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A study on Selected Individual Tree Canopy of Cassia fistula, Linn.; -In related with Urban Greening

Dr. Arul Sheeba Rani. M[1], Dr. Mary Josephine. R[2]
[1, 2]*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. For the present study Cassia fistula 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.

I. 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 pSShysical 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.

II. 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. Nirmala college academic campus is located in the southern parts of the Western Ghats. 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.

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A. Collection Of Selected Tree Sample

For the present study *Cassia fistula,* Linn.; 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.

Sample: Cassia fistula, Linn.; Taxonomic Position

Division :Phanerogams
Class :Dicotyledons
Subclass :Polypetalae
Series :Calyciflorae
Order :Fabales
Family :Fabaceae
Sub family :Caesalpinieae
Genus :*Cassia*
Species :C. *fistula,* Linn.;

Cassia fistula, Linn.; is native to India, commonly known as Amaltas or 'golden shower, golden rain tree 'Indian laburnum' or (in Thailand) 'lantern tree". It is one of the most beautiful of all tropical trees when it sheds its leaves and bursts in to a mass of long, grape-bunches like yellow gold flowers. Slender with moderate to fast growth usually medium in size and has pinnately-compound leaves. The flowers are bright yellow in colour that hangs from the branches. The fruits are shiny dark brown in colour and are usually cylindrical in shape. Traditional and alternative medicine is extensively practiced in the prevention diagnosis and treatment of constipation, common cold, fever, intestinal disorders, and various illnesses. Leaves are laxative and used for skin diseases, burning sensation, dry cough and bronchitis. Fruits are sweet, cooling, carminative, anti-inflammatory, diuretic and ophthalmic. Roots are astringent, cooling, purgative and tonic also used for skin diseases, burning sensations and syphilis, burning sensation also useful in cardiac disorders.

B. 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.

1) *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.
2) *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.

C. Microbial Analysis

1) *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 *cassia* 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

a) *Preparation Of Nutrient Medium: Potato-Dextrose Agar (PDA):* 120 gms of freshly peeled potato are 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.
b) *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).

c) *Identification of Bacteria:* 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).

d) *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).

D. 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). 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.
2) *Moisture Content Of The Soil:* 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.
5) *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 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.
6) *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 were added and titrated against 0.02N versenate solution until the colour changes from red to blue.
7) *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.
8) *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 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.
9) *Estimation of iron by atomic absorption spectrophotometer (Issac and Johnson, 1975):* 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.

E. Analysis Of The Selected Tree Canopy Litter Formed By The Selected Samples

1) *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.

a) *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 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).

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III. 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 character, Propagation and the Biodiversity of the selected sample

Sample	Tree	Height in (m)	Breadth in (m)	Leaf		Inflorescence	Flower colour	Fruit		Seed shape and colour	Propagation	Biodiversity
				Type	Shape							
Cassia fistula	Medium sized Deciduous	07.08	01.05	Compound	Paripinnate	Racemose	Bright yellow	Cylindrical bean pods shape	Seed with hard seed coat	Elongated pod,brown	Seeds	Honey bee, Butterflies, Grasshopper, Ants, Squirrels, Spider

Table - 2 Morphology of the Leaf/ Leaflet length of the selected tree

Sample	Simple/ compound	Leaf length in (cm)	Leaflet length in (cm)	Leaf/ Leaflet of the selected trees
Cassia fistula	Paripinnately compound	28.02	12.00	

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)	
Cassia fistula	Racemose	Bright yellow	06.06	

Table - 4 Morphology of the fruits of the selected tree

Sample	Fruit				Fruit of the selected trees
	Type	Colour	Shape	Length in (cm)	
Cassia fistula	Cylindrical bean pod	Brown	Cylindrical bean shape	56	

Table - 5 Dehiscent and indehiscent seeds of the selected tree

Sample	Pod
	Dehiscent/ Indehiscent
Cassia fistula	Indehiscent

Table - 6 Biodiversity of the selected tree

Sample	Biodiversity of the selected trees
Cassia fistula	Honey bee, Butterflies, Grasshopper, Ants, Squirrels, Spider.

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 (%)
Cassia fistula	80.00	905.60	406.40	146.80	3.84

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
Cassia fistula	3	3	2	7	5	4	7	6	4

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
Cassia fistula	Streptococcus sps	Staphylococcu sps	Coccobacillus sps

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
Cassia fistula	-	-	-	2	2	1	3	3	2

Table - 11 Fungus present in the selected tree canopy soil

Sample	Fungi		
	10^{-3}	10^{-6}	10^{-9}
Control	Aspergillus niger	Aspergillusglaucus	Aspergillus niger
Cassia fistula	Rhizopussps	Aspergillus fumigatus	Aspergillusglaucus

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
Cassia fistula	20	18.08	9.6	5.1

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
Cassia fistula	0.21	0.06	0.44	0.043	0.008	0.36

