APTI (AIR POLLUTION TOLERANCE INDEX) OF TREES IN LOHAGAON AREA IN PUNE CITY IN DIFFERENT SEASONS

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ABSTRACT

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Air Pollution is having severe impact on Roadside trees of Lohegaon area. Plant samples were collected in and around Airport area. It was found that concentration of PM 10 was found to be highest in all seasons studied and had impact on trees. Plant studied were Indian Rosewood , Tamarind tree, Mango tree, Rain tree, Neem tree, Peepal tree. p H was found to be highest in Mango tree, Relative water content (RWC) was found to highest in Tamarind tree, Total Chlorophyll content in Mango tree, Ascorbic acid was found to be highest in Peepal tree. APTI was found to be highest in Peepal and lowest in Tamarind tree

KEYWORDS: *Air Pollutants, APTI of plants, Total Chlorophyll, Ascorbic acid, p H of leaf Relative water Content (RWC)*

INTRODUCTION

Air Pollution is turned out to be major problem in Pune city. Urbanization &increased number of vehicles in Pune city are the cause of rise in Air pollution in Pune City. These air pollutants are having major impacts on the plants and trees. Plants susceptibility and tolerance towards air pollution can be determined by calculating APTI of plants using parameters like –Total Chlorophyll , Relative water content(RWC) , Ascorbic acid content and p H of plant.

MATERIALS AND METHODS
Study area

Lohagaon area is known for Pune International Airport and has Air Force Base. Located in 18°35'45.6864"N & 73°55'28.9128"E. Samples were collected twice each month of October, November, December, January and February 2017-2018. Plant samples were analysed for APTI calculations. Trees that were selected are as follows- Indian rosewood (Dalbergiasissoo), Tamarind tree (Tamarindusindica), Mango tree (Mangiferaindica), Rain tree (Samaneasaman), Neem tree(Azadirachtaindica),Peepal tree (Ficusreligiosa)

1. Estimation of Leaf-extract pH 0.5 g of leaf material was ground to paste and dissolved in 50 ml of deionized water and Leaf-extract pH was measured by using calibrated digital pH meter (model).

2. Estimation of relative moisture content- Fresh leaf samples collected from the study area were brought immediately to the laboratory and washed thoroughly. The excess water was removed with the help of blotting paper. The initial weight of samples were taken (W1 g) and

kept in oven at 60oC until constant weight was obtained and the final weight was taken (W2 g).

3. Estimation of Total Chlorophyll and Ascorbic acid Acetone extraction method (Arnon 1949) and ascorbic acid was estimated by 2,6-dichlorophenol indophenol's dye method.

Total chlorophyll -The total chlorophyll was estimated principally by the method of Arnon. One gram fresh leaf was macerated with 80% (v/v) chilled acetone and a pinch of magnesium carbonate in a prechilled pestle and mortar. The extract was centrifuged at 2500 rpm for 10 minutes. The process was repeated till the extract becomes colourless and the extracts were pooled and the volume was made up to 15mL. All operations were carried in the ice bath under dark condition. The absorbance was measured at 645, 663 and 750nm using UV-visible spectrophotometer. TCh = 20.2(A645)+8.02(A663)xV/(1000x W) Where, TCh= Total chlorophyll in mgg-1 A645 = Absorbance at 645nm minus the absorbance at 750nm A663=Absorbance at 663nm minus the absorbance at 750nm V = Total volume of the extract in mL W = Weight of the sample in g

Ascorbic acid One gram fresh leaf was homogenized in 4mL of freshly prepared oxalic acid (0.4% w/v), filtered and centrifuged at 1000 rpm for 20 minutes. Final volume was made up to 10mL using oxalic acid. About 5mL of the extract was titrated against standardized 2,6-dichlorophenol-indophenol [11]. AA = IxSxD/Ax1/W Where, AA = Ascorbic acid in mgg-1 I = mL of indophenol used for titration S = mg of ascorbic acid reacting with 1mL indophenol D = total volume of the extract in mL A = Aliquot titrated in mL W = Weight of the sample in gm.

APTI (Air Pollution Tolerance Index) was calculated using formula -

Air pollution tolerance Index of species = [A(T+P)] +R/ 10

Where

A= ascorbic acid content of leaf in mg/g dry weight

T=total chlorophyll content of leaf in mg/g dry weight

P= Leaf extract pH

R= Relative water content(RWC)

10= Total sum is divided by 10 to obtain APTI values After calculations result was interpreted as-plants showing APTI between 30-100 were termed as Tolerant, APTI between - 29-17 were termed as Intermediate and plants having APTI between 16-1 were termed as Sensitive to Air Pollution.

