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RESEARCH ARTICLE

COMPARATIVE PHYSICAL PARAMETERS OF SELECTED TREE CANOPY SOIL RELATED WITH URBAN GREENING IN NIRMALA COLLEGE CAMPUS, COIMBATORE, TAMILNADU, INDIA

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ABSTRACT

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. Tress provide various benefits associated with air, water quality, building energy conservation, cooler air temperatures, reductions in ultraviolet radiation and many other environmental and social benefits. Trees have played an important role in human settlements throughout history. Natural forests with their complete canopy cover, large leaf areas and permeable soils handle rain water effectively through interception and infiltration, returning water to ground water and the atmosphere and protecting water quality in surface waterways. In the present study five trees were selected from the college campus and the physical parameters of the tree canopy soil were analysed and compared with the soil profile.

INTRODUCTION

Trees and green spaces help keep cities cool, act as natural filters and noise absorbers; improve microclimates and the quality of natural resources including soil water, vegetation and wildlife. Trees contribute significantly to the aesthetic beauty of cities, thereby helping to maintain the psychological health of the inhabitants. The tangible benefits of urban forests include availability of fruit, fuel wood and small timber. However, their full value to urban- dwellers have recently been recognized. The most explosive urban growth is expected in India. The need of the hour in India is to educate people and policy makers about the utility of urban spaces because public knowledge of the connection between human well being and ecosystem services is limited. Urban vegetation can reduce CO_2 levels in two ways. This is the cause for green effect. First all plants through photosynthesis absorb CO_2. Secondly vegetation cover reduces the heat island effect in urban area. Trees and other vegetation can also have an important impale on the energy budgets of buildings and in turn of entire cities. Large areas of paved surfaces dissipate the heat of the sun only very slowly. In urban environments human alter these soil-forming factors by impacts associated with urban infrastructure. For instance, building specifications often result in the scraping, compacting and covering of urban soil, which can impact soil organic matter, texture, structure, bulk density, infiltration, aeration, root penetration and biological activity.

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As a result of impacts associated with urban infrastructure, arborists and urban landscape managers perform remedial management actions to make urban soils more suitable plant-growing environments, remedial soil management actions include irrigation, aeration, radial trenching, mulching, and fertilization, all of which further alter the physical properties of urban soils. Soil organic matter (SOM) is a dynamic property of soil not a static one. Soil organic matter is often viewed as the thread that links the 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. Grows well with average annual rainfalls of 400-2500 nm (16-98 in), and in soil that are saline or alkaline but not water logged soils. Flowers from April to September, but primarily in spring, with pods held nearly throughout the year (Lowry *et al.*, 1994).

MATERIALS AND METHODS

Study Area

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 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 college campus is 20 acre. 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.

Study Area - Plate 1

Location Map - Plate 2

Collection of tree canopy soil samples

For the present study five different trees of different genera were selected in the college campus to find out the Physical parameters of tree canopy soil.

The tree canopy soil samples were collected during the year, 2013. Soil with litter formation and ground vegetation from the corners and centre of the selected samples of *Butea monosperma*, (*Lamk.) Taub., Jacaranda mimosifolia, D. Don., Cassia fistula*, *Linn., Albizzia lebbeck (L), Benth., and Peltophorum pterocarpum (DC.)k. Heyne*., were collected separately in sterile bags. Barren land soil is taken from the same campus was kept as control. Soil was taken from the depth of 0-50cm. Soil samples were packed in sterile bags, and as soon as possible returned to the laboratory and processed within 2 days.

Physical parameters of tree canopy soil samples

Physical parameters such as soil pH, Electrical conductivity and Moisture content were analyzed. Part of the moist soil samples were air dried and sieved to obtain fine soil samples (2gm). Soil pH was measured with soil–water (1:5) slurry using a pH glass electrode. The minerals were analyzed in the standard laboratory by employing Atomic Absorption Spectrophotometer and the results were represented in charts:

SAMPLE 1: Plate 3
Butea monosperma, (Lamk.)Taub.,

SAMPLE 2: Plate 4
Jacaranda mimosifolia, D.Don.

