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EFFECT OF AIR POLLUTANTS ON CHLOROPHYLL AND AIR POLLUTION TOLERANCE INDEX (APTI) OF CERTAIN PLANTS IN HYDERABAD CITY

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ABSTRACT

Air pollution is defined as any item introduced into the air as a result of human activity that has a detrimental effect on human health, vegetation, or impairs the utilization of natural resources. The following investigations were carried out in all the fourteeen plants *Acacia nilotica, Azadirachta indica, Calotrophis procera., Cassia auriculata, Delonix regia.Hook., Dalbergia sissoo., Ficus benghalensis, Ficus carica, Hibiscus rosasinensis, Lantana camara. L., peltophorum ferrugineum, Benth, Polyalthia longifolia, Pongamia pinnata.L and Syzgium cumini*. For photosynthetic study chlorophyll pigments (Chlorophyll a, chlorophyll b and total chlorophyll) were studied and biochemical changes in leaves (Starch, phenols, and sugars- total, reducing and non-reducing) were studied. Air Pollution Tolerance Index (APTI), PH, Relative Moisture Content, Ascorbic Acid Content, Determination of the antioxidant enzymes like CAT, POD, PPO and air quality parameters like NOX, SO_2, PM_{10}, TSPM were studied. Meteorological data of AT, RH, BP, SR, VWS, WS, WD were studied.

KEYWORDS: Air Pollution Tolerance Index (APTI), Chlorophyll pigments, *Acacia nilotica, Azadirachta indica, Calotrophis procera, Cassia auriculata, Delonix regia.Hook.*

1. INTRODUCTION

Air pollution has been getting more attention because it causes a lot of sickness and death. It is thought to be one of the most serious problems the world is having right now, and many people agree. John Evelyn wrote a pamphlet called "Fumifugium" in 1661 that said all plants that make smoke should be removed from the area around London. The combination of sulphur dioxide, water, and smoke caused a coal-inducing smog near London, which lasted for nearly five days and killed 1000 people in January 1956, 700 people in 1957, 200 people in 1959, and 700 people in 1963 in Britain. At least 63 people died and a lot of people had respiratory problems because of a strong inversion of the air over the Meuse Valley in 1930 because of the unstable air. Radhapriya P *et al.* (2012) studied the effect of plants near the cement industry, Coimbatore, India based on APTI. The results indicate those plants surrounding the industry show high pollution exposure than that of the plants in controlled areas. Plants like Mangifera indica, Bougainville species, Psidium guajava exhibited high APTI value. 37% of the plants were tolerant, 33% were highly susceptible, and only 15%

were at intermediate and moderate levels. Yan-Ju-Liu *et al.* (2008) studied the effect of twenty three plant species present and growing around steel factory in Beijing. The study showed that high air pollution tolerance index values of some of the species of plants in the form of trees and shrubs available there in the vicinity proved as an ideal candidate for land scape planting. The tolerant plants identified were Broussonetia papyrifera, Robinia pseudoacacia and Ailanthus altissima. These species were given priority for planting in the surrounding locality close by the polluting industry to control pollution. Krishnaveni .M *et al.* (2015) studied the effect of fifteen multiple plants available and grown near Dalmia, Salem in Tamil Nadu, India. The selected plants were tested for their air pollution tolerance index. The physiochemical properties of the soil were in turn tested. The results revealed very clearly that the plants found in those places close to industry were sensitive to air pollution due to a much lower value of air pollution tolerance index. Also it was clearly noticed that the soil present in the industrial area was found to contain all the nutrients required for the growth.

Krishnaveni.M *et al.* (2013) studied the air pollution tolerance index value of the selected twenty different plant species near Perumalmalai hills in the Salem district during the month of February 2013.The study revealed that the intermediate species tolerant to pollution was Nerium oleander having air pollution tolerance index value of 16.65. All others selected showed lower value of air pollution tolerance index and were grouped as sensitive to air pollution.

Abed Esfahani *et al.* (2013) carried out studies to assess the tolerance level of some of the higher plants in the Esfahan city. The lowest and the highest observed value of the deposition rate was seen in Morus alba and Cercis siliquastrum among the nine different plants considered for evaluation for the development of green belt.

Tiwari *et al.* (2006) studied the air pollution tolerance index of a few plants in the growing areas adjacent to Raigarh (India). The results clearly indicated that Ficus glomerata was found to be a tolerant species during the study. The sensitive species to air pollution was Acacia nilotica.

Sridhar Reddy *et al.* (Nov 2013) evaluated nearly seven plants for their air pollution tolerance index in the neighborhood of the cement manufacturing unit present close by Yogi vemana Campus at some of the polluted areas and control sites. The plants identified to be tolerant to air pollution were Aegle marmelos, Cassia auriculata and Bouganvillea Spectabillis.

Khureshi S.G.D *et al.* (2013) studied considering the eight different plant species present along the road side polluted area Ponnur in Guntur district using some of the biochemical parameters. The results indicate the plant Delonix Regia as one of the most tolerant variety. All biochemical parameters indicated a worsening condition with rise in the concentration of air pollution.