RESULTS AND DISCUSSION

Table 1-Showing Air Quality data & Graphs for Lohgaon area –IITM
### (Indian Institute of Tropical Meteorology)

| Year	Month	PM 10	PM 2.5	NOx	SOx
2017	October	73	23	23	52
2017	November	122	24	24	47
2017	December	134	24	24	46
2018	January	136	80	42	44
2018	February	109	65	100	42
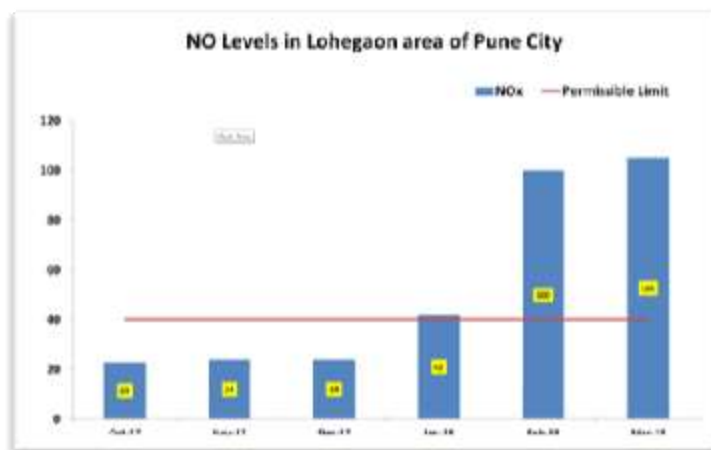
It was found that NOx level was high and above the permissible limit in the month of March 2018 as compared to October , November, December 2017.
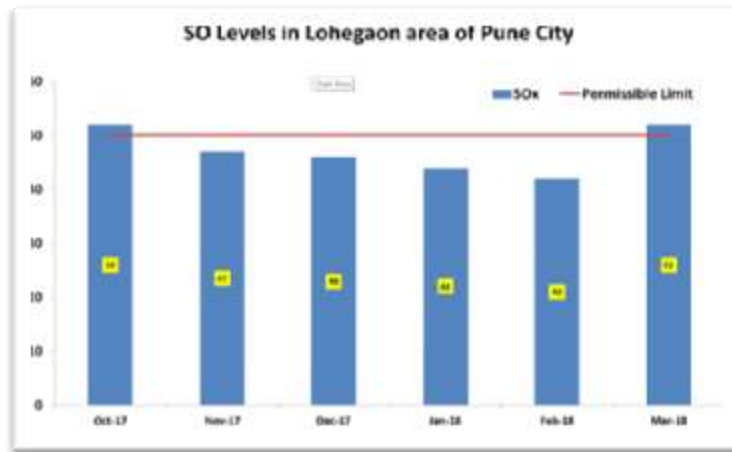
Concentration of SO was found to be within permissible limits but slightly higher in October 17 and March 17.
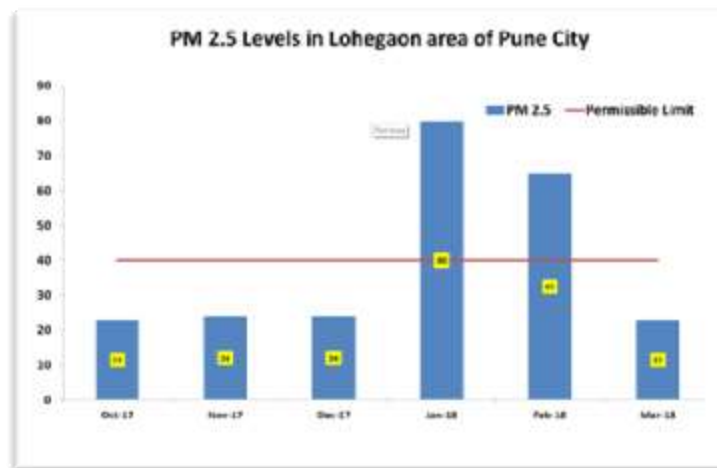

