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Study of Air Pollution Tolerance Index of Plants Growing in Kinassery, Palakkad

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Abstract

Air pollution causes tremendous problems to the anthropogenic community. Plants are mostly the key species which have a greater impact because of the air pollution. Kinassery being a less polluted region , the air pollution index of Mussaenda plants growing in the road sides were assessed. The study also here focuses on whether the plants in this region is affected by air pollution, if so the concentration of air pollution tolerance of plants.

***Keywords:** Mussaenda, Kinassery, Anthropogenic, Air pollution*

INTRODUCTION

Kinassery (10.7288° N, 76.6658° E) is a small Village/hamlet in Kuzhalmannam Block in Palakkad District of Kerala State, India. It is under Kannadi Panchayath. It belongs to Central Kerala Division. It is located 8 Km towards South from District head quarters Palakkad. 9 KM from Kuzhalmannam, 293 KM from State capital Thiruvananthapuram Compared to other places in Palakkad like Chandranagar, Kanjikodeetc, Kinassery seems to be a less polluted area. The major objective of the study is to understand the air pollution tolerance index of plants. Mussaenda is avery common plant species found in the road side of the region.

Mussaenda frondosa is a rounded, evergreen shrub growing up to 3 metres tall. The plant is gathered from the wild for its edible leaves and medicinal uses. It is also cultivated as an ornamental in garden (Adrees et al., 2017).

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Mussaenda philippica is a plant species in the family Rubiaceae that grows as a shrub or small tree (Pauwels,1998). It is native to the Philippines it is commonly grown elsewhere as an ornamental species. Known varieties include: "Donna Laz" (pink), "Alicia Luz" (dark pink), "Queen Siricket" (light pink), "Donna Aurora" (white), and "Donna Envangellina" (dark red) (Achakzai et al.,2015).

MATERIAL AND METHODS

Leaves was collected in triplicate for the analysis of air pollution tolerance indexfrom Malampuzha gardens (10.8302° N, 76.6809° E), hugely biodiversity oriented area with location 1 and control(Aghajanzadeh, et al.,2016).

Plant species studied were Codiaeum variegatum, Euphorbia Milli, Chrysanthemum.

Sample collection

Samples were collected during early morning and brought to laboratory in polythene bag kept in ice box to nullify the adverse impacts of high light intensity and temperature. The leaves were carried out from a height of 01 to 02 meter from the ground level (Agrawal et al.,1991).

Procedure

Photosynthetic pigment: - The leaves were washed with distilled water and cut into small pieces in asceptic conditions. 100 mg each fresh leaves were taken for analysis (Agrawal et al.,1997). The samples were crushed with 5ml of 76-80% acetone in a glass pestle with a pinch of washed sand. The crushed samples along with washings were collected and sediment was thoroughly washed with 2ml of 80% acetone and again centrifuged for 3 -4 minutes ((Table:3). The final volume of supernatant was made up to 10ml by adding further 80% acetone for analysis (Aguiar-Silva et al.,2016). The samples were assessed with the help of visible spectrophotometer. Absorbance was read in 645 to 660 nm for chlorophyll, 480 and 515 nm for carotenoids (Table:4) .

Following formulae are used:
Photosynthetic pigment mg/gm of leaves = Chl.a + Chl.b+ Carotenoid

Chl.a (mg/gm) = 22.7× OD 663-2.69 ×OD 645

Chl.b (mg/gm) =12.9× OD 645-4.68 ×OD 660

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Carotenoied (mg/gm) =7.6 × OD 480 – 1.49 × OD 510

Relative water content (RWC)

RWC= [FW-DW)/ (TW-DW)] x100 FW = fresh weight, DW= dry weight and TW= turgid weight. Fresh weight was obtained by weighing the fresh leaves (Aguiar-Silva et al.,2012). The leaves were then immersed in water over night, blott dried and weighed to get turgid weight. The leaves were dried over in an oven at 70 ˚C and reweighed to obtain the dry weight 9 (Table:1).

Leaf extract pH

5 grams of the leaves were homogenized for uniform distribution in 50 ml deionized water, and then filtered and the pH of filtered leaf extract was determined by using pH meter (Table: 2).

Ascorbic acid content (AA): Ascorbic acid content was assessed and measured by using spectro photometric method (Chung, 1998).

RESULTS AND DISCUSSION

Total photosynthetic pigment: Many factors observations are present in controlling the tolerance in plants(Table:3). Mussaenda Plants with lower pH are more sensitive, while those with pH around 7 are more tolerant. Total chlorophyll (TCH) is related to Ascorbic Acid productivity and Ascorbic acid is concentrated in chloroplast (Table:4). Photosynthetic efficiency was quietly dependent on leaf pH. Photosynthetic rate was found to be decreased in plants at low leaf pH(Table:2). A considerable loss in total chlorophyll in the leaves of plants exposed to air pollution stress assist the argument that the chloroplast is the primary site of attack by air pollutants. The plants having Chlorophyll content between 4 to 17 mg/gm are categorized as intermediately tolerant plant species (Chaudhry, et al.,2016). All plant species used for the study were intermediately tolerant plants species against pollution load and dust particulates

Table: 1 RWC (mg/gm)

S.No.	PLANT	CONTROL	SECTOR1
1	*Mussaendafrondosa*	76.4931	71.6192
2	*Mussaendaphilippica*	78.5589	82.9134

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Table: 2 pH

S.No.	PLANT	CONTROL	SECTOR1
1	*Mussaendafrondosa*	5.05	5.01
2	*Mussaendaphilippica*	5.17	4.92

Table: 3 Photosynthetic Pigment (mg/gm)

S. No.	PLANT	CONTROL	SECTOR1
1	*Mussaendafrondosa*	5.67±0.04	1.09±0.14
2	*Mussaendaphilippica*	7.25±0.57	0.58±0.17

Table: 4 ASCORBIC ACID(mg/gm)

S. No.	PLANT	CONTROL	SECTOR1
1	*Mussaendafrondosa*	3.82±0.12	3.91±0.01
2	*Mussaendaphilippica*	5.97±0.36	5.94±0.01

CONCLUSION

In order to analyse the concentration of plants which is exposed to pollutants, there is cocncoction of pollutants occursin plant leaf. There are multiple parameters by which the air pollution tolerance index are measured, the key factors include RWC, pH, Photosynthetic pigment, Ascorbic acid content.

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