# 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 chrorophyll content of leaves. The leaves samples of *caesalpinia pulcherrima, Cassia tora, bougainvillea spectabilis, lantana camera,Ticoma stans* and *cassia aurulata* were collected from areas with potentially higher vehicular pollution Photosynthetic pigments chlorophyll a, chlorophyll b are estimated. A reduction in the photosynthetic pigments of plant leaves growing in higher polluted site as compared to non polluted sites.



**Keywords** : Chlorophyll; vehicular Pollution,


## INTRODUCTION

Pollution is the most alarming issue related to the environment there is increase in pollutants which are deteriorating the quality & quantity of air. The exposure of these pollutants to the leaves cause a reduction in the concentration of their photosynthetic pigments viz., chlorophyll and carotenoids, which affects the plant productivity. [1] Chlorophyll play the 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 field of research in developing city. 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 environment is responsible for altering the ecosystem. At present study was under taken 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 road side selected plant leaves.

## MATERIALS AND METHODS

Present investigation deals with comparative study under heavy trafficular pollution with those growing in less or unpolluted site. Site selected for sampling the plant material (plant leaves) from Malegaon to Saundane (National Highway no. 3) 10 Km area selected for collecting samples where heavy

trafficular pollution. Malegaon city, Maharashtra India is located at India country in the cities place with the GPS coordinates of at $20^0$ 33' 38.8692" N and $74^0$ 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 were 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)**

$$\text{Mg chlorophyll a/g tissue} = \frac{12.7(A663) - 2.69(A645) \times V}{1000 \times W}$$

$$\text{Mg chlorophyll b/g tissue} = \frac{22.9(A645) - 4.68(A663) \times V}{1000 \times W}$$

$$\text{Mg Total chlorophyll/g tissue} = \frac{20.2(A645) - 8.02(A663) \times V}{1000 \times W}$$

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-1) 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 | *Cassia tora* | 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 | *Cesalpinia pulcherima* | 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 | *Bouganvillia spectrabilus* | 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 | *Lantena camare* | 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 | *Tecoma stans* | 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 | *Cassia aurculata* | 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 Chl ‘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 Chl ‘b’ was 0.462 mg/g in the leaf samples collected from polluted sites while it was 0.748mg/g in the samples from control site. The polluted sites sample thus had 38.23% less Chl ’b’ content. Total chlorophyll content was 1.286mg/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 pulcherima

The concentration of Chl ‘a’ in the leaves of *Cesalpinia pulcherima* 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 Chl ‘b’ was 0.568 mg/g in the leaf samples collected from polluted sites while it was 0.670mg/g in the samples from control site. The polluted sites sample thus had 13.23% less Chl ’b’ content. Total chlorophyll content was 1.541mg/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 spectrabilus**

The concentration of Chl ‘a’ in the leaves of *Bougainvillea spectrabilus* 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 Chl ‘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 Chl ’b’ content. Total chlorophyll content was 1.922mg/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.

**Lantena camare**

The concentration of Chl ‘a’ in the leaves of *Lantena camare* 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 Chl ‘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 Chl ’b’ content. Total chlorophyll content was 1.040mg/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 sit

**Tecoma stans**

The concentration of Chl ‘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 Chl ‘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 Chl ’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 aurculata**

The concentration of Chl ‘a’ in the leaves of *Cassia aurculata* 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 Chl '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 Chl '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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