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Air Pollution Tolerance Index of Plants of Anwarul Uloom Campus

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Abstract: ***Air Pollution Tolerance Index is used to select plant species tolerant to Air pollution. Hyderabad is the capital of Indian State of Telengana and occupying 650 sqkms ,along the banks of Musi river. It is a metropolitan city with high population and traffic, dust, suspended particles, smoke and Heavy pollution in the Environment. We have collected Plant samples from our campus only. As the College is located in the heart of the city, there is high level of pollutants accumulated in the Environment. Screening of plants for their Sensitivity/Tolerance levels to air pollution, is important because the sensitive plants can serve as Bioindicators and tolerant plants as controlling the air pollution in Urban and Industrial areas.***
This Research work indicates the APTI and certain Biochemical properties of trees available in our campus. In this context 4 Physiological and Biochemical parameters have been studied like pH, Relative Water Content, Ascorbic Acid and Total Chlorophyll Content. The results will be helpful for future planning, which brings out possible control measures in air pollution and also to protect the Biodiversity for Future Citizens of Hyderabad.
Keywords: Suspended particles, Bioindicators, Biochemical parameters, Relative Water Content.

I. INTRODUCTION

Pollution is an emerging issue which alters metabolism in any organism. The primary reasons for Air Pollution is construction work and vehicular emission. Trees are playing a major role in imposing air quality by exchanging of gases as they act as a sink for pollutants. Trees that are exposed to environmental pollutants, absorb, accumulate and integrate with these pollutants into their system, depending on their sensitivity level. Plants show visible damage which shows an alteration of biochemical processes or accumulation of individual metabolites, these changes are used for APTI of plants.

Urban Population remains a threat to human health and this is expected to increase reasonably as industrial and vehicular ownership increases globally. The urban air quality is effected by emissions from vehicles. Over 600 million people globally are exposed to these hazardous pollutants. Particulates are dangerous and are said to be facilitators in the development of lung cancer and increase rate of mortality. Recent studies have explored the possibility to find the ability of plants, to remove pollutants from the air and act as a sink for contaminants. On the basis of Air pollution indices, different plants can be categorized into sensitive, intermediate and tolerant plant groups.

II. MATERIALS AND METHODS

Fully mature leaves were collected from the selected plant species. The fresh samples were analyzed.

A. Measuring leaf Extract PH

5gms of fresh leaves were homogenized in 10ml of distilled water. Leaf extract filtered and pH is determined , after caliberating the pH meter with the help of a buffer solution having pH of 4,7& 9.

B. Total Chlorophyll Content

The total amount of chlorophyll present was determined using 0.5gms of fresh leaves. These leaves were blended well with 10ml of 80% acetone . This mixture was left for 15min and then the liquid portion was taken into another test tube and centrifuged at 2500rpm for about 3min. The Supernatant after centrifugation was collected and the absorbance was taken at 645nm and 663nm using a Spectrophotometer.

The chlorophyll content is thus calculated making use of the following formula

Chl –a = 12.7(A663) – 2.69(A645)

Chl-b = 22.9(A645) -4.68 (A663)

Total Chlorophyll Content = 20.2(A645)+8.02(A663)

C. Ascorbic Acid Analysis

Keller and Schwager method was used for the analysis of Ascorbic Acid content. In this method fresh leaves weighing about 0.5gms were homogenized using 20ml of extracting solution. The Extracting solution was made with 5gms Oxalic Acid added to 0.75gms EDTA in 1000ml of distilled water. The fresh leaf sample was centrifuged for 15min at 6000xg and the supernatant solution was collected. To about 1ml of the supernatant 2,6-dichlorophenol indophenol(DCPIP) was added till it turns pink.

At 520nm the Optical Density of the mixture was taken(E_s).Then 1 drop of ascorbic acid was added to bleach the pink color. Then again at 520nm the optical density was recorded(E_t). At 520nm optical density of DCPIP was recorded(E_0).

By using different concentrations of ascorbic acid ,a standard curve was drawn.

