

Air Pollution Tolerance Index (APTI) of Certain Plants in Hyderabad City

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ABSTRACT:

Air pollution is one of the serious problems faced by the people globally due to its transboundary dispersion of pollutants over the entire world. Plants responses towards air pollution are assessed by air pollution tolerance index (APTI) value. In this study, the air pollution tolerance index was investigated in 12 plant species named *Acacia nilotica*, *Azadirachta indica*, *Bauhinia variegata.L*, *Bougainvillea spectabilis*, *Cassia tora. L*, *Calotropis procera*, *Delonix regia*, *Ficus religiosa*, *Peltophorum ferrugineum*, *Pongamia pinnata*, *Polyalthia longifolia*, *Terminalia catappa*. Two different sites of the city were selected for the study. The first name is Krishna kanth park Jawaharnagar. The second site is Venkatagiri. The plant species having higher APTI value can be given priority for plantation program in urbanize and industrial areas; so as to reduce the effects of air pollution and to make ambient atmosphere clean and healthy.

KEYWORDS: APTI, Air pollution, Hyderabad

1. INTRODUCTION

Air pollution is one of the best condition indecencies. The air we inhale has life supporting properties as well as life harming properties. It has been known for something like 240 years that air pollution can effectively affect plants. Air pollutants both, vaporous and particulate are known to create a quantifiable impact on plants Seinfeld, J. H. (1975). The unfavorable impact of residue settled on leaves has been accounted for by Chaphekar (1972). The hurtful impacts of air pollution on vegetation have just been all around archived Rayappa (1993). Bannett and Hill (1973) have recorded the capacity to decrease air pollution. The air pollution tolerance index (APTI) in light of each of the four parameters has been utilized for distinguishing tolerance dimensions of plant species Singh, and Rao (1983), Yan-Ju, & Hui (2008), Singh et al (1991). A few patrons concur that the air pollutants impact plant development

antagonistically Bhatia (2006), Sodhi (2007). Air pollution tolerance index has likewise been utilized to rank plant species in their request of tolerance to air pollution Raza and Murthy (1988). The proficiency of plants in engrossing pollutants is with the end goal that it can deliver pockets of clean air Gilbert (1968). Bernatsky (1969) has recommended that green belts may decrease air pollution. Plants developing in the air dirtied condition reacted and indicated noteworthy changes in their morphology, physiology and biochemistry.

Singh and Rao (1983) have suggested a method to determine Air Pollution Tolerance Index by synthesizing the values of four different foliar biochemical features i.e. Total chlorophyll content, Relative Water Contents, leaf extract pH and Ascorbic acid. In this study, the air pollution effects on the activity of antioxidant enzymes were investigated in 12 plant species named *Acacia nilotica*, *Azadirachta indica*, *Bauhinia variegata.L*, *Bougainvillea spectabilis*, *Cassia tora. L*, *Calotropis procera*, *Delonix regia*, *Ficus religiosa*, *Peltophorum ferrugineum*, *Pongamia pinnata*, *Polyalthia longifolia*, *Terminalia catappa*. The main objective of this study is to evaluate air quality by determination of the activity air pollution tolerance index (APTI) in the above mentioned plants in the polluted sites and less polluted areas.

2. MATERIALS & METHODS

Site Selection: Hyderabad is continuously losing its grace and beauty under the growing pressure of densification of activities. The air is being continuously polluted in urban areas because of heavy traffic, industries. Two different sites of the city were selected for the study. The first site is Jawahar Nagar (Krishnakanth Park). At this site dump yard is located and it is polluted area. The second site is Venkatagiri, it is a residential as well as commercial site.

Parameters and sampling frequency: At the height of three to four meters, fully expanded mature leaves were collected from each plant in the polythene bags and transported to the laboratory. The leaf samples were collected on seasonal basis and this frequency was strictly maintained throughout the year. Investigations APTI was carried out in all the twelve plants (*Acacia nilotica*, *Azadirachta indica*, *Bauhinia variegata.L*, *Bougainvillea spectabilis*, *Cassia tora.L*, *Calotropis procera*, *Delonix regia*, *Ficus religiosa*, *Peltophorum ferrugineum*, *Pongamia pinnata*, *Polyalthia longifolia*, *Terminalia catappa*).

Air Pollution Tolerance Index

An attempt has been made to determine the air pollution tolerance index (APTI) which gives an empirical value for the tolerance level of plant to air pollution. The leaf samples were analyzed for total chlorophyll, ascorbic acid, leaf pH and relative water content using the standard procedure. The air pollution tolerance index was computed by the method suggested by Singh and Rao (1983) using the equation.

The formula for APTI is

$$\text{APTI} = \frac{(A (T+P)) + R}{10}$$

Where, A = Ascorbic acid (mg/100ml)

T = Total chlorophyll (mg/g)

P = pH of leaf extract

R = RWC of leaf extract (%)

The entire sum is divided by 10 to obtain a small manageable figure.