Singh vandana *et al.* (2013) investigated the screening of a few medicinal plants in the control of pollutants to make the environment healthy by improving the design as well as by developing it. The result from the work showed that the method adopted for reduction in pollution was by placing the plants in some of the urban canyons for pollution mitigation.

Sirajuddin T.Horaginamani *et al.* (2012) carried out analysis to study thirty different plant species from Tiruchirappalli. From the concluded result it was clear that Azadirachta indica

showed the higher value of air pollution tolerance index and more tolerant condition.Psidium spicigera showed a lower value indicating sensitive nature to pollution.

Ponnammal N.R.*et al.* (2005) determined the air pollution tolerance index of twentyseven species of plants found to be growing near the I.T.I area of Coimbatore, Tamil Nadu. Among the trees Azadiracta indica and among herbs Datura stramonium and among the shrubs Ricinus communis,and among climbers Cucurbita pepo were recognized to be the most tolerant varieties and are classified as bio indicators and grown as bio accumulator. .

Srinivas N *et al.* (2008) calculated the air pollution tolerance index of twenty four types of plant species by finding the biochemical parameters like ascorbic acid, chlorophyll, pH and relative water content for the plants available in the industrial area of Visakhapatnam. Some of the varieties like Ficus religiosa, Zizypus jujube, Phyllanthus emblica and Cassia fistula revealed their responses by varying their biochemical contents and are recognized as few species that are moderately tolerant to air pollution.

Bakiyaraj R *et al.* (2013) studied the level of susceptibility to air pollution using the biochemical parameters and calculated the air pollution tolerance index around Neyveli Lignite Corporation Ltd, India. Some of the varieties of plants like Eucalyptus spectabilis having a higher value of air pollution tolerance index exhibited high tolerance level to air pollution.

Shyamala.L *et al.* (2015) studied the modified air pollution tolerance index evaluation of some fifteen of the selected varieties of plants by the addition of free amino acid and total carbohydrate at Abids, Hyderabad. The observations from the work very clearly indicate seven species of plants were tolerant, three of them were intermediate species and five were found to be much sensitive.

Debnath palit *et al.* (2013) carried out work on the monitoring of air pollutants by using biochemical parameters for ten different varieties of the species of crop at four different sites to compute the air pollution tolerance index at Durgapur, west Bengal,. The results computed indicate that Polyalthia longifolia showed a highest value of tolerance index and lowest value was shown by Zizyphus mauritiana to combat the air pollution problem.

2. MATERIALS & METHODS

For photosynthetic study the chlorophyll pigments (Chlorophyll a, chlorophyll b and total chlorophyll) were studied and biochemical changes in leaves (Starch, phenols, and sugars-total, reducing and non-reducing) were studied. Air pollution tolerance index, PH, Relative Humid Content, Ascorbic Acid Content, Determination of the antioxidant enzymes like CAT, POD, PPO and air quality parameters like NOx, SO_2, PM_{10}, TSPM were studied. Meteorological data of AT, RH, BP, SR, VWS, WS, WD were studied.

3. RESULTS & DISCUSSION

3.1 Chlorophyll (µg/ml):

The Total Chlorophyll Content is one of essential generally utilized and broke down parameter of Environmental appraisal. All out Chlorophyll content contains chlorophyll – 'a', chlorophyll-'b' and other adornment shade. It gives greenness and is the primary organ of catching daylight and its transformation to chemical to vitality. Plant species show high Total

chlorophyll Content amid Rainy season pursued by summer and winter. The most minimal substance of Total Chlorophyll substance might be credited to the Photosynthetic shades which are genuinely touchy to air toxins and their affectability may decide the reactions of plants to poisons Singh et.al (2005). Huge negative connections were gotten between air toxins and complete chlorophyll substance. Decline in Total Chlorophyll substance could be because of the development of Sulphuric acid, framed by the mix of SO2 with water in the plant tissues and resulting separation into H+ and HSO2 particles which cause debasement of chlorophyll colors, Rao and LeBlanc, (1966).

The gradual disappearance of chlorophyll and yellowing of leaves is one of the common effects of air pollution that reduces photosynthesis. Ascorbic acid is an important electron donor in photosynthesis, Ivanov BN., (2014).

Total chlorophyll is considered as an index of photosynthetic activity, growth and biomass productivity, Joshi PC, et.al (2009); Pavlovic D et.al (2014). Degradation of photosynthetic pigments has been widely used as an indicator of air pollution, and a decrease in chlorophyll content shows that plants are more sensitive to air pollution, Woo SY et.al (2006).

Air pollutants like sulphur dioxide, nitrogen dioxide, carbon dioxide and suspended particulate matter may lower the chlorophyll concentration, Joshi PC, et.al (2009) as the pollutants enter into tissues through stomata and cause partial denaturation of chloroplasts.

In the present investigation Chlorophyll of the leaf concentrate of 14 plants were taken for a time of 2-years i.e, Dec 2017-Dec 2019.

