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Quantitative Estimation of Indole-3-acetic Acid in Shoot Tips and Young Leaves of *Tecoma stans* and *Ixora coccinea* from Polluted and Control Regions

P. Usha Shri[1], Anitha[1*], S. Roja[1] and Samreen Fatima[2]

St. Anns College for Women, Mehdipatnam, Hyderabad 500 028, India

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ABSTRACT

Plants are sensitive to pollution and especially air pollution can alter the physiological processes of plants affecting growth patterns. Study was carried out to determine the IAA production and response of plants exposed to vehicular emission. Two plant species namely *Tecoma stans* and *Ixora coccinea* which were exposed to roadside vehicular pollution were taken and control plants were collected from the college campus (unpolluted zone) and Estimation of IAA is carried out using Salkowski reagent, which upon reaction with IAA, yields pink color, due to AA complex formation and reduction of Fe^{+3} . A decrease and increase in IAA concentration was observed in *Tecoma stans* and *Ixora cocenia* respectively growing in pollution zones as compared to control zones clearly demonstration air pollution stress.

Key words*: Air pollution, IAA, Tecomastans, Ixoracoccinea, Stress, Salkowski reagent.*

Introduction

Air pollution comes from natural and anthropogenic sources and has a negative impact on plant growth and development. Plants show damage in a variety of ways. All the different types of air pollutants directly or indirectly affect plant growth and development. Plant growth and development is also dependent on plant hormones traditionally, five major hormone classes are auxins, cytokinins, gibberellin, abscisic acid and ethylene and a newly added Brassinosteroids have been reported to help growth and development in plants .Plant growth regulators are molecules other than nutrients which in minute concentration effect the physiological processes of the plants. Auxins represent one of the most important group of plant hormones because of their pleotropic effect on the plant growth and development. Auxin is the most versatile phytohormone, which can coordinate plant growth even under stressed conditions.

Air pollution is one of the devastating abiotic stress than cause substantial crop loss. The frequency and magnitude of pollution stress is intensified due to global climate change. Plants have evolved various sophisticated mechanisms to sense pollution and activate different defense responses rapidly, to protect its vital cellular structures. Phytohormones are the endogenous messenger molecules that mediate plant growth and development and responses to various biotic and abiotic stresses. All major hormones have been reported to play critical roles in response of plants to air pollution (Elizabeth *et al.*, 2020).

In the present investigation was carried out to understand the changes in the concentration of IAA in

([1]Lecturer, [2]Student)

plants subjected to air pollution stress.

Materials and Methods

Estimation of IAA is carried out using Salkowski reagent. The reagent is a mixture of 0.5M ferric chloride (Fe Cl_3) and 35% Perchloric acid ($HClO_4$) which upon reaction with IAA, yields pink color, due to AA complex formation and reduction of Fe^{+3} (Kamner *et al.,* 2001). The OD of colour developed is read at 540 nm.

Two plants *Tecoma stans* and *Ixora coccinea* were selected for the experiment. The plant samples were collected from both the polluted and control region inthe early hours of the day and brought to the lab in an ice box. The sample were surface sterilized with sodium hypochlorite and thoroughly rinsed two to three times with distilled water. The tips and young leaves were separated and weighted. One g of the material was macerated with extraction solution and filtered using Whattman's filter paper 1.

To 1 ml of the filtrate, 4 ml distilled water and 4ml of reagent was added and incubated for 25 mins in dark and the OD was recorded at 540 nm. Using a standard graph the quantity of IAA in the samples was calculated separately in shoot tips and young leaves of all plant samples.

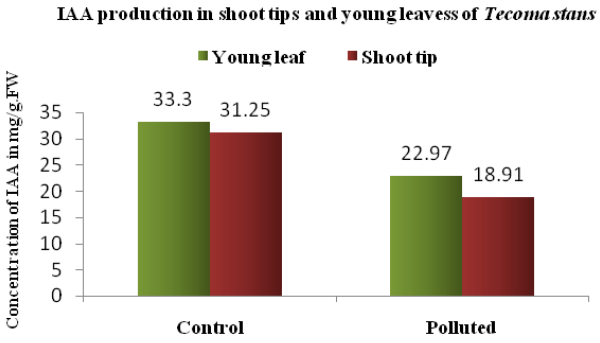

Fig. 1. Concentration of IAA in *Tecomastans* shoot tip and young leaves

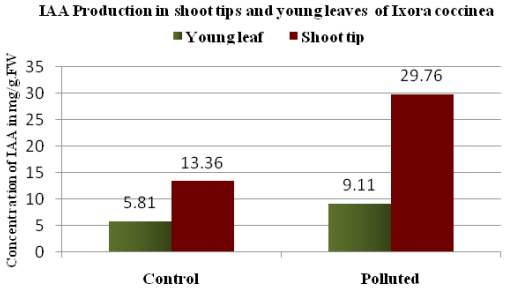

Fig. 2. Concentration of IAA in *Ixora coccinea* shoot tip and young leaves

Results and Discussion

Plants of *Tecoma stans* and *Ixora coccinea* from control and polluted area were selected for the experiment. The amount of IAA was estimated separately, in the shoot tips and young leaves.

In *Tecomastans*, the concentration of IAA in the shoot tips was 31.25 mg/g FW and 33.3 mg/g fresh weight in the young leaves in the plants growing in the control (unpolluted) zones. Whereas the amount of IAA in the shoot tips was 18.91 mg/g FW and 22.97mg/g. FW in the young leaves in the plants growing in polluted region. A decrease of 29% is seen in shoot tip and 36% decrease was observed in young leaf as compared to the control plant. This decrease in the activity of auxin indicates stress-induced auxin signaling attenuation (Blomster *et al.,* 2011*).*

In the shoot tips of *Ixora coccinea* 13.3 mg/g F.W of IAA was noted and 5.81 mg/g FW was noted in the young leaves of the plant growing in the control (unpolluted) zone. The plants growing in the polluted region showed 29.76 mg/g FW. in the shoot tips and 9.11 mg/g FW in the young leave was observed. An increase of 22% in the shoot tips and 57% in the young leaves was observed in plants collected from polluted region as compared to the control plants. Auxin transport has received much attention and the role of polar auxin transport (PAT) by auxin carrier proteins during unstressed conditions and gravitropism has been well established. By contrast, the changes in PAT during abiotic stresses remain largely unknown (Ruud *et al.,* 2018).

Conclusion

It is clear that plant responses to abiotic stress are complex and involve multiple signaling pathways of growth and physiology. In the present investigation altered production of IAA has been noted in plants growing in the polluted zone as compared to the plants growing in the control zone. In *Tecoma stans*, plants growing in polluted zones showed decreased amount of IAA as compared to the control plants. Whereas *Ixora coccinea* plants collected from polluted zones showed an increase in IAA in both the shoot tips and young leaves.

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