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

Sample	Fresh weight (gm)	Dry weight (gm)	Moisture content(%)	pH
Cassia fistula	406.04	146.08	64.02	6.8

Table - 15 Mineral profiles of the selected tree canopy litter

Sample	Potassium (%)	Phosphorus(%)	Calcium(%)	Magnesium(%)	Iron(%)	Sodium(%)
Cassia fistula	840	177	904	190	30	35

IV. 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. Planting tree is the need of the hour. As tree grows their component value increases. Healthy trees contribute to the overall value of its properties to the society. Urban green areas contribute to maintaining and expanding the biological base for diversity that is essential to human survival in to the millennium. Hence, the study on selected individual tree canopy of the soil and litter is found to be high Calcium content, high moisture content, rich in biodiversity eg. Honey bee, Butterflies, Grasshopper, Ants, Squirrels, Spider. So the result reveals that the selected sample is suitable for urban greening to enrich the urban soil and to promote plant growth to the urban environment.

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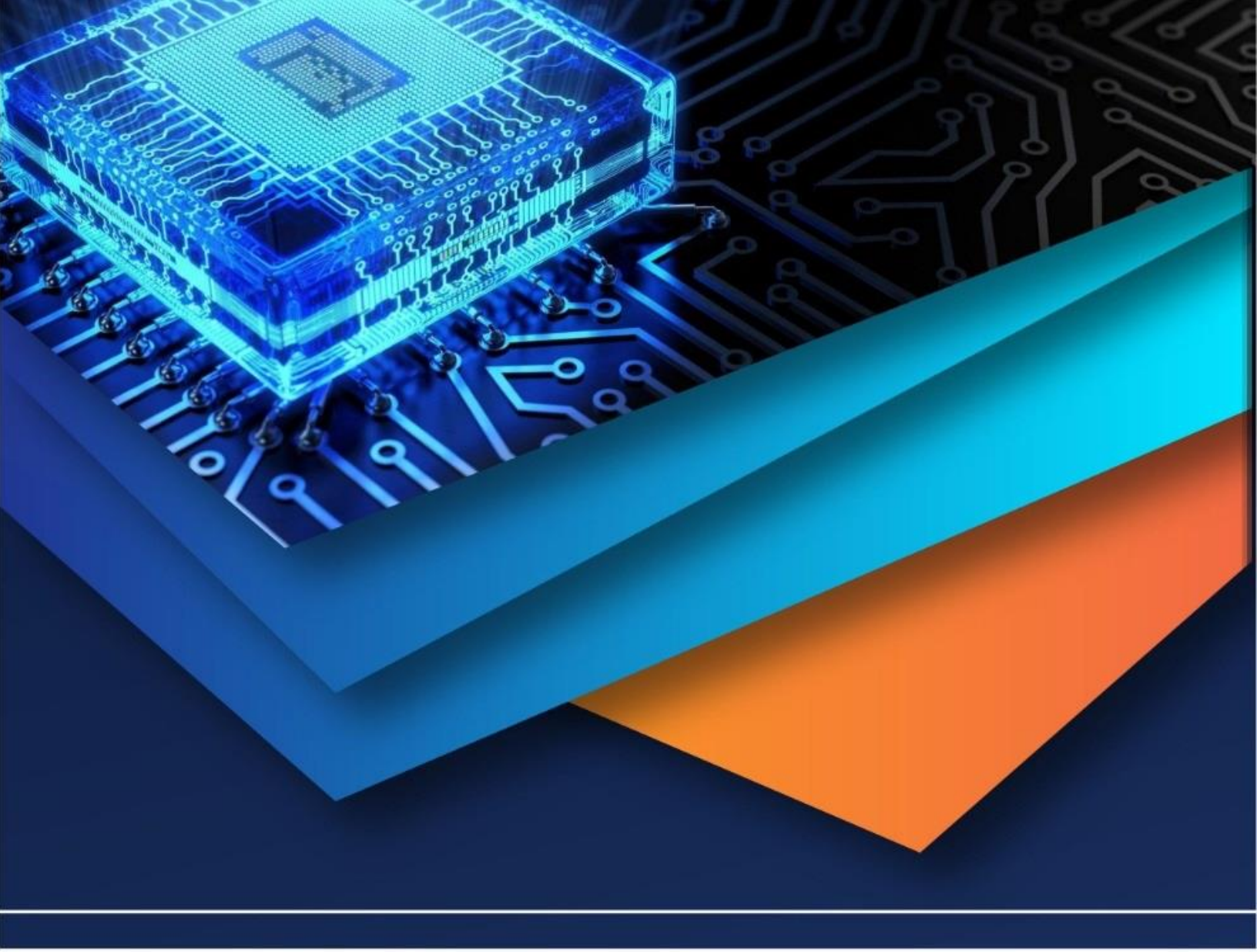

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