In Site-1 *Acacia nilotica,* Chlorophyll was 0.66 (µg/ml)- 3.01(µg/ml) and Reached at the Average of 1.09 (µg/ml) amid the first year of study. Amid the second year it is from 0.7(µg/ml) - 1.93(µg/ml) and found the average of 0.97(µg/ml). At Site-2 Chlorophyll was 0.13(µg/ml)-1.67(µg/ml) and the average of 0.90(µg/ml) amid the first year. In second year its range was 0.68(µg/ml)-3.81(µg/ml) and Reached at the Average of 1.63(µg/ml). In site-3, Chlorophyll was 0.35(µg/ml)- 1.35(µg/ml) and Reached at the Average of 0.79(µg/ml) amid the first year of study. Amid the second year it is from 0.9(µg/ml)- 3.38(µg/ml) and found the average of 1.57(µg/ml). At Site-4 Chlorophyll was 0.4(µg/ml)- 1.49(µg/ml) and the average of 0.76(µg/ml) amid the first year. In second year its range was 0.4(µg/ml)- 2.31(µg/ml) and Reached at the Average of 1.16(µg/ml).

At Site-1 *Azadirachta indica,* Chlorophyll between 0.5(µg/ml)- 0.83(µg/ml) and found the average of 0.67(µg/ml) in the first year. During the second year its range was 0.5(µg/ml)-1.08(µg/ml) and found the average of 0.74(µg/ml). At Site-2 Chlorophyll is between 0.16(µg/ml)- 1.44(µg/ml) and found the average of 0.63(µg/ml) in the first year. Amid second year its range 0.9(µg/ml)- 1.43(µg/ml) and found the average of 0.84(µg/ml). At Site-3 *Azadirachta indica,* Chlorophyll between 0.31(µg/ml)- 1.35(µg/ml) and found the average of 0.67(µg/ml) in the first year. During the second year its range was 0.7(µg/ml)- 1.57(µg/ml) and found the average of 0.87(µg/ml). At Site-4 Chlorophyll is between 0.4(µg/ml)-1.49(µg/ml) and found the average of 0.69(µg/ml) in the first year. Amid second year its range 0.9(µg/ml)- 1.63(µg/ml) and found the average of 1.10(µg/ml).

In *Calotrophis procera*, Chlorophyll between 0.8(µg/ml)- 1.41(µg/ml) and found the average of 0.96(µg/ml) amid the first year. Amid the second year it is between 0.68(µg/ml)- 1.41(µg/ml) and found the average of 1.03(µg/ml) at Site 1. At Site-2 Chlorophyll was 0.37(µg/ml)- 1.41(µg/ml) and found the average of 0.73(µg/ml) in the first year. Amid the second year Chlorophyll was 0.8(µg/ml)- 1.33(µg/ml) and Reached at the Average of 0.87(µg/ml). In *Calotrophis procera*, Chlorophyll between 0.8(µg/ml)- 3.25(µg/ml) and found the average of 1.47(µg/ml) amid the first year. Amid the second year it is between 0.91(µg/ml)- 3.31(µg/ml) and found the average of 1.63(µg/ml).at Site-3. At Site-4 Chlorophyll was 0.4(µg/ml)- 2.25(µg/ml) and found the average of 2.17(µg/ml) in the first year. Amid the second year Chlorophyll was 0.51(µg/ml)- 3.31(µg/ml) and Reached at the Average of 2.43(µg/ml).

In at Site-1 *Cassia auriculata* Chlorophyll between 0.54(µg/ml)- 1.54(µg/ml) and found the average of 1.35(µg/ml) in the first year. Amid The second year Chlorophyll was 1.03(µg/ml)- 1.68(µg/ml) and Reached at the Average of 1.38(µg/ml). In Site-2 Chlorophyll from 0.7(µg/ml)- 1.65(µg/ml) and Reached the average of 0.9(µg/ml) in first year. Amid the second year Chlorophyll between 0.7(µg/ml)- 3.86(µg/ml) and Reached at the Average of 1.84(µg/ml). In at Site-3 *Cassia auriculata* Chlorophyll between 0.34(µg/ml)- 1.06(µg/ml) and found the average of 0.80(µg/ml) in the first year. Amid The second year Chlorophyll was 0.7(µg/ml)- 1.09(µg/ml) and Reached at the Average of 1.00(µg/ml).In Site-4 Chlorophyll from 0.4(µg/ml)- 2.25(µg/ml) and Reached the average of 1.17(µg/ml) in first year. Amid the second year Chlorophyll between 0.51(µg/ml)- 3.31(µg/ml) and Reached at the Average of 1.43(µg/ml).

In *Delonix regia .Hook*. Site-1 Chlorophyll was 0.68(µg/ml)- 3.01(µg/ml) and found the average of 1.06(µg/ml) amid the first year of study. Amid the second year it is between 0.7(µg/ml)- 1.43(µg/ml) and Reached at the Average of 0.93(µg/ml). At Site-2 Chlorophyll was 0.38(µg/ml)- 1.87(µg/ml) and found the average of 1.1(µg/ml) amid the first year. Amid the second year its range was 0.41(µg/ml)- 3.17(µg/ml) and Reached at the Average of 1.00(µg/ml). In *Delonix regia .Hook*. Site-3 Chlorophyll was 0.33(µg/ml)- 1.81(µg/ml) and found the average of 1.06(µg/ml) 0.91(µg/ml) amid the first year of study. Amid the second year it is between 0.6(µg/ml)- 1.94(µg/ml) and Reached at the Average of 1.07(µg/ml). At Site-4 Chlorophyll was 0.31(µg/ml)- 1.09(µg/ml) and found the average of 0.64(µg/ml) amid the first year. Amid the second year its range was 0.5(µg/ml)- 1.04(µg/ml) and Reached at the Average of 0.63(µg/ml).

