

IMPACT ASSESSMENT OF AIR POLLUTION STRESS ON ROADSIDE PLANT SPECIES THROUGH BIOCHEMICAL ESTIMATION

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ABSTRACT

Air pollution has been described as an additional stress on plants since they often respond to atmospheric contamination in the same way as they respond to drought and other environmental stress. The present study was undertaken to work out the impact of vehicular pollution on the pigment content of two plants namely-*Dalbergia sissoo* and *Pongamia pinnata* growing at different roadsides with varying number and type of plying vehicles. For this, leaf samples from different sites of the above-referred species were collected and analyzed for leaf extract pH, Chl a, Chl b, Carotenoid and protein content. All the parameters showed reduction with increase vehicular density in comparison to control (least polluted) site. It is concluded that plants can be used as indicators for urban air pollution, and there is need to protect the roadside plants from air pollution.

Keywords – Vehicular pollution, Chlorophyll, Carotenoid, Plant protein.

INTRODUCTION

Our environment is the entire web of geological, hydrological, atmospheric, biological and anthropogenic interactions that characterize the relationship between life and the planet earth. Normal air contains about 78% nitrogen, 21% oxygen, 0.93% argon, 0.038% carbon dioxide and several other trace gases is the gaseous composition of earth's atmosphere have become a prime concern for today's world due to human activities.

Rapid industrialization and addition of the toxic substances to the environment are responsible for altering the ecosystem (Mudd and Kozlonwski.; Niragau and Davidson, 1986; Clayton and Clayton, 1982). Industrialization, urbanization, economic growth and associated increase in energy demands have resulted in a profound deterioration of air quality in developing countries like India.

The Climatic conditions, the physico-chemical properties of air pollutants and their residence time in the atmosphere have the impact on surrounding plants and animals. Pollutants can cause leaf injury, stomatal damage, premature senescence, decrease photosynthetic activity, disturb membrane permeability and reduce growth and yield in sensitive plant species (Tiwari et. al., 2006).

The rapid urbanization imparts more stress on the vehicular use, which release toxic air pollutants in the urban atmosphere in the developing countries. Motor vehicles account for 60-70% of the pollution found in urban environment (Agrawal, 1985) followed by industries (20-30% in India). The implemental of appropriate transportation policy by using minimally polluting automobiles, improving combustion system, and planting roadside vegetation could reduce air pollutants from motor vehicles. In this context a relationship between traffic density, photosynthetic activity, Stomata conductance, total chlorophyll content and leaf senescence has been reported (Honour et. al., 2009). Net photosynthetic rate is a commonly used indicator of impact of increased air pollutant on tree growth (Woo et. al., 2007).

In order to determine causal relationships between air pollution and regional or local scale vegetation damage, present study was undertaken.

MATERIALS AND METHODS

An extensive survey of the city was under taken to select more polluted and less polluted sites, on the basis of the number of vehicles plying through sites and on that basis following area was selected.

A street from Panchwati square to its attachment with Walgaon road in Amravati City, which is commonly known as VMV road is selected as study area as polluted site. This street is with high traffic for twenty four hours in a day. Various types of vehicles from heavy to light vehicles, motor cycles, bikes, autorikshaws etc. continuously runs over it. On both sides of this street number of plant species are growing and sustained their life. There are number of trees among these following species are dominant. Therefore these two species *Dalbergia sissoo* and *Pongamia pinnata* were selected for the present study. The identification of plants was done with the help of floras (Naik et al., 1998).

Same plant species growing in nursery where minimum traffic of vehicles and supposed to be minimum polluted area were brought to the laboratory for further analysis.

PLANT ANALYSIS

Mature leaves of the plant species, were collected from all the four sides of the trees at almost same height. Samples collected from each plant were mixed to get a composite sample, which was analysed for following different parameters as -

1. Determination of pH.
2. Estimation of chlorophyll content. (Arnon, D.I. 1949).
3. Estimation of total carotenoids (Jensen, A. 1978).
4. Estimation of Protein by Biuret Method (Layne, E.1957).

RESULTS AND DISCUSSION

The vegetation growing along the roadside did not show any visible symptoms of injury. But the study of leaf extract pH in both the plant species showed less pH in polluted area as compared to control.

In the present study there was marked changes occurred in total chlorophyll and carotenoid content of both the plant species growing in polluted area and non-polluted area. The marked reduction in chlorophyll and carotenoids content along the sites in both the plant species was noted.

The plant protein is an essential component for the plant growth and development significant lowering of the protein content was recorded in both the plant species.

Table :- pH, Chlorophyll, Carotenoids and Protein content of *D. sissoo* and *P. pinnata*

	<i>Dalbergia sissoo</i>		<i>Pongamia pinnata</i>	
	Polluted area	Controlled area	Polluted area	Controlled area
pH	6.22	7.20	6.40	7.38
Chlorophyll mg/g	4.32	5.50	4.56	8.74
Carotenoids mg/g	0.31	0.52	0.34	0.55
Protein mg/g	1.75	6.12	2.73	9.65

CONCLUSION

Trees act as a source for air pollutants consumption and this reduce their concentration in the air. Pollutants when absorbed by the leaves cause a reduction in the concentration of photosynthetic pigments, which directly affect plant photosynthesis. Their impact on chemical composition of plants is also used as an indicator for measurement of environmental pollution. The plant can be used as biomonitors as well as biomitigators in the urban-industrial environmental to indicate the air quality and to enhance the pollution level in a locality.

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