Concentration of PM 2.5 was found to be highest in the month of January 18, February 18 while at other times it was below the permissible limits
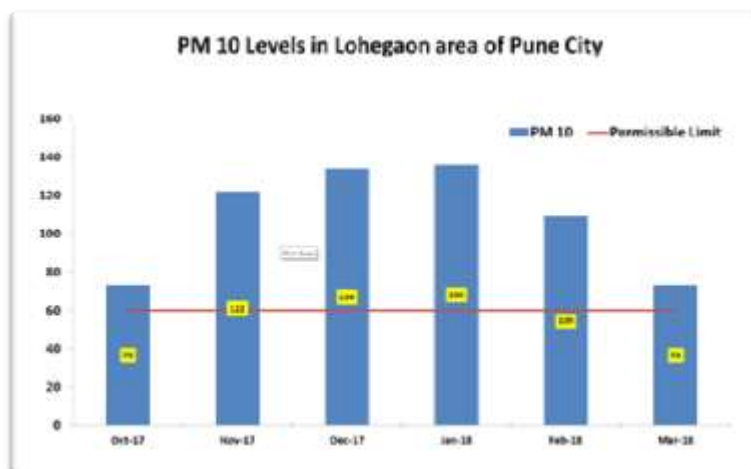
It was found that concentration of PM 10 was higher and above permissible limits in oCtober 17 – March 18, but highest in Nov, Dec,17 Januuary, February 18

It was found thatPM 10 concentartion was found to be above permissible limit, PM 2.5 was found to be high in month of January and February 2018. NOx concentration was found to be highest in the month of January and Febrauary 2018. Concentration of SOx was found to be slightly high in the month of October 2017.

Table 2-Showing Graphs of Relative water Content, Ascorbic acid, Total Chlorophyll, p H levels, APTI of plants in October, November, December 2017 & January, February2018.
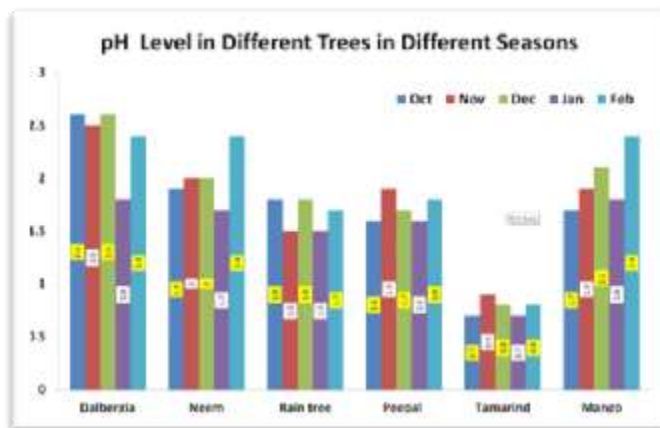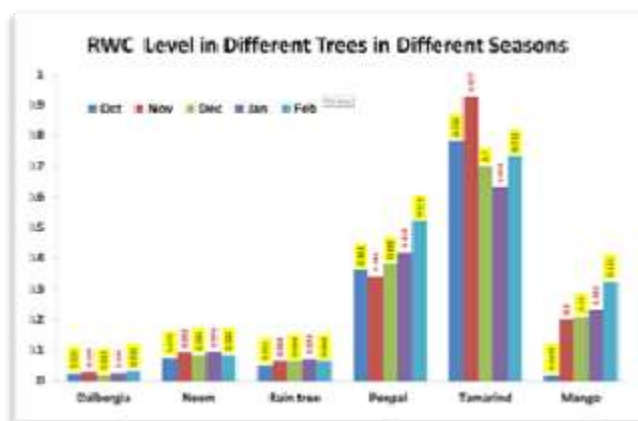

Tamarind tree showed p H acidic, followed by other trees. Most of the trees studied showed acidic p H indicating of pollutant impact of NOx and PM 10 on them .
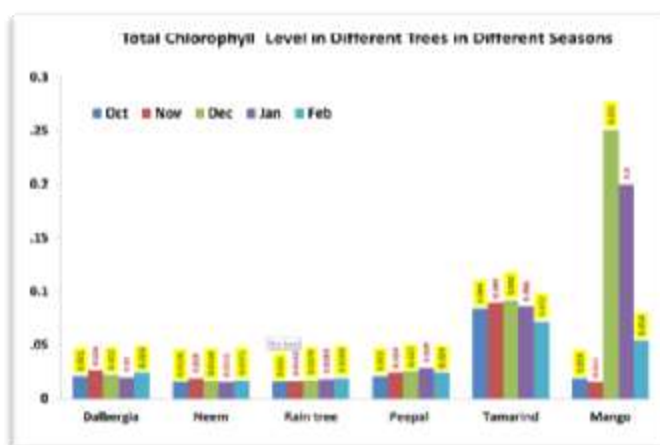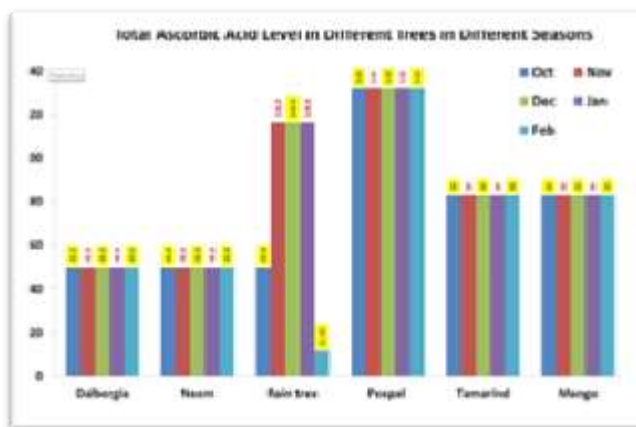