In *Dalbergia sissoo*. Site-1 Chlorophyll was 0.3(µg/ml)- 2.15(µg/ml) and Reached at the Average of 0.89(µg/ml) amid the first year of study. Amid the second year it is between 0.3-1.63(µg/ml) and Reached at the Average of 0.90(µg/ml). At Site-2 Chlorophyll was 0.7(µg/ml)- 1.37(µg/ml) and found the average of 0.84(µg/ml) amid the first year. Amid the second year its range was 0.93(µg/ml)- 3.34(µg/ml) and Reached at the Average of 1.50(µg/ml). In *Dalbergia sissoo*. Site-3 Chlorophyll was 0.33(µg/ml)- 3.09(µg/ml) and Reached at the Average of 1.33(µg/ml) amid the first year of study. Amid the second year it

is between 0.33(µg/ml)- 4.15(µg/ml) and Reached at the Average of 1.75(µg/ml). At Site-4 Chlorophyll was 0.34(µg/ml)- 3.09(µg/ml) and found the average of 0.71(µg/ml) amid the first year. Amid the second year its range was 0.6(µg/ml)- 2.35(µg/ml) and Reached at the Average of 1.64(µg/ml).

In *Ficus benghalensis* Site-1 Chlorophyll was 0.57(µg/ml)- 3.15(µg/ml) and Reached at the Average of 1.40(µg/ml) amid the first year of study. Amid the second year it is between 0.48(µg/ml)- 3.06(µg/ml) and Reached at the Average of 1.47(µg/ml). At Site-2 Chlorophyll was 0.37(µg/ml)- 3.46(µg/ml) and found the average of 1.11(µg/ml) amid the first year. Amid the second year its range 1(µg/ml)- 3.17(µg/ml) and Reached at the Average of 1.70(µg/ml). In *Ficus benghalensis* Site-3 Chlorophyll was 0.7(µg/ml)- 3.15(µg/ml) and Reached at the Average of 1.07(µg/ml) amid the first year of study. Amid the second year it is between 0.81(µg/ml)- 3.01(µg/ml) and Reached at the Average of 1.43(µg/ml). At Site-4 Chlorophyll was 0.4(µg/ml)- 1.49(µg/ml) and found the average of 0.69(µg/ml) amid the first year. Amid the second year its range 0.9(µg/ml)- 1.63(µg/ml) and Reached at the Average of 1.10(µg/ml).

In *Ficus carica* Site-1 Chlorophyll was 0.37(µg/ml)- 1.41(µg/ml) and Reached at the Average of 0.77(µg/ml) amid the first year of study. Amid the second year it is between 0.5(µg/ml)- 1.36(µg/ml) and found the average of 0.59(µg/ml). At Site-2 Chlorophyll was 0.6(µg/ml)- 1.37(µg/ml) and Reached at the Average of 0.66(µg/ml) amid the first year. Amid the second year its range was 0.33(µg/ml)- 1.61(µg/ml) and Reached at the Average of 0.96(µg/ml). In *Ficus carica* Site-3 Chlorophyll was 0.33(µg/ml)- 1.81(µg/ml) and Reached at the Average of 0.91(µg/ml) amid the first year of study. Amid the second year it is between 0.6(µg/ml)- 1.94(µg/ml) and found the average of 1.07(µg/ml). At Site-4 Chlorophyll was 0.4(µg/ml)- 2.25(µg/ml) and Reached at the Average of 1.17(µg/ml) amid the first year. Amid the second year its range was 0.51(µg/ml)- 3.31(µg/ml) and Reached at the Average of 1.43(µg/ml).

In *Hibiscus rosasinensis* Site-1 Chlorophyll was 1.06(µg/ml)- 3.81(µg/ml) and found the average of 1.41(µg/ml) amid the first year of study. Amid the second year it is between 1.03(µg/ml)- 3.13(µg/ml) and Reached at the Average of 1.34(µg/ml). At Site-2 Chlorophyll was 0.36(µg/ml)- 1.73(µg/ml) and Reached at the Average of 1.17(µg/ml) amid the first year. Amid the second year its range was 0.89(µg/ml)- 3.33(µg/ml) and Reached at the Average of 1.50(µg/ml). In *Hibiscus rosasinensis* Site-3 Chlorophyll was 0.33(µg/ml)- 3.09(µg/ml) and found the average of 1.33(µg/ml) amid the first year of study. Amid the second year it is between 0.33(µg/ml)- 4.15(µg/ml) and Reached at the Average of 1.75(µg/ml). At Site-4 Chlorophyll was 0.7(µg/ml)- 3.15(µg/ml) and Reached at the Average of 1.07(µg/ml) amid the first year. Amid the second year its range was 0.81(µg/ml)- 3.01(µg/ml) and Reached at the Average of 1.43(µg/ml).

