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Effect of automobile exhausts on bio-chemical composition of *Polyalthia* and *Mangifera* leaves

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ABSTRACT

Increasing pollution especially by automobile exhausts in the urban has evidenced the decline in the environmental quality. These pollutants from automobiles are known to affect the physiology of plants. The effects are most often apparent on leaves, which are usually the most abundant and most obvious organs. The study involved determination of effect of automobile exhausts on biochemical composition of two important trees viz., *Polyalthia longifolia* and *Mangifera indica*. The leaves of two plants collected from polluted and unpolluted areas revealed that major effect of the pollutants is on chlorophyll content. Significant loss of chlorophyll was observed in case of polluted leaves. Studies also revealed that these pollutants result in increase in the phenol content of the leaves and decrease in the ascorbic acid content.

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KEYWORDS

Ascorbic acid;
Chlorophyll;
Mangifera indica;
Polyalthia longifolia.

INTRODUCTION

Concern over the state of environment has grown all over the world over since sixties. The decline in environmental quality has been evidenced by increasing pollution, loss of vegetation cover and biological diversity, excessive concentration of harmful chemicals in the ambient environment in the food chain, growing risk of environmental accidents and threat to the life support systems.

Pollution is the contamination of earth's environ-

ment with materials that interfere with human health, quality of life or the natural functioning of ecosystem. There are two categories of pollutants one is biodegradable and other nonbiodegradable. Biodegradable pollutants are materials such as sewage that rapidly decompose by natural processes. These pollutants become a problem when added to the environment faster than they decompose. Nonbiodegradable pollutants are materials that either do not decompose or decompose very slowly in the natural environment. Once contamination occurs, it is difficult or impossible to remove these

Current Research Paper

pollutants from the environment (Ex. DDT, Dioxins and PCBs). The accumulation of these pollutants may lead to bioaccumulation and biomagnification.

Effects of air pollution on plants

1. Air pollution effects on distribution of plants

Air pollutants are well known to effect the distribution of plants. SO₂ is the prime cause of the disappearance of lichen flora especially of epiphytic forms from industrial urban areas. Numerous mapping studies have repeatedly demonstrated that lichen distribution correlates with SO₂ concentration in the air. Grindson and Nylander were the first to note that smoke and gases cause a decrease in lichen numbers. Unlike higher plants, lichens never shed their toxin-laden parts and on the contrary seem to have a marked capacity for absorbing and accumulating pollugenic substances from the environment.

2. Air pollution effects on plant parts

Air pollution effects are most often apparent on the leaves, which are usually the most abundant and most obvious organs. Even though injury may occur on the stem or roots, sooner or later it is the leaf that shows the symptoms. The exception occurs in some peach varieties on which fluorides can cause a premature softening of the basal part. Flowers are rarely injured by air pollutants except for ethylene which causes abscission, buds may remain or wholly closed and flowers may open slowly at all.

3. Air pollution stress

There are several possibilities of air pollution modifying or distributing the normal seasonal rhythm of plants, depending on the severity of air pollution induced injuries or stress. In many controlled environmental studies this stress has been shown to reduce the growth and yield of the plants due to cell damage.

EXPERIMENTAL

1. Absorbance of acetone extracted chlorophyll was taken at 663nm and 645nm in a spectrophotometer. Amount of chlorophyll was calculated using the absorption co-efficient.
2. Total phenol estimation was carried out with folin-

ciocalteu reagent (FCR). Phenol reacts with an oxidizing agent phosphomolybdate in FCR under alkaline condition and result in the formation of a blue coloured complex, the molybdenum blue that was measured at 650nm colorimetrically.

3. Ascorbic acid reduces 2, 6-dichlorophenol indophenols dye to a colorless leucobare. Ascorbic acid gets oxidized to 1-dehydro ascorbic acid. Though the dye is blue in colour, it appears pink at the end point in acidic medium. Oxalic acid is used as a titrating medium.

Materials

The study involved determination of effect of automobile exhausts on biochemical composition of two important trees viz, *Mangifera indica* and *Polyalthia longifolia*.

The leaves of the two plants were collected from both polluted and unpolluted areas. Three important constituents viz., Chlorophyll, Phenol, Ascorbic acid were considered for comparative analysis.

Collection of plants

The plants selected for the study were collected from two different places. The plant materials collected from B.H. Road (NH-206), near college campus were considered as polluted samples. For unpolluted samples, the plant materials were collected from an orchard near shinganabidare, which is 15 kms interior from the main road near Mandagadde, Thirthahalli taluk, Shimoga district. The leaves from lower branches were selected during material collection.

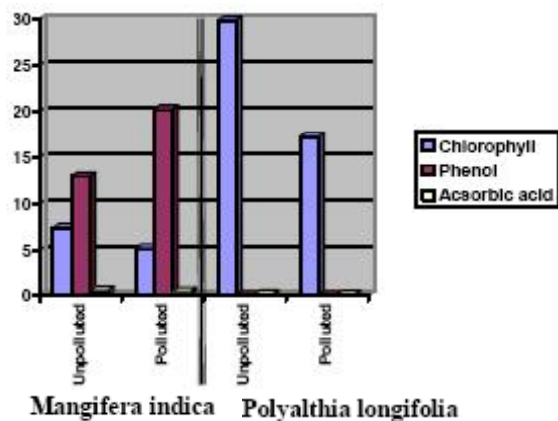
RESULTS AND DISCUSSION

Species	Sample	Chlorophyll in mg	Phenol in mg	Ascorbic acid in mg
<i>Mangifera indica</i>	UP	7.4776	12.9625	0.468
	P	5.2337	20.2435	0.375
<i>Polyalthia longifolia</i>	UP	29.855	*	0.093
	P	17.2540	*	0.0354

UP=Unpolluted, P=Polluted, *= Found in negligible amount

Average foliar biochemical estimation mg/gram in polluted and unpolluted environment

The above observations showed that the amount of chlorophyll pigment were considerably lower in plants growing in polluted area. The decrease in pigment con-

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centration might be due to the gross disruption of thylakoid membranes in the chloroplast or chlorophyllase activity.

Phenol content of leaves showed higher concentration in polluted areas than in comparatively non polluted areas. The increase in foliar phenol content in response to air pollution might be due to an increased polyphenolase activity generally accompanied by increased concentration of the phenol substances.

The observation on the estimation of ascorbic content of leaves showed lower concentration in the polluted environment than those growing in the comparatively non polluted area. The decrease in ascorbic acid level may be because invariably it is related with chloroplast activity including its synthesis.

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