Trees showed low chlorophyll content , Except Mango tree this was again due to presence of air pollutants
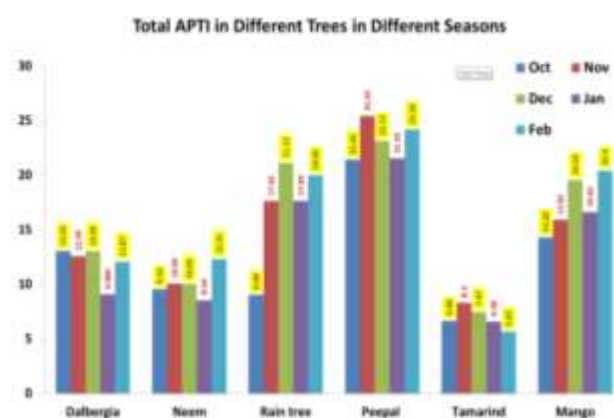

It was found that Tamarind tree showed highest Relative water content followed by Peepal, mango tree. Low RWC indicates intolerance towards air pollution.

Peepal tree showed highest Ascorbic acid content in all seasons followed by Rain tree, Tamarind, Mango

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Tolerant plant to air pollution was Peepal tree, Rain tree and Mango tree.

1. Leaf Ph
Plants with lower pH are more susceptible, while those with pH around 7 are tolerant.
It was found that most of the plants showed p H below 7 . Indian Rosewood (Dalbergiasisoo) showed highest p H level followed by Mango (Mangiferaindica), Neem (Azadirachtaindica), Rain tree (Samaneasaman), Peepal tree (Ficusreligiosa), Tamarind tree (Tamarindusindica)showed lowest p H .

2. Relative Water Content
Water is crucial prerequisite for plant life. RWC of a leaf is the amount of water present in it relative to its full turgidity. Relative water content is associated with protoplasmic permeability in cells and causes loss of water and dissolved nutrients, resulting in early senescence of leaves. Under stress conditions of air pollution when the transpiration rates are usually high, higher water content in a leaf will help to maintain its physiological balance.
It was found that Tamarind tree showed highest Relative water content followed by Peepal, Mango, Neem, Rain tree &*Dalbergiasisoo* tree.

3. Total Chlorophyll
Chlorophyll content of plants varies from species to species, age of leaf, and also with the pollution level as well as with other biotic and abiotic conditions. Thus, plants having high chlorophyll content show tolerance to air pollution.
It was found that Total Chlorophyll was highest in Mango tree followed by Tamarind tree, Peepal tree, Rain tree , *Dalbergiasisoo* and Neem tree.

4. Ascorbic acid
Ascorbic Acid plays an important role in cell division, defences, and cell wall synthesis. It is a natural detoxicant, which may prevent the effects of air pollutants in the plant tissues. Thus, plants maintaining high Ascorbic Acid under pollutant conditions are considered to be tolerant to air pollution.
It was found that Peepal tree has highest Ascorbic acid content followed by Rain tree, Tamarind tree, Mango tree, Neem tree and *Dalbergiasisoo* had lowest Ascorbic acid content.

5. APTI of Plants
APTI gives an empirical value for tolerance level of plants to air pollution. It was found that plants with high index values are tolerant to air pollutants, whereas low index values were generally sensitive to air pollutants.
It was found that Peepal showed highest APTI values followed by Rain tree , Mango, Indian rosewood tree, Neem and tamarind tree.

CONCLUSION

It can be concluded that PM 10 (Particulate matter 10) is above the permissible limit in all seasons. It is one the major pollutant having impact on Leaf p H, Relative water content (RWC), Total chlorophyll content, Ascorbic acid content, thus finally having impact on Plant APTI. It can be concluded that Peepal tree was found to be tolerant in all seasons to the Pollution levels, especially Particulate matter and Tamarind tree was found to be Sensitive to pollution levels in all seasons.

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