In *Lantana camara*. L. Site-1 Chlorophyll was 0.7(µg/ml)- 0.83(µg/ml) and Reached at the Average of 0.60(µg/ml) amid the first year of study. Amid the second year it is between 0.7(µg/ml)- 0.91(µg/ml) and Reached at the Average of 0.61. At Site-2 Chlorophyll was

0.36(µg/ml)- 1.43(µg/ml) and Reached at the Average of 0.69(µg/ml) amid the first year. Amid the second year its range was 0.5(µg/ml)- 1.34(µg/ml) and Reached at the Average of 0.89(µg/ml). In *Lantana camara*. L. Site-3 Chlorophyll was 0.31(µg/ml)- 1.35(µg/ml) and Reached at the Average of 0.67(µg/ml) amid the first year of study. Amid the second year it is between 0.7(µg/ml)- 1.57(µg/ml) and Reached at the Average of 0.87(µg/ml). At Site-4 Chlorophyll was 0.31(µg/ml)- 1.09(µg/ml) and Reached at the Average of 0.64(µg/ml) amid the first year. Amid the second year its range was 0.5(µg/ml)- 1.04(µg/ml) and Reached at the Average of 0.63(µg/ml).

In *Pletoforum ferrigoenum*(Benth) Site-1 Chlorophyll was 0.5(µg/ml)- 1.33(µg/ml) and found the average of 0.78(µg/ml) amid the first year of study. Amid the second year it between 0.13(µg/ml)- 1.33(µg/ml) and Reached at the Average of 0.73(µg/ml). At Site-2 Chlorophyll extend was 0.9(µg/ml)- 1.73(µg/ml) and Reached at the Average of 0.99(µg/ml) amid the first year. Amid the second year its range 0.93(µg/ml)- 8.3(µg/ml) and Reached at the Average of 1.36(µg/ml). In *Pletoforum ferrigoenum*(Benth) Site-3 Chlorophyll was 0.4(µg/ml)- 2.25(µg/ml) and found the average of 1.17(µg/ml) amid the first year of study. Amid the second year it between 0.51(µg/ml)- 3.31(µg/ml) and Reached at the Average of 1.43(µg/ml). At Site-4 Chlorophyll extend was 0.31(µg/ml)- 1.09(µg/ml) and Reached at the Average of 0.64(µg/ml) amid the first year. Amid the second year its range 0.5(µg/ml)- 1.04(µg/ml) and Reached at the Average of 0.63(µg/ml).

In *Polyalthia longifolia.sonn* Site-1 Chlorophyll content was 0.9(µg/ml)- 2.11(µg/ml) and Reached at the Average of 1.8(µg/ml) amid the first year of study. Amid the second year it is between 0.5-2.73(µg/ml) and Reached at the Average of 0.74(µg/ml). At Site-2 Chlorophyll was 0.9(µg/ml)- 1.77(µg/ml) and the average of 1.89(µg/ml) amid the first year. Amid the second year its range 0.43(µg/ml)- 4.84(µg/ml) and Reached at the Average of 1.92(µg/ml). In *Polyalthia longifolia.sonn* Site-3 Chlorophyll content was 0.34(µg/ml)- 1.06(µg/ml) and Reached at the Average of 0.80(µg/ml) amid the first year of study. Amid the second year it is between 0.7(µg/ml)- 1.09(µg/ml) and Reached at the Average of 1.00(µg/ml).At Site-4 Chlorophyll was 0.33(µg/ml)- 1.81(µg/ml) and the average of 0.91(µg/ml) amid the first year. Amid the second year its range 0.6(µg/ml)- 1.94(µg/ml) and Reached at the Average of 1.07(µg/ml).

In *Pongamia Pinnata.L*. Site-1 Chlorophyll content was 0.4(µg/ml)- 2.35(µg/ml) and Reached at the Average of 0.98(µg/ml) amid the first year of study. Amid the second year it is between 0.4-1.73(µg/ml) and Reached at the Average of 0.94(µg/ml). At Site-2 Chlorophyll was 0.8(µg/ml)- 1.47(µg/ml) and found the average of 0.89(µg/ml) amid the first year. In second year its range was 0.83(µg/ml)- 3.84(µg/ml) and Reached at the Average of 1.62(µg/ml). In *Pongamia Pinnata.L*. Site-3 Chlorophyll content was 0.4(µg/ml)- 1.49(µg/ml) and Reached at the Average of 0.69(µg/ml) amid the first year of study. Amid the second year it is between 0.9(µg/ml)- 1.63(µg/ml) and Reached at the Average of 1.10(µg/ml). At Site-4, Chlorophyll was 0.4(µg/ml)- 2.25(µg/ml) and found the average of

2.17(µg/ml) amid the first year. In second year its range was 0.51(µg/ml)- 3.31(µg/ml) and Reached at the Average of 2.43(µg/ml).