Ascorbic Acid(mg/gm)=$[E_0 – (E_s – E_t)]$x V/W x V_1 x 1000

W = Weight of fresh leaves taken

V_1 = Volume of supernatant taken

V = Total volume of the mixture

Singh and Rao have given the formula to determine the value of species and it is stated as follows:

APTI = [A (T + P)] + R / 10

Where,

A = Ascorbic acid content of the leaf in mg/gm dry weight

T = Total Chlorophyll Content of the leaf in mg/gm dry weight

P = Leaf extract pH

R = Percentage (%) of relative water content of leaf.

D. Relative Water Content

RWC = ($W_f – W_d$) x 100/ ($W_t – W_d$)

W_f = Fresh weight

W_d= Dry weight

W_t = Turgid Weight

III. OBSERVATION

Name of the Plant	pH	Total Chlorophyll Content	Ascorbic Acid Content	Relative Water Content	APTI
Polyalthia longifolia	5.9	113.68	0.00148	61.5	6.16
Nerium indicum	6.2	113.68	0.0018	26.9	2.71
Clerodendron inerme	6.7	24.882	0.00276	52.3	5.23
Peltophorumpterocarpum	6.5	113.68	0.00324	30.6	3.09
Croton variegatum	7.1	113.68	0.00192	69.45	6.96
Ceasalpinia pulcherrima	9.5	3.001	0.00202	88.0	8.80
Caryota urens	11.6	52.329	0.0015	54.7	5.47
Plumeria alba	11.4	19.904	0.00288	49.2	4.92
Eucalyptus lanceolatus	11.8	113.68	0.180	34.2	5.67
Callistemon verminolis	10.7	113.68	0.00118	62.0	6.21
Azadirachta indica	10.0	101.74	0.0609	61.5	6.83

Table 1: The pH, total chlorophyll content, ascorbic acid content, relative water content and air pollution tolerance index values of selected plants.

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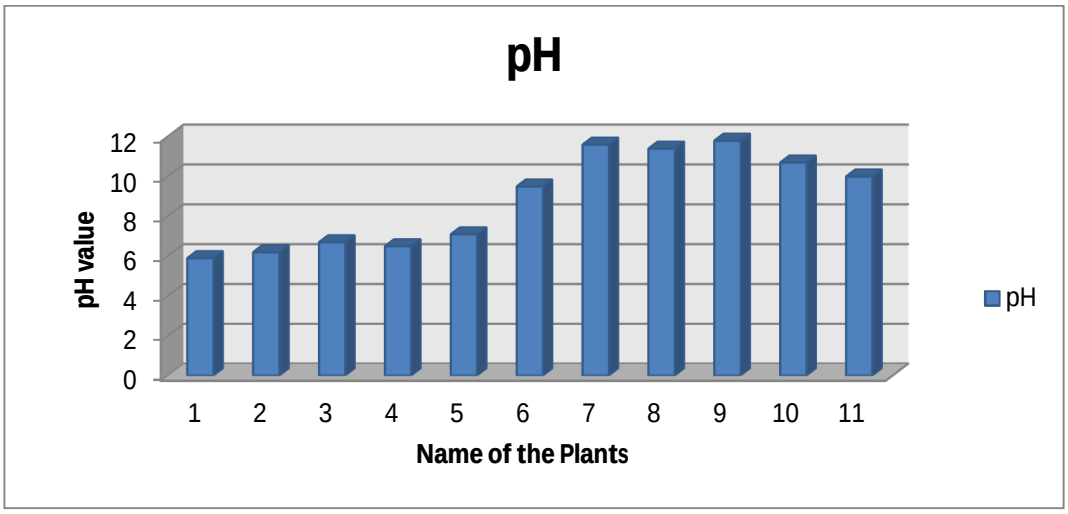

