

# STUDIES ON AIR POLLUTION TOLERANCE INDEX OF SELECTED 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 5 plant species named *Azadirachta indica*, *Bougainvillea spectabilis*, *Delonix regia*, *Ficus religiosa*, *Pongamia pinnata*. Three different sites of the city were selected for the study. The first site is Dilsukhnagar- Polluted site. Second site is Ranigunj - Polluted site. Third site is HCU – Control site. 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:** Air pollution, APTI, Hyderabad city

## INTRODUCTION

Plants are an essential reason for all environments and furthermore well on the way to be influenced via airborne pollution which are distinguished as the creatures with most potential to get impacts from encompassing air pollution. Additionally the impacts are frequently clear on the leaves which are typically the most plentiful and most evident essential receptors of enormous number of air poisons. Biomonitoring of plants is a significant apparatus to assess the effect of air pollution. Thus in the most recent years urban vegetation turned out to be progressively significant for social reasons as well as generally for influencing neighborhood and local air quality. The reaction of plants towards air was surveyed via air pollution resilience list. The helpfulness of assessing APTI for the assurance of resilience just as affectability of plant species were trailed by a few creators (Agrawal and Tiwari, 1997; Dwivedi and Tripathi, 2007; Liu and

Ding, 2008; Dwivedi et al., 2008). These examinations gave important information to gardeners and greenbelt originators to choose the delicate just as tolerant assortments of plant species for utilizing them to distinguish the pollution heaps of urban/modern territories, and furthermore to utilize the tolerant assortments for controlling the danger of air pollution. The consequences of these examinations demonstrated that the plants with higher APTI qualities were observed to be impervious to air pollution.

All ignition discharges gases and particles into the air. These can incorporate sulfur and nitrogen oxides, carbon monoxide and ash particles, just as littler amounts of dangerous metals, natural atoms and radioactive isotopes. Air pollution can be characterized as the human presentation into the climate of synthetic concoctions, particulate issue or natural materials that reason mischief or inconvenience to people, or other living life form or harm the earth (Anonymous 2008) Air pollution is a noteworthy issue emerging for the most part from industrialization (Odilora, et al 2006). Air pollutions can straightforwardly influence plants through leaves or in a roundabout way by means of soil fermentation (Steubing, et al 1989). It has likewise been accounted for that when uncovered to air toxins, most plant experience physiological changes before displaying unmistakable harm to leaves (Dohmen, et al 1990). In any case, the air pollution tolerance index (APTI) in light of each of the four parameters has been utilized for distinguishing resistance dimensions of plant species (Singh and Rao, 1993; Yan-Ju and Ding, 2007; Singh et al 1991); Several supporters concurs that air poisons impact plant development unfavorably (Rao, 2006; Bhatia, 2006; Sodhi, 2007; Horsefall, 1998).

In this study, the air pollution effects on the activity of antioxidant enzymes were investigated in 5 plant species named *Azadirachta indica*, *Bougainvillea spectabilis*, *Delonix regia*, *Ficus religiosa*, *Pongamia pinnata*. 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.

## 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. Three different sites of the city were selected for the study. The site names are as follows:

1. Dilsukhnagar- Polluted site.
2. Ranigunj - Polluted site.
3. HCU – Control 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 (*Azadirachta indica*, *Bougainvillea spectabilis*, *Delonix regia*, *Ficus religiosa*, *Pongamia pinnata*).

### 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

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

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; and
- 5.9-3.0 as Sensitive species.

### 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 5 Plants were analyzed and the values of APTI given in Tables- 1, 2 and 3 plants having higher index values are more tolerant to air pollution.

**Table 1: Range, Annual-Average and Bi-Annual Average of APTI, Site-1, Dilshukh Nagar, Hyderabad.**

S.No	Plant Name	Year	Range	Annual-Average	Bi-Annual Average
	<i>Azadirachta indica .L.</i>	I	1.26-8.07	4.98	4.66
		II	0.74-7.98	4.34	
	<i>Bougainville aspectabilis .Comm.</i>	I	1.41-10.04	5.97	6.12
		II	2.40-9.63	6.28	
	<i>Delonix regia .Hook.</i>	I	1.30-9.12	5.45	5.33
		II	1.71-9.44	5.21	
	<i>Ficus religiosa .L.</i>	I	2.23-10.51	5.86	5.86
		II	1.25-11.25	5.87	
	<i>Pongamia pinnata .L.</i>	I	1.88-7.38	4.30	5.01
		II	1.37-9.56	5.72	

At site 1 highest APTI value was 6.12 of *Bougainville aspectabilis* which is a tree and lowest APTI value was recorded as 4.66 for *Azadirachta indica* 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 4 species is sensitive to APTI.

**Table 2: Range, Annual-Average and Bi-Annual Average of APTI, Site-2, Ranigunj, Secunderabad.**

S.No	Plant Name	Year	Range	Annual-Average	Bi-Annual Average
	<i>Azadirachta indica .L.</i>	I	1.26-9.49	5.39	5.19
		II	1.47-7.95	4.99	
	<i>Bougainville aspectabilis .Comm.</i>	I	1.63-7.59	4.24	4.55
		II	2.75-7.95	4.87	
	<i>Delonix regia .Hook.</i>	I	1.95-8.81	4.05	4.44
		II	1.75-7.95	4.84	
	<i>Ficus religiosa .L.</i>	I	1.87-10.4	5.41	6.17
		II	4.24-9.41	6.94	
	<i>Pongamia pinnata .L.</i>	I	2.14-10.29	5.85	5.44
		II	1.82-8.37	5.04	

At site 2 highest APTI value was 6.17 of *Ficus religiosa* which is a tree and lowest APTI value was recorded as 4.44 for *Delonix regia* which is also a tree. By the obtained values we can consider that at site 2, there is only one intermediate species named *Ficus religiosa*. Remaining 4 species are sensitive to APTI.

**Table 3: Range, Annual-Average and Bi-Annual Average of APTI, Site-3, HCU, Hyderabad.**

S.No	Plant Name	Year	Range	Annual-Average	Bi-Annual Average
	<i>Azadirachta indica .L.</i>	I	3.45-10.25	10.01	10.01
		II	4.20-10.25	10.03	
	<i>Bougainville spectabilis .Comm.</i>	I	1.51-10.4	4.86	4.99
		II	1.96-10.23	5.12	
	<i>Delonix regia .Hook.</i>	I	2.35-10.38	6.17	
		II	2.96-10.30	6.35	6.26
	<i>Ficus religiosa .L.</i>	I	3.70-10.01	9.95	
		II	4.01-10.04	8.05	9.00
	<i>Pongamia pinnata .L.</i>	I	2.01-9.83	5.26	
		II	2.60-11.13	6.44	5.85

At site 3 highest APTI value was 10.01 of *Azadirachta indica* which is a tree and lowest APTI value was recorded as 4.99 for *Bougainville spectabilis* which is also a tree. By the obtained values we can consider that at site 3, there is two tolerant species. Only *Delonix* and *Ficus* are Intermediate species and remaining 1 is sensitive to APTI.

#### CONCLUSION:

APTI determination is of importance because with increase in air pollution there is increase in 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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