In *Syzygium cumini* Site-1 Chlorophyll content was 0.9(µg/ml)- 2.11(µg/ml) and Reached at the Average of 2.1(µg/ml) amid the first year of study. Amid the second year it is between 0.5-2.73(µg/ml) and Reached at the Average of 1.74(µg/ml). At Site-2 Chlorophyll was 0.9(µg/ml)- 3.77(µg/ml) and found the average of 2.89(µg/ml) amid the first year. Amid the second year its range was 0.43(µg/ml)- 4.84(µg/ml) and Reached at the Average of 2.92(µg/ml). In *Syzygium cumini* Site-3 Chlorophyll content was 0.31(µg/ml)- 1.35(µg/ml) and Reached at the Average of 0.67(µg/ml) amid the first year of study. Amid the second year it is between 0.7(µg/ml)- 1.57(µg/ml) and Reached at the Average of 0.87(µg/ml). At Site-4 Chlorophyll was 0.8(µg/ml)- 3.25(µg/ml) and found the average of 1.47(µg/ml) amid the first year. Amid the second year its range was 0.91(µg/ml)- 3.31(µg/ml) and Reached at the Average of 1.63(µg/ml).

3.2 Air Pollution Tolerance Index (APTI)

Air Pollution tolerance Index (APTI) of plants assumes significant job in deciding the resistivity and weakness. In urban zones, air toxins may get assimilated or amassed by plant body, if these are harmful in nature, may harm the plants in different ways. The air Pollution impacts are high in touchy plant species and low in tolerant plant species. Regularly, these tolerant plant species help in reduction of air toxins and the touchy plant species help in showing air Pollution (S.M. Seyyednejad et. al., 2011). The status of encompassing air quality and information of how existing vegetation is affecting or being impacted by the regularly developing Pollution in urban and modern focuses is exceptionally basic for arranging of urban advancement and Pollution control. This is increasingly imperative for the city like Hyderabad.

Radhapriya P *et al.* (2012) studied the effect of plants near the cement industry, Coimbatore, India based on APTI. The results indicate those plants surrounding the industry show high pollution exposure than that of the plants in controlled areas. Plants like Mangifera indica, Bougainville species, Psidium guajava exhibited high APTI value. 37% of the plants were tolerant, 33% were highly susceptible, and only 15% were at intermediate and moderate levels.

Plants exposure to pollutants leads to physiological changes followed by visible injury symptom (Dohmen *et al*., 1990). Air pollution is accounted for impact on seed germination and flowering. Each plant response differently to different pollutants in different environments. APTI is the mean estimated based on physiological and biochemical parameters (Das and Prasad, 2010; Leghari *et al*., 2011; Nayak *et al*., 2015). Among the damages caused by air pollutants, the most significant one occurr in the leaves of plants. These damages include chlorosis and necrosis of leaves (Deepalakshmi *et al*., 2013).

Effects of air pollutants on a plant can be analysed by calculating the APTI which is calculated on the basis of four parameters such as chlorophyll, ascorbic acid, pH and relative water content. It is a very useful tool to select tolerant plant species and understand the plant

response to air pollution at biochemical and physiological levels (Agbaire and Esiefarienrhe, 2009).

Literature reveals that various methods such as the use of air pollution tolerance index (APTI) had been explored using the leaves of plant species to monitor air pollution in the environment [Mahecha, et. al., (2013); Irerhievwie, et. al., (2014)].

Based on APTI values, low APTI plant species can be used in low pollution areas as bio-indicators, while high APTI plant species can be used in highly polluted areas to mitigate air pollution, Bharti SK et al.,(2018); Molnar VE et al.,(2020).

APTI of plants has been described with four biochemical parameters: total chlorophyll, relative water content (RWC), ascorbic acid and leaf extract pH. Pollution-induced alterations in a single parameter may not depict a clear picture of the situation. So, four biochemical parameters are considered to obtain an empirical value representing the APTI of plants, Nadgorska-Socha A, et al.,(2017).

In view of APTI results acquired in the present investigation plants were ordered into three classes. Air Pollution Tolerance Index (APTI) esteem ranges 9-10 were considered as Sensitive, plants indicated Index esteems from 10.1-11.1 were considered as Intermediate, while Index ranges 11.3-13.3 were considered as Tolerant plants.

In the present investigation APTI of the leaf concentrate of 14 plants taken for a time of 2-years i.e., Dec 2017-Dec 2019.

In Site-1 *Acacia nilotica* APTI Value was 1.17-8.51 and Reached at the Average of 4.85 amid the first year of study. Amid the second year between 1.45-8.47 and Reached at the Average of 4.93. At Site-2 APTI Value was 1.36-9.38 and Reached at the Average of 4.98 amid the first year. Amid the second year its range 1.58-9.75 and Reached at the Average of 5.33. In Site-3 APTI was 1.66-7.93 and found the average of 5.54 amid the first year of study. Amid the second year it is from 4.35-7.93 and found the average of 5.79. In Site-4 APTI was 1.38-8.59 and Reached at the Average of 5.37 amid the first year of study. Amid the second year it is between 3.88-7.89 and Reached at the Average of 5.53.

At Site-1 *Azadirachta indica* APTI from 1.5-13.7 and found the average of 5.98 in the first year. Amid the second year its range was 1.15-8.66 and Reached at the Average of 5.33. At Site-2 APTI is between 1.08-7.45 and found the average of 4.43 in the first year. Amid second year APTI was 3.81-8.06 and Reached at the Average of 4.41. At Site-3 APTI between 1.07-7.63 and found the average of 4.68 in the first year. Amid the second year APTI from 1.63-14.53 and Reached at the Average of 6.03. At Site-4 APTI was 1.09-9.9 and found the average of 4.63 amid the first year. Amid the second year its range 6.07-8.99 and Reached at the Average of 7.75.

Calotrophis procera. at Site-1 APTI between 1.65-9.76 and found the average of 6.64 amid the first year. Amid the second year it is between 1.77-8.48 and Reached at the Average of 5.46. At Site-2 APTI was 7.53-7.69 and Reached at the Average of 4.50 in the first year. Amid second year it is 3.89-7.09 and found the average of 11.87. In Site-3 APTI was 1.3-13.08 and found the average of 5.31 amid the first year of study. Amid the second year it is

between 1.69-5.53 and Reached at the Average of 4.04. At Site-4 APTI Value was 1.36-9.38 and Reached at the Average of 4.98 amid the first year. Amid the second year its range 1.58-9.75 and Reached at the Average of 5.33.

At Site-1 *Cassia auriculata* APTI between 1.04-9.9 in the first year and found the average of 5.33. Amid the second year APTI Value was 1.56-7.45 and found the average of 5.50. In Site-2 APTI from 1.15-7.57 and found the average of 4.71. Amid the second year APTI between 3.83-10.43 and Reached at the Average of 7.05. At Site-3 APTI was 1.34-8.93 and Reached at the Average of 4.60 amid the first year. Amid the second year it is between 1.71-7.03 found the average of 3.63. In Site-4 APTI was 1.6-10 and found the average of 6.03 amid the first year of study. Amid the second year it is between 1.59-7.1 and found the average of 4.64.

In *Dalbergia sissoo. Site*-1 APTI was 1.53-7.93 and Reached at the Average of 5.34 amid the first year of study. Amid the second year is it between 1.64-7.9 and Reached at the Average of 5.18. At Site-2 APTI was 1.56-13.1 and Reached at the Average of 14.51 amid the first year. Amid the second year its range 4.17-9.04 and Reached at the Average of 6.39. At Site-3 APTI was 1.33-10.61 and Reached at the Average of 6.18 amid the first year. Amid the second year its range 5.34-9.46 and Reached at the Average of 7.18. In Site-4 APTI Value was 1.65-9.35 and found the average of 6.11 amid the first year of study. Amid the second year it is between 1.63-7.35 and found the average of 5.10.

In *Delonix regia.Hook.* Site-1 APTI was 1.66-7.93 and found the average of 5.54 amid the first year of study. Amid the second year it is from 4.35-7.93 and found the average of 5.79. At Site-2 APTI between 1.07-7.63 and found the average of 4.68 in the first year. Amid the second year APTI from 1.63-14.53 and Reached at the Average of 6.03. At Site-3 APTI was 7.53-7.69 and Reached at the Average of 4.50 in the first year. Amid second year it is 3.89-7.09 and found the average of 11.87. In Site-4 APTI from 1.15-7.57 and found the average of 4.71. Amid the second year APTI between 3.83-10.43 and Reached at the Average of 7.05.

In *Ficus benghalensis* Site-1 APTI was 1.56-8.55 and found the average of 5.64 amid the first year of study. Amid the second year its range from 1.68-7.3 and found the average of 4.45. At Site-2 APTI was 1.37-6.86 and found the average of 3.54 amid the first year. Amid the second year it is 3.68-13.67 and Reached at the Average of 11.31. At Site-3 APTI Value was 1.33-8.08 and Reached at the Average of 3.50 amid the first year. Amid the second year its range 3.14-7 and Reached at the Average of 4.38. At site-4 APTI was 2.23-7.53 and Reached at the Average of 5.61 amid the first year of study. Amid the second year it is between 2.64-7.9 and Reached at the Average of 5.18.

In *Ficus carica* Site-1 APTI was 1.6-10 and found the average of 6.03 amid the first year of study. Amid the second year it is between 1.59-7.1 and found the average of 4.64. At Site-2 APTI Value was 1.33-8.08 and Reached at the Average of 3.50 amid the first year. Amid the second year its range 3.14-7 and Reached at the Average of 4.38. APTI was 2.23-7.53 and

Reached at the Average of 5.61 amid the first year of study. Amid the second year it is between 2.64-7.9 and Reached at the Average of 5.18 at site-3. At Site-4 APTI was 1.56-13.59 and Reached at the Average of 13.51 amid the first year. Amid the second year its range 3.17-7.04 and Reached at the Average of 6.21.

In *Peltaforum* Site-1 APTI Value was 1.65-9.35 and found the average of 6.11 amid the first year of study. Amid the second year it is between 1.63-7.35 and found the average of 5.10. At Site-2 APTI was 1.34-8.93 and Reached at the Average of 4.60 amid the first year. Amid the second year it is between 1.71-7.03 found the average of 3.63. At Site-3 APTI was 1.56-13.1 and Reached at the Average of 14.51 amid the first year. Amid the second year its range 4.17-9.04 and Reached at the Average of 6.39. At Site-4 APTI between 1.07-7.63 and found the average of 4.68 in the first year. Amid the second year APTI from 1.63-14.53 and Reached at the Average of 6.03.

