

## Impact of dust pollution on photosynthetic pigments of some selected trees grown at nearby of stone-crushers

Avnish Chauhan<sup>#</sup> and Sanjeev<sup>\*</sup>

<sup>#</sup>Department of Zoology and Environmental Sciences, G.K.V., Haridwar

<sup>\*</sup>Deptt. of Chemistry, G.K.V., Haridwar

### Abstract

A significant reduction in chlorophyll 'a', 'b' and carotenoid of all the selected trees were observed in polluted site as compared to their control site. There was maximum (30.99%) reduction in chlorophyll 'a' on the leaves of *Psidium guajava* L. and minimum (6.52%) on *Eucalyptus citriodora* Hook. while maximum chlorophyll 'b' contents (43.43%) was depleted in *Syzygium cumini* L. and minimum (11.11%) in *Eucalyptus citriodora* Hook..

**Keywords:-** Dust pollution, Chlorophyll-a, Chlorophyll-b, Stone-crushers, Carotenoid

### Introduction

Over the years there has been a tremendous increase in human population, road transportation, vehicular traffic and industries in Haridwar region, has lead to increased concentration of gaseous and particulate pollutant (Chauhan and Joshi, 2007). Air pollution, both gaseous and particulate (dust) pollutants are known to produce serious hazards to plants and animals. According to an estimate, dust pollutants comprise around 40% of the total air pollution problem in our country. The particulate dust falling on the leaves said to cause foliar injuries, change in the rate of photosynthesis, transpiration and uptake and accumulation of mineral element from soil (Lerman and Darley, 1975).

### Materials and Method

The leaves of *Syzygium cumini* L., *Psidium guajava* L., *Dalbergia sisso* Roxb., *Eucalyptus citriodora* Hook., *Cassia fistula* L. and *Mangifera indica* L. were collected from nearby of stone-crushers (referred to as polluted site) and also from 2 km far from the polluted site, near agricultural land (referred to as control site). Stone-crushers are located on Haridwar-Laksar road, Haridwar. The chlorophyll 'a', chlorophyll 'b' and carotenoid were estimated using standard method. For the plant materials two-way-analysis of variance (ANOVA) was performed as per standard method of Gomez and Gomez (1984). Variations in photosynthetic pigments of the selected economically plant species are given Table-1.

### Results and Discussion

***Syzygium cumini* L.:** The concentration of chlorophyll 'a' content was 28.57% less, chlorophyll 'b' content was 43.43% less and carotenoid content was 17.21% less in leaves sample from polluted site as compared to control site.

***Psidium guajava* L.:** In case of *Psidium guajava* L. the reduction recorded was 30.99% in chlorophyll 'a' content, 38.54% in chlorophyll 'b' content and 15.97% in the concentration of carotenoid in the leaves from polluted sites as compared to their control site.

***Dalbregia sisso* Roxb.:** The concentration of chlorophyll 'a' content was 22.69% less, chlorophyll 'b' content was 21.21% less and carotenoid was 19.10% less in the leaves sample from polluted site as compared to control site.

***Eucalyptus citriodora* Hook.:** The reduction recorded in the leaves of *Eucalyptus citriodora* Hook. sampled from polluted site was 6.52%, 11.24% and 11.95% in the concentration of chlorophyll 'a', 'b' and carotenoid, respectively.

***Cassia fistula* L.:** A reduction in the concentration of different pigments were also recorded in the leaf samples collected from polluted site as compared to samples from control site which was 6.80%, 15.18% and 12.95% in chlorophyll 'a', 'b' and carotenoid, respectively.

***Mangifera indica* L.:** The reduction recorded in the leaves of *Mangifera indica* L. sampled from polluted site was 14.09%, 16.67% and 28.36% in the concentration of chlorophyll 'a', 'b' and carotenoid, respectively. Mishra and Gupta (1993) reported that dusted or encrusted leaf surface is responsible for reduced photosynthesis and thereby causing reduction in chlorophyll content. Agarwal *et al.* (1988) found that cement dust adversely affected and reduced the chlorophyll content of *Mangifera indica* L. and *Psidium guajava* L. Pandey and Simba, (1989) reported that the concentration of chlorophyll a, chlorophyll b and total chlorophyll in the leaves of polluted gram were lower than those of control. Bhorney *et al.* (2002) reported a decrease in chlorophyll content of different trees due to the dust pollution from stone-crushers. Mandre and Tuulmets (1977) found that dust pollution reduces the chlorophyll 'a', 'b' and carotenoid of Norway spruce. The carotenoids are red, orange, and yellow pigments synthesized by all green plants and some microbes. Both chlorophyll and carotenoid occur in all green leaves, but chlorophylls mask the carotenoid to the human eye. When the chlorophyll break down as leaves senesce (mature), the yellow and orange carotenoids persist and the leaves turn yellow. The carotenoids occur in photosynthetic tissues along with chlorophyll to protect them from photo-oxidative damage. Thus it helps in the protection of the photosynthesis reaction of the plants from phyto-oxidative damage.

**Table-1: Effect of pollution on photosynthetic pigments in different plant**

Plant species	Chlorophyll 'a' (mg/gm)		Chlorophyll 'b' (mg/gm)		Carotenoid (mg/gm)	
	C	P	C	P	C	P
<i>Syzygium cumini</i> L.	1.47 ±0.08	1.05 ±0.09***	0.99 ±0.09	0.56 ±0.12***	1.22 ±0.06	1.01 ±0.04***
<i>Psidium guajava</i> L.	1.42 ±0.12	0.98 ±0.14***	0.96 ±0.08	0.59 ±0.07***	1.44 ±0.07	1.21 ±0.09***
<i>Dalbregia sisso</i> Roxb.	1.41 ±0.15	1.09 ±0.19***	0.66 ±0.11	0.52 ±0.13***	0.89 ±0.09	0.72 ±0.07***
<i>Eucalyptus citriodora</i>	1.38 ±0.22	1.29 ±0.20***	0.63 ±0.15	0.56 ±0.17*	1.59 ±0.12	1.40 ±0.15***
<i>Cassia fistula</i> L.	1.91 ±0.12	1.78 ±0.09***	1.12 ±0.14	0.95 ±0.11***	1.39 ±0.07	1.21 ±0.09***
<i>Mangifera indica</i> L.	1.49 ±0.21	1.28 ±0.18***	1.02 ±0.22	0.85 ±0.17***	1.34 ±0.11	0.96 ±0.14***

(Mean of 10 replicate ± SE)

Significant at: \* $p < 0.05$ , \*\* $p < 0.001$ , C= control site, and P= polluted site

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