SAMPLE: 3 Plate 5
Cassia fistula, Linn.,

SAMPLE: 4 Plate 6
Albizzia lebbeck, (L,)Benth.,

SAMPLE: 5 Plate 7
Peltophorum pterocarpum, (DC.) k.Heyne.,

RESULTS AND DISCUSSION

Physical-parameters of selected tree canopy soil samples

Soil Moisture

Soil moisture values showed the overlapping trends as different samples had different values. The maximum soil moisture was recorded in *Albizzia lebbeck, (L), Benth.,* On the other extreme, minimum value was recorded in *Cassia fistula, Linn.,* The top soil has very little soil organic matter because high temperatures and moisture quickly decompose soil organic matter (Chart 1). The rate of soil organic matter decomposition increases when the soil is exposed to cycles of drying and wetting compared to soils that are continuously wet or dry (James, 2010). Water content in leaves, stems, tap roots and lateral root tissues significantly decreased with increasing concentration of salt in soil. There was maximum water content in lateral roots and minimum in leaves. Tissues, according to their water content can be arranged in the following decreasing order: lateral roots > tap roots > stems > leaves **(**Taiz, 2006).

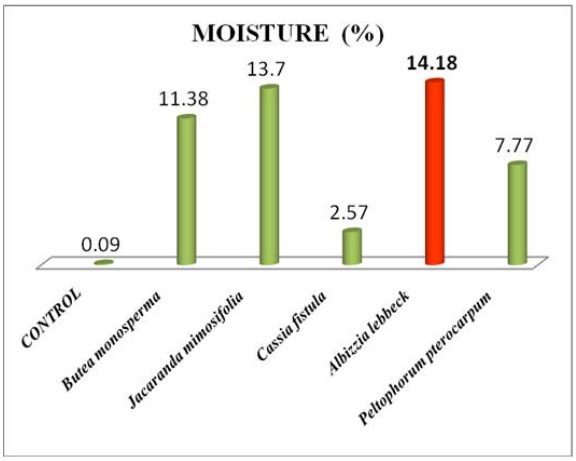

Chart - 1 Comparative moisture content of the selected tree canopy soil

pH

Most of the plants prefer a range between 5.5 and about 6.7 an acid range, but there are plenty of other plants that like soil more alkaline or above 7 Alkaline pH of 7 is where the plant can most easily absorb the most nutrients in the soil. Some plants prefer more or less of certain nutrients, and therefore do better at a certain pH (Chart 2). All the soils were on slightly acidic. In the canopy soil of five samples, *Albizzia lebbeck, (L), Benth., and Peltophorum pterocarpum (DC.) k. Heyne*., were more acidic than the other selected samples which ranges between 9.56 and 9.53 **(**Millen, 1998) observed the differences in pH between the sites studied did not significantly impact on Arbuscular Micorrhizal propagules density. Differences in pH are also known to have an impact on spore viability but not on Micorrhizal infection. Soils that are neutral to slightly alkaline in pH decompose soil organic matter quicker than acid soils; therefore, liming the soil enhances soil organic matter decomposition and carbon dioxide evolution (James, 2010). Whitelock, (2002) commented that most cycads prefer a slightly acidic (pH 6.5) or neutral (pH 7.0).

Table 1. Physical parameter of the selected tree canopy soil

S.No	Parameter	Control	*Butea monosperma*	*Jacaranda mimosifolia*	*Cassia fistula*	*Albizzia lebbeck*	*Peltophorum pterocarpum*
1	Moisture	0.09%	11.38%	13.70%	2.57%	14.18%	7.77%
2	pH	8.83	9.37	9.32	9.47	9.56	9.53
3	Electrical Conductivity	15.85 µmhos/cm	45.00 µmhos/cm	41.57 µmhos/cm	38.57 µmhos/cm	35.57 µmhos/cm	39.24 µmhos/cm

pH outside of this range can cause or greatly exacerbate nutrient deficiencies. Highly alkaline soils (pH 8.0 and above) lock up micronutrients (such as manganese, iron, and zinc) and make them unavailable to plant roots. More acidic soils (below pH 6.0) can likewise prevent good growth and proper nutrient uptake.

