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# EFFECT OF AIR POLLUTANTS ON PