

# Air Pollution Tolerance Index (Apti) Of Certain Plants Of 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*. Three different sites of the city were selected for the study. The first site is industrial site its name is IDA Bollaram. At this site number of industries located and it is considered as polluted area. The second site is commercial site its name is Koti. Most of the Hyderabad business is done here and impact of vehicular number is high. The third site is residential site and its name is Shivam. 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

## I. INTRODUCTION

Air pollution is a serious problem throughout the world. Rapid industrialization and vehicular traffic especially in the urban areas of India lead to the deterioration of air quality by adding toxic gases and other substances to the atmosphere (G.S. Mahecha et al 2013). The degradation of air quality is major environmental problem that affects many urban and industrial sites and the surrounding regions worldwide (Kuddus et al. 2011).

Plants are very important to maintain ecological balance but they can severely get effect directly or indirectly by air pollution (Agbaire, 2009). Plants when exposed constantly to environmental pollutants, it induces functional weakening and structural simplification and finally leads to negative effects on other biotic communities. The plants response to air pollutant vary from species to species and also in terms of type of pollutant, its reacting mechanisms,

concentration and duration of exposure. The resistance and susceptibility of plants to air pollutants can be determined by its physiological and bio-chemical levels. Now a day, urban vegetation became very important because it affects the local and regional air quality (S. JissyJyothi and D.S. Jaya, 2010). Regional impact of air pollution on local plant species is one of the major ecological issues. The climate condition, the physico-chemical properties of air pollutants and their residence time in the atmosphere have impact on surrounding plants (Wagh et al., 2006). The most obvious damage occurs in the leaves which include chlorosis, necrosis and epinasty (Prasad and Choudhury, 1992). The selection and growing of the resistant plant species is another facet of the problem of pollution. Planting of certain tolerant plant species can with stand the increasing air pollution will be significantly useful for the air pollution control. 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.

## II. MATERIALS & METHODS

### A. 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 first site is industrial site its name is IDA Bollaram. At this site number of industries located and it is considered as polluted area. The second site is commercial site its name is Koti. Most of the

Hyderabad business is done here and impact of vehicular number is high. The third site is residential site and its name is Shivam.

### B. 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*).

### C. 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

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

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.

## III. 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.

Table1 Annual Average of APTI at site-1

| Site     | Parameter     | Biannual Avg. |
|----------|---------------|---------------|
| Bollaram | Acacia        | 4.89          |
|          | Azadirachta   | 5.65          |
|          | Bauhinia      | 6.05          |
|          | Bougainvillea | 5.36          |
|          | Cassia        | 5.67          |
|          | Caliotropis   | 5.26          |
|          | Delonix       | 5.04          |
|          | Ficus         | 5.34          |
|          | Pettaforum    | 5.61          |
|          | Polyalthia    | 5.40          |
|          | Pongamia      | 3.11          |
|          | Terminalia    | 4.67          |

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.

**Table2 Annual Average of APTI at Site-2**

| Site | Parameter     | Biannual Avg. |
|------|---------------|---------------|
| Koti | Acacia        | 5.15          |
|      | Azadirachta   | 4.41          |
|      | Bauhinia      | 8.19          |
|      | Bougainvillea | 5.88          |
|      | Cassia        | 4.11          |
|      | Caliotropis   | 10.40         |
|      | Delonix       | 7.37          |
|      | Ficus         | 3.89          |
|      | Pettaforum    | 4.12          |
|      | Polyalthia    | 6.19          |
|      | Pongania      | 4.01          |
|      | Terminalia    | 6.68          |

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 Calitropis. Bauhinia, Delonix, Terminalia, Polyathia are Intermediate species at this site. Remaining 7 species is sensitive to APTI.

**Table3 Annual Average of APTI at site-3**

| Site   | Plant name    | Biannual Avg. |
|--------|---------------|---------------|
| Shivam | Acacia        | 4.26          |
|        | Azadirachta   | 5.29          |
|        | Bauhinia      | 4.75          |
|        | Bougainvillea | 5.35          |
|        | Cassia        | 5.27          |
|        | Caliotropis   | 4.53          |

|  |            |      |
|--|------------|------|
|  |            |      |
|  | Delonix    | 6.72 |
|  | Ficus      | 4.72 |
|  | Pettaforum | 4.55 |
|  | Polyalthia | 5.32 |
|  | Pongania   | 5.36 |
|  | Terminalia | 5.43 |

At site 3 highest APTI value was 6.72 of Delonix which is a tree and lowest APTI value was recorded as 4.26 for Acacia which is also a tree. By the obtained values we can consider that at site 3, there is no tolerant species. Only Delonix is an Intermediate species at this site. Remaining 11 species is sensitive to APTI.

#### IV. 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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