylococcus sps*	*Streptococcus sps*
Peltophorum pterocarpum	*Steptomycetessps*	*Streptococcus sps*	*Corynebacteriumsps*

Table - 10 Enumeration of Fungal colony of the selected tree canopy soil

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}**
Control	-	-	-	3	3	2	3	3	2
Peltophorum pterocarpum	-	-	-	1	2	1	3	2	1

Table - 11 Fungus present in the selected tree canopy soil

Sample	**Fungi**		
	10^{-3}	**10^{-6}**	**10^{-9}**
Control	*Aspergillus niger*	*Aspergillus glaucus*	*Aspergillus niger*
Peltophorum pterocarpum	*Rhizopussps*	*Aspergillus niger*	*Aspergillus niger*

Distribution of Microbes present in the selected individual tree canopy soil (Plate-4)

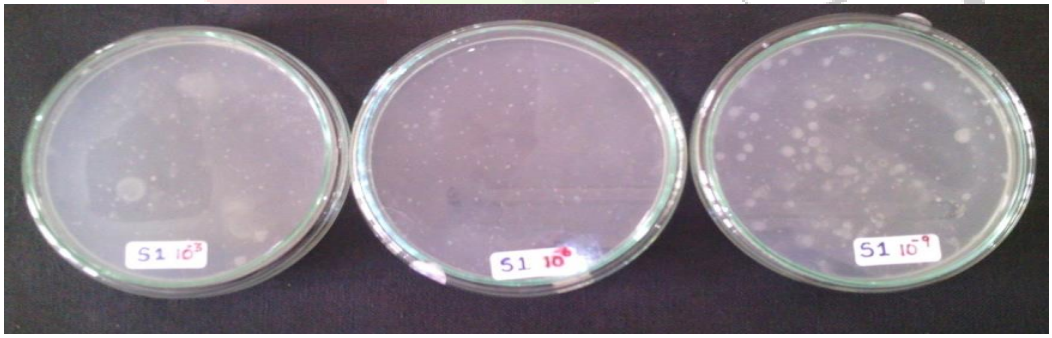

Table - 12 Moisture content and pH of the selected tree canopy soil

Sample	**Fresh weight (gm)**	**Dry weight (gm)**	**Moisture content (%)**	**pH**
Control	20	18.86	5.7	5.7
Peltophorum pterocarpum	0.37	0.09	0.67	**0.17**

Table – 13 Mineral profile of the selected tree canopy soil

Sample	Potassium (%)	Phosphorus (%)	Calcium (%)	Magnesium (%)	Iron (%)	Sodium (%)
Control	0.39	0.10	**0.31**	0.081	0.048	0.18
Peltophorum pterocarpum	0.37	0.09	0.67	**0.17**	0.013	0.35

Table - 14 Moisture content and pH of the selected tree canopy litter

Sample	Fresh weight (gm)	Dry weight (gm)	Moisture content (%)	pH
Peltophorum pterocarpum	0.37	0.09	0.67	**0.17**

Table - 15 Mineral profiles of the selected tree canopy litter

Sample	Potassium (%)	Phosphorus (%)	Calcium (%)	Magnesium (%)	Iron (%)	Sodium (%)
Peltophorum pterocarpum	**980**	**420**	**1498**	290	**42**	**54**

CONCLUSION

India is urbanizing at a very fast pace. The enhancement of urban green spaces or urban green forests is one of the ways, which has the potential to mitigate the adverse effects of urbanization economic or environmental costs. Urban forestry is the art, science and technology of managing trees and forest resources in and around urban community ecosystems for physiological, sociological ecological and aesthetic benefits for society. In urban environment human alter soil forming factors by impacts associated with urban infrastructure for instance, building specifications often results in the scraping, compacting and covering of urban soil which can impact soil organic matter, texture, structure, infiltrations, aeration, root penetration and biological activity. The research on urban greening is very meagre particularly in India. Hence, the study on selected individual tree canopy of the soil and litter in urban greening to enrich the urban soil and to promote plant growth to the urban environment

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