Figure 1 : pH value

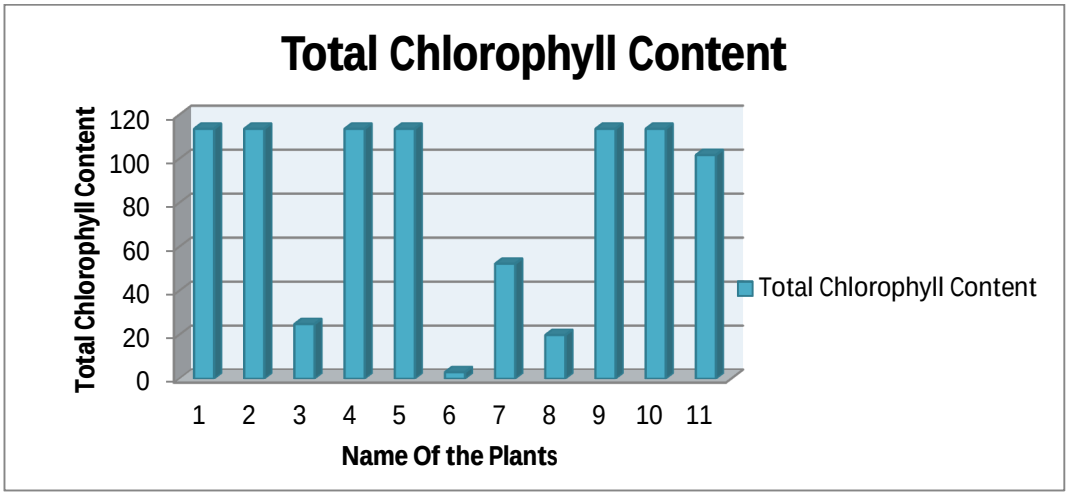

Figure 2: Total Chlorophyll Content

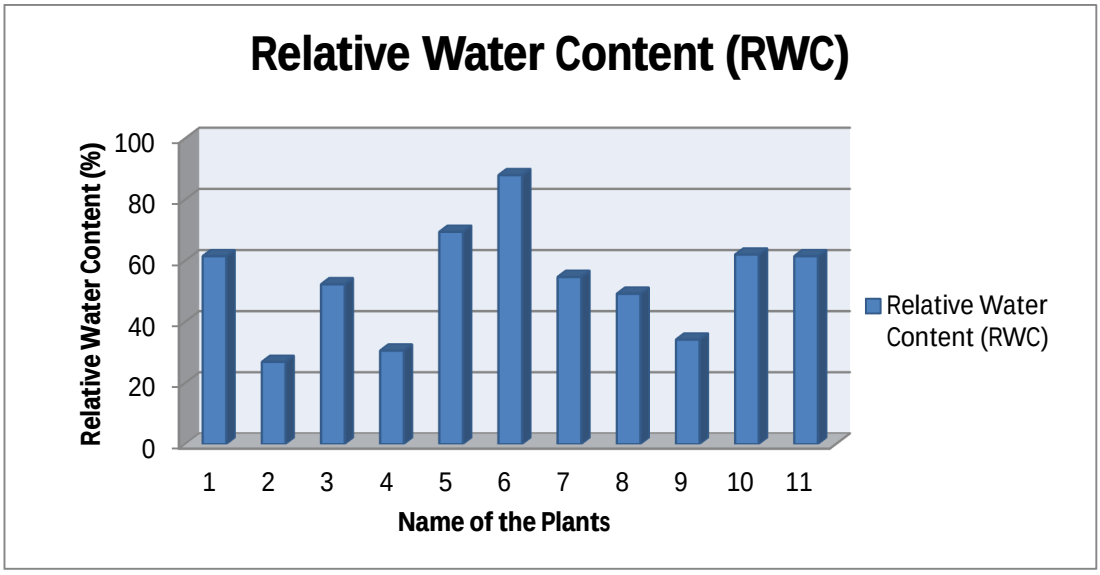

Figure 3 : Relative Water Content (RWC)

