

# **Effect of Vehicular pollution on chlorophyll content of road side plants**

## **ABSTRACT:**

In the present investigation, comparative studies have been done to find the effect of vehicular pollutants generated from automobiles on the chlorophyll content of leaves. The leaves sample. Of *Caesalpinia pulcherrima*, *Cassia tora*, *Bougainvillea spectabilis*, *Lantana camera*, *Tacoma stans*, and *Cassia auriculata* were collected from areas with potentially higher vehicular pollution. Photosynthetic pigments chlorophyll a, and chlorophyll b are estimated. A reduction in the photosynthetic pigments of plant leaves growing in higher polluted sites as compared to non-polluted sites.

**Keyword** = Chlorophyll; vehicular Pollution,

## **INTRODUCTION**

Pollution is the most alarming issue related to the environment. There is an increase in pollutants which are deteriorating the quality & quantity of air. The exposure of these pollutants to the leaves causes a reduction in the concentration of their photosynthetic pigments viz., chlorophyll and carotenoids, which affects the plant productivity.<sup>1</sup> Chlorophyll plays an important role in the process of fixation of energy giving the carbohydrates and oxygen as the end product.

Pollution from automobiles normally comes from engine fumes, due to incomplete combustion of fuel. It is well known that air pollution represents a threat to both the environment and human health, and it is estimated that millions of tons of toxic pollutants are released into air each year (Rai, 2013). Chlorophyll catabolism not only affects the key components of a plant's photosynthesis systems, but it is also responsible for the green color of leaves and fruits and therefore, it plays an important role in plant development. (Peng et al., 2013).

Plants can be used as bio-indicators in various fields of research in developing cities. It is densely populated and has heavy vehicular traffic. Air pollution has increased tremendously that is affecting the proper growth of plants. The rapid addition of toxic substances to the environment is responsible for altering the ecosystem. At present study was undertaken from Malegaon to Saundane (10km area) national highway (NH 3) this area have very high vehicular pollution. The present work is to find out the effect vehicular pollution on chlorophyll content of roadsideslected plant leaves.

## **MATERIALS AND METHODS**

Present investigation deals with comparative study under heavy trafficable pollution with those growing in less or unpolluted site. The site selected for sampling the plant material (plant leaves) from Malegaon to Saundane (National Highway no. 3) 10 Km area selected for collecting samples were heavy trafficable pollution. Malegaon city, located in Nashik district state Maharashtra with the GPS coordinates of at 20° 33' 38.8692" N and 74° 31' 30.2520" E. For non polluted or less polluted samples collected from 5km away from the polluted sites.

### **Extraction of Chlorophyll ( Arnon, 1949)**

One gram of finely cut fresh leaves was taken and then grinded with mortar and pestle. With 20 ml of 80% acetone and made the volume 100 ml with 80% acetone and the solution was used for chlorophyll estimation. The absorbance of the solution was measured at 645nm and 663nm against the solvent (acetone) blank.

**The chlorophyll a, b and total chlorophyll content were calculated by using following formula (Arnon's 1949)**

$$\text{Mg chlorophyll a/g tissue} = \frac{12.7(A_{663}) - 2.69 (A_{645}) \times V}{1000 \times W}$$

$$\text{Mg chlorophyll b/g tissue} = \frac{22.9(A_{645}) - 4.68 (A_{663}) \times V}{1000 \times W}$$

$$\text{Mg Total chlorophyll/g tissue} = \frac{20.2(A_{645}) - 8.02 (A_{663}) \times V}{1000 \times W}$$

Where, A- absorbance at specific wavelength

V- Final volume of chlorophyll extract in 80% acetone

W- Fresh weight o tissue extract

## RESULT & DISCUSSION

**Table 1 :Concentration of Different photosynthetic pigments (mg g<sup>-1</sup>) in the leaves of following plants collected from polluted & Non polluted (control) sites.**

Sr.No.	Name of the plant	Polluted		Non polluted/less pollution	% Reduction
1	<i>Cassia tora</i>	Chlo. a	0.824	0.954	13.63
		Chlo.b	0.462	0.748	38.23
		Total chlo.	1.286	1.502	14.38
2	<i>Cesalpinia pulcherrima</i>	Chlo. a	0.973	1.215	19.59
		Chlo.b	0.568	0.670	13.23
		Total chlo	1.541	1.885	18.24
3	<i>Bougainvillea spectabilis</i>	Chlo. a	1.219	1.815	33.66
		Chlo.b	0.703	0.982	28.42
		Total chlo	1.922	2.795	31.28
4	<i>Lantana camara</i>	Chlo. a	0.644	0.902	28.61
		Chlo.b	0.396	0.584	32.20
		Total chlo	1.040	1.486	31.28
5	<i>Tecoma stans</i>	Chlo. a	0.535	0.702	23.79
		Chlo.b	0.445	0.590	24.58
		Total chlo	0.980	1.292	24.14
6	<i>Cassia auriculata</i>	Chlo. a	0.873	1.015	14.00
		Chlo.b	0.620	0.862	29.08
		Total chlo	1.493	1.867	20.03