In *Lantana camara. L.* Site-1 APTI was 1.38-8.59 and Reached at the Average of 5.37 amid the first year of study. Amid the second year it is between 3.88-7.89 and Reached at the Average of 5.53. At Site-2 APTI was 1.09-9.9 and found the average of 4.63 amid the first year. Amid the second year its range 6.07-8.99 and Reached at the Average of 7.75. In *Site*-3 APTI was 1.53-7.93 and Reached at the Average of 5.34 amid the first year of study. Amid the second year is it between 1.64-7.9 and Reached at the Average of 5.18. In Site-4 APTI was 1.66-7.93 and found the average of 5.54 amid the first year of study. Amid the second year it is from 4.35-7.93 and found the average of 5.79.

In *Pletoforum ferrigoenum.(Benth)* Site-1 APTI was 1.3-13.08 and found the average of 5.31 amid the first year of study. Amid the second year it is between 1.69-5.53 and Reached at the Average of 4.04. At Site-2 APTI was 1.33-10.61 and Reached at the Average of 6.18 amid the first year. Amid the second year its range 5.34-9.46 and Reached at the Average of 7.18. In site-3 APTI between 1.65-9.76 and found the average of 6.64 amid the first year. Amid the second year it is between 1.77-8.48 and Reached at the Average of 5.46. In Site-4 APTI from 1.15-7.57 and found the average of 4.71. Amid the second year APTI between 3.83-10.43 and Reached at the Average of 7.05.

In *Polyalthia longifolia.sonn Site*-1 APTI was 2.23-7.53 and Reached at the Average of 5.61 amid the first year of study. Amid the second year it is between 2.64-7.9 and Reached at the Average of 5.18. At Site-2 APTI was 1.56-13.59 and Reached at the Average of 13.51 amid the first year. Amid the second year its range 3.17-8.04 and Reached at the Average of 5.21. At Site-3 APTI Value was 1.36-9.38 and Reached at the Average of 4.98 amid the first year. Amid the second year its range 1.58-9.75 and Reached at the Average of 5.33. At Site-4 APTI from 1.5-13.7 and found the average of 5.98 in the first year. Amid the second year its range was 1.15-8.66 and Reached at the Average of 5.33.

In *Pongamia Pinnata.L.*. *Site*-1 APTI was 1.23-7.53 and Reached at the Average of 5.11 amid the first year of study. Amid the second year it is between 2.64-7.9 and Reached at the

Average of 4.18. At Site-2 APTI was 1.56-13.1 and Reached at the Average of 13.51 amid the first year. Amid the second year its range 3.17-8.04 and Reached at the Average of 6.21. At Site-3 APTI was 7.53-7.69 and Reached at the Average of 4.50 in the first year. Amid second year it is 3.89-7.09 and found the average of 11.87. At Site-3 APTI between 1.04-9.9 in the first year and found the average of 5.33. Amid the second year APTI Value was 1.56-7.45 and found the average of 5.50.

In *Syzygium cumini Site*-1 APTI was 2.23-7.53 and Reached at the Average of 6.11 amid the first year of study. Amid the second year it is between 2.64-7.9 and Reached at the Average of 6.18. At Site-2 APTI was 1.56-13.59 and Reached at the Average of 13.51 amid the first year. Amid the second year its range 3.17-7.04 and Reached at the Average of 6.21. In Site-3 APTI Value was 1.17-8.51 and Reached at the Average of 4.85 amid the first year of study. Amid the second year between 1.45-8.47 and Reached at the Average of 4.93. At Site-4 APTI is between 1.08-7.45 and found the average of 4.43 in the first year. Amid second year APTI was 3.81-8.06 and Reached at the Average of 4.41.

4. CONCLUSION:

Air and water Pollution are developing concerns, in light of the fact that the dangers of natural Pollution are genuine and the impacts are now felt worldwide with the beginning of 21st century. Despite the fact that water and land Pollution is exceptionally perilous, air Pollution has turned into a worldwide issue looked by both the created countries just as the creating ones. As air Pollution has its very own idiosyncrasies, because of the inclination of its trans-limit scattering of toxins over the whole world. Air Pollution can be characterized as the human presentation into the climate of synthetic compounds, particulate issue or natural materials that reason mischief or distress to people, or other living creature or harm the earth. It has been bothered by improvements that commonly happen as nations end up industrialized: developing urban areas, expanded traffic, fast financial advancement and industrialization, and abnormal amounts of vitality utilization. Every one of these variables go about as circumstances and logical results for each other and act in a synergistic way to befoul the holiness of regular habitat. As indicated by UNEP it is evaluated that more than 1 billion individuals are presented to open air Pollution every year. Urban air Pollution is connected to up to 1 million unexpected losses and 1 million pre-local passings every year. The qualities of urban air Pollution have essentially over ongoing decades. Groupings of customarily essential poisons, for example, sulfur dioxide (SO2) and dark smoke have declined generously, while street traffic discharges have risen as the significant reason for poor air quality.

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