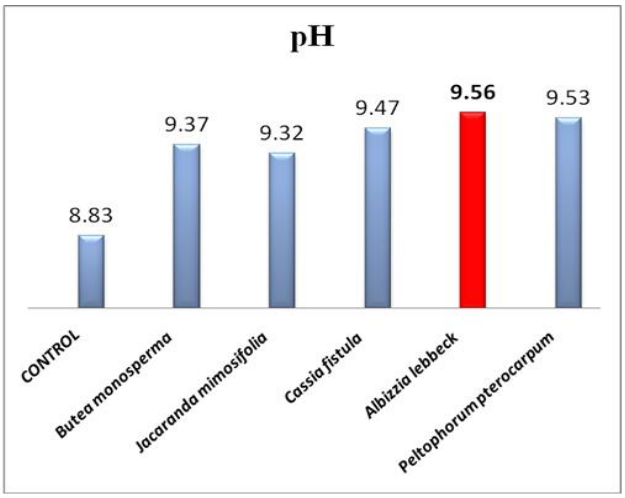

Chart - 2 Comparative pH values of the selected tree canopy soil

Electrical conductivity

Significant differences were recorded in Electrical conductivity which ranges from 45µhos/cm to 39.24µhos/cm *Butea monosperma,(Lamk.) Taub.,* was found to be high. *Albizzia lebbeck, (L), Benth.,*was found to be low with the value of 35.57µhos/cm when compared with all the selected samples (Chart 3).

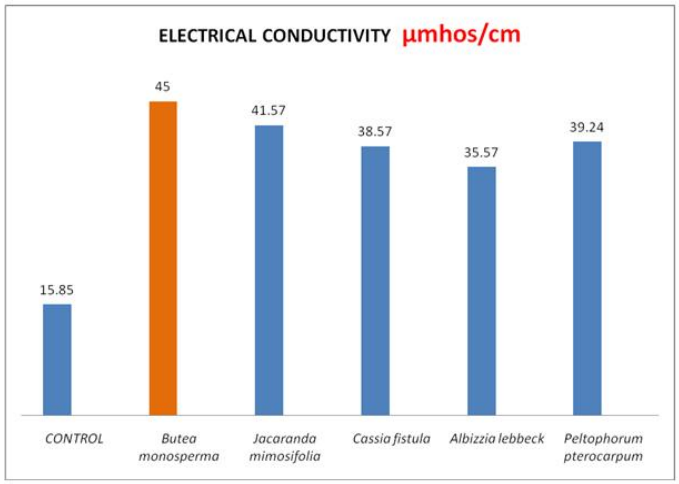

Chart - 3 Comparative Electrical conductivity of the selected tree canopy soil

APPENDIX

TABLE: Physical parameter of the selected tree canopy soil

LIST OF PLATES

PLATE: 1 Study area
PLATE: 2 Location map
PLATE: 3 Sample 1- *Butea monosperma (Lamk.) Taub.,*
PLATE: 4 Sample 2- *Jacaranda mimosifolia, D. Don.,*
PLATE: 5 Sample 3- *Cassia fistula, Linn.,*
PLATE: 6 Sample 4- *Albizzia lebbeck, (L,) Benth.,*
PLATE: 7 Sample 5- *Peltophorum pterocarpum, (DC.) k. Heyne.,*

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PHYSICAL PARAMETERS (CHARTS 1 - 3)

CHART 1: Comparative moisture content present in the selected tree canopy soil sample
CHART 2: Comparative pH values of the selected tree canopy soil samples
CHART3: Comparative Electrical conductivity present in the selected tree canopy soil samples

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