### **Cassia tora**

The concentration of Chlorophyll 'a' in the leaves of *cassia tora* at polluted sites was recorded as 0.824 mg/g which was 0.954 mg/g at the control site. Thus, a reduction of 13.63 % in Chlorophyll 'a' was recorded in the samples from the polluted sites in comparison to control. The concentration of Chlorophyll 'b' was 0.462 mg/g in the leaf samples collected from polluted sites while it was 0.748 mg/g in the samples from control site. The polluted sites sample thus had 38.23% less Chlorophyll 'b' content. Total chlorophyll content was 1.286 mg/g and 1.502 mg/g in the leaf samples collected from polluted and control site respectively. Thus, there was a reduction of 14.38% in the total chlorophyll content in the samples from polluted site.

### **Cesalpinia pulcherrima**

The concentration of Chlorophyll 'a' in the leaves of *Cesalpinia pulcherrima* at polluted sites was recorded as 0.973 mg/g which was 1.215 mg/g at the control site. Thus, a reduction of 19.59 % in Chlorophyll 'a' was recorded in the samples from the polluted sites in comparison to control. The concentration of Chlorophyll 'b' was 0.568 mg/g in the leaf samples collected from polluted sites while it was 0.670 mg/g in the samples from control site. The polluted sites sample thus had 13.23% less Chlorophyll 'b' content. Total chlorophyll content was 1.541 mg/g and 1.885 mg/g in the leaf samples collected from polluted and control site respectively. Thus, there was a reduction of 18.24% in the total chlorophyll content in the samples from polluted site.

### **Bougainvillea spectabilis**

The concentration of Chlorophyll 'a' in the leaves of *Bougainvillea spectabilis* at polluted sites was recorded as 1.219 mg/g which was 1.815 mg/g at the control site. Thus, a reduction of 33.66% in Chlorophyll 'a' was recorded in the samples from the polluted sites in comparison to control. The concentration of Chlorophyll 'b' was 0.703 mg/g in the leaf samples collected from polluted sites while it was 0.982 mg/g in the samples from control site. The polluted sites sample thus had 24.42% less Chlorophyll 'b' content. Total chlorophyll content was 1.922 mg/g and 2.795 mg/g in the leaf samples collected from polluted and control site respectively. Thus, there was a reduction of 31.28% in the total chlorophyll content in the samples from polluted site.

### **Lantana camara**

The concentration of Chlorophyll 'a' in the leaves of *Lantana camara* at polluted sites was recorded as 0.644 mg/g which was 0.902 mg/g at the control site. Thus, a reduction of 28.61% in Chlorophyll 'a' was recorded in the samples from the polluted sites in comparison to control. The concentration of Chlorophyll 'b' was 0.396 mg/g in the leaf samples collected from polluted sites while it was 0.584 mg/g in the samples from control site. The polluted sites sample thus had 32.20% less Chlorophyll 'b' content. Total chlorophyll content was 1.040 mg/g and 1.486 mg/g in the leaf samples collected from polluted and control site respectively. Thus, there was a reduction of 31.28% in the total chlorophyll content in the samples from polluted site.

### **Tecoma stans**

The concentration of Chlorophyll 'a' in the leaves of *Tecoma stans* at polluted sites was recorded as 0.535 mg/g which was 0.702 mg/g at the control site. Thus, a reduction of 23.79% in Chlorophyll 'a' was recorded in the samples from the polluted sites in comparison to control. The concentration of Chlorophyll 'b' was 0.445 mg/g in the leaf samples collected from polluted sites while it was 0.590 mg/g in the samples from control site. The polluted sites sample thus had 24.58% less Chlorophyll 'b' content. Total chlorophyll content was 0.980 mg/g and 1.292 mg/g in the leaf samples collected from polluted and control site respectively. Thus, there was a reduction of 24.14% in the total chlorophyll content in the samples from polluted site.

## **Cassia auriculata**

The concentration of Chlorophyll 'a' in the leaves of *Cassia auriculata* at polluted sites was recorded as 0.873 mg/g which was 1.015 mg/g at the control site. Thus, a reduction of 14.00% in Chlorophyll 'a' was recorded in the samples from the polluted sites in comparison to control. The concentration of Chlorophyll 'b' was 0.620 mg/g in the leaf samples collected from polluted sites while it was 0.862 mg/g in the samples from control site. The polluted sites sample thus had 29.08% less Chlorophyll 'b' content. Total chlorophyll content was 1.493 mg/g and 1.867 mg/g in the leaf samples collected from polluted and control site respectively. Thus, there was a reduction of 20.03% in the total chlorophyll content in the samples from polluted site.

## **CONCLUSION**

The effect of automobile pollution on chlorophyll content chlo. a & chlo. b, total chlorophyll for different plant species growing at polluted road sites as compared to control sites was determined. All the plant species showed that decreased in chlorophyll content as compared to sample collected from control or less polluted sites. It was concluded that auto vehicular exhaust emission significantly affected concentration of chlorophyll a, chlorophyll b, & total chlorophyll.

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