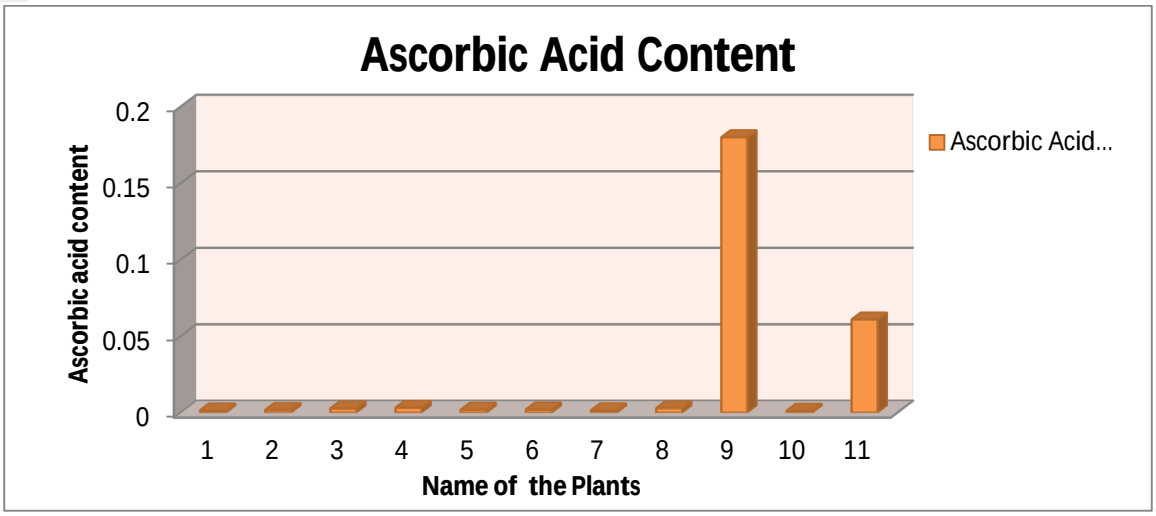

Figure 4 : Ascorbic Acid Content

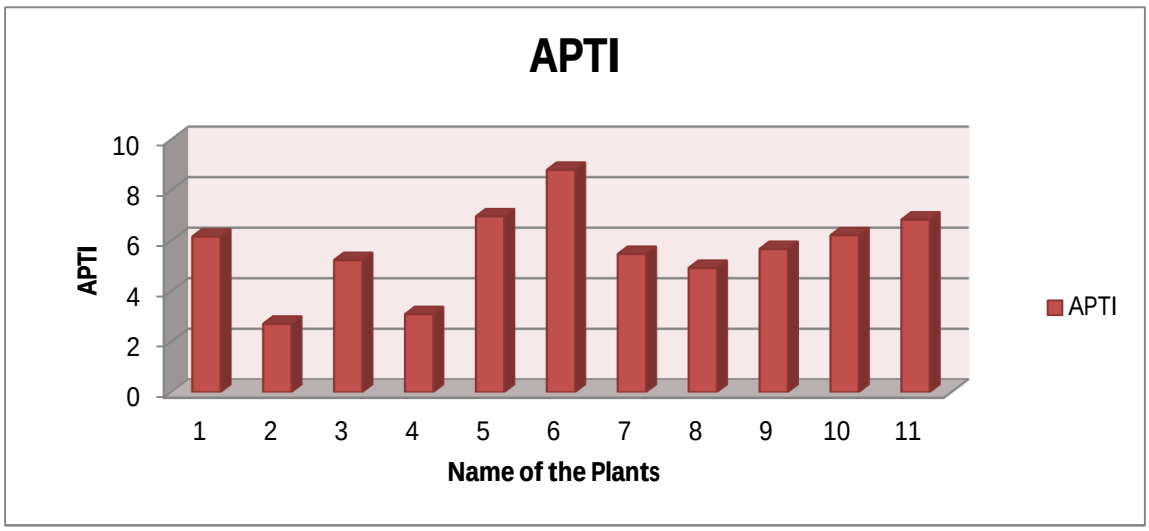

Figure 5: Air Pollution Tolerance Index

IV. RESULTS AND CONCLUSION:

The Air Pollution Tolerance Index was calculated for the different plant species, in the study area. About 11 species were studied for their pH values, Total Chlorophyll content, Ascorbic acid content, Relative water content and APTI values were estimated. For the above species it had been observed from the database that, among all the plant species **Ceasalpinea *pulcherima*** is having the pH value of 9.5, RWC is highest about 88.0 and APTI value is highest about 8.80 when compared with other species.

Therefore, we can conclude in this Research work about the species having highest APTI is ***Ceasalpinea***. ***Croton*** is next to ***Ceasalpinea*** in having 2nd highest APTI value.

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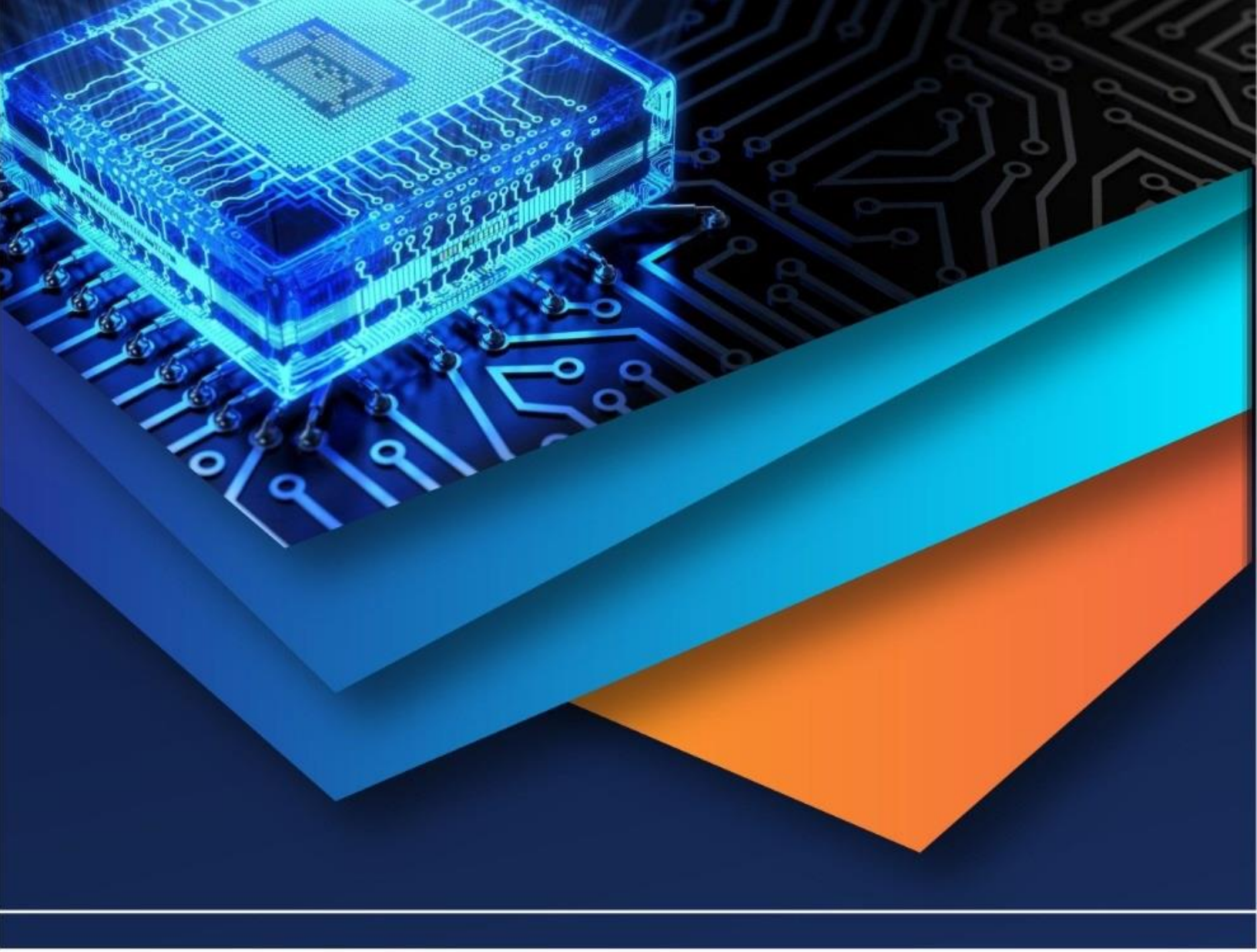

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