Based on the development and evaluation of APTI values among the plants they are categorized into three groups namely:-

- 10.5 - 8.5 as Tolerant species;
- 8.4-6.0 as Intermediate species;
- 5.9-3.0 as Sensitive species.

3. RESULTS & DISCUSSION

Air Pollution Tolerance Index (APTI) of plants plays major role in determining the resistivity and susceptibility. In urban areas, air pollutants may get absorbed or accumulated by plant body, if these are toxic in nature, may injure the plants in various ways.

Total of 12 Plants were analyzed and arranged in the descending order of APTI given in Tables- 1, 2 and 3 plants having higher index values are more tolerant to air pollution.

At site 1 highest APTI value was 6.05 of *Bauhinia* which is a tree and lowest APTI value was recorded as 3.11 for *Pongamia* which is also a tree. By the obtained values we can consider that at site 1, there are no tolerant species. *Bauhinia* is only an Intermediate species at this site. Remaining all 11 species is sensitive to APTI.

At site 2 highest APTI value was 10.40 of *Caliotropis* which is a tree and lowest APTI value was recorded as 3.89 for *Ficus* which is also a tree. By the obtained values we can consider that at site 2, there is only one tolerant species named *Caliotropis*. *Bauhinia*, *Delonix*, *Terminalia*, *Polyathia* are Intermediate species at this site. Remaining 7 species is sensitive to APTI.

Table1: Range and Annual average of APTI at site-1

Site	Plant name	Year	Range	Annual	Biannual Avg.
Krishna Kanth Park Jawaharnagar	<i>Acacia nilotica.L.</i>	I	1.17-8.51	4.85	4.89
		II	1.45-8.47	4.92	
	<i>Azadirachta indica .L.</i>	I	1.5-12.7	5.98	5.65
		II	1.15-8.66	5.33	
	<i>Bauhinia variegata .L</i>	I	1.65-9.76	6.64	6.05
		II	1.77-8.48	5.46	
	<i>Bougainvillea spectabilis .comm.</i>	I	1.04-9.9	5.23	5.36
		II	1.56-7.45	5.50	
	<i>Cassia tora .L.</i>	I	1.66-7.93	5.54	5.67
		II	4.35-7.92	5.79	
	<i>Calotropis procera .T.Aiton</i>	I	1.53-7.92	5.34	5.26
		II	1.64-7.9	5.18	
	<i>Delonix regia .Hook.</i>	I	1.56-8.55	5.64	5.04
		II	1.68-7.2	4.45	
	<i>Ficus religiosa .L.</i>	I	1.6-10	6.03	5.34
		II	1.59-7.1	4.64	
	<i>Peltaforum ferrigoenum .Benth</i>	I	1.65-9.35	6.11	5.61
		II	1.63-7.35	5.10	
	<i>Pongamia pinnata .L.</i>	I	1.38-8.59	5.27	5.40
		II	2.88-7.89	5.53	
<i>Polyalthia longifolia .sonn.</i>	I	1.1-7.92	3.27	3.11	
	II	1.63-4.69	2.94		
<i>Terminalia catapa .L.</i>	I	1.2-13.08	5.31	4.67	
	II	1.69-5.52	4.04		

Table23: Range and Annual average of APTI at site-2

Site	Plant name	Year	Range	Annual	Biannual Avg.
Venkatagiri	<i>Acacia nilotica.L.</i>	I	1.36-9.38	4.98	5.15
		II	1.58-9.75	5.33	
	<i>Azadirachta indica .L.</i>	I	1.08-7.45	4.42	4.41
		II	2.81-8.06	4.41	
	<i>Bauhinia variegata .L.</i>	I	1.38-8.11	4.50	8.19
		II	3.89-70.9	11.87	
	<i>Bougainvillea spectabilis .comm.</i>	I	1.15-7.57	4.71	5.88
		II	2.82-10.43	7.05	
	<i>Cassia tora .L.</i>	I	0.99-7.17	4.11	4.11
		II	1.86-8.19	4.12	
	<i>Calotropis procera .T.Aiton</i>	I	1.56-131	14.51	10.40
		II	4.17-9.04	6.29	
	<i>Delonix regia .Hook.</i>	I	1.27-6.86	3.54	7.37
		II	2.68-12.67	11.21	
	<i>Ficus religiosa .L.</i>	I	1.33-8.08	3.50	3.89
		II	3.14-7	4.28	
	<i>Peltaforum ferrigoenum .Benth</i>	I	1.34-8.93	4.60	4.12
		II	1.71-7.02	3.63	
	<i>Pongamia pinnata .L.</i>	I	1.09-9.9	4.62	6.19
		II	6.07-8.99	7.75	
<i>Polyalthia longifolia .sonn.</i>	I	2.07-9.45	5.60	4.01	
	II	0.93-4.29	2.43		
<i>Terminalia catapa .L.</i>	I	1.23-10.61	6.18	6.68	
	II	5.34-9.46	7.18		

4. CONCLUSION:

APTI determination is of importance because with increase in air pollution there is increase danger to the existing flora. From the results of the present study, this tolerant plant species can be used as indicators of pollution thereby acting as a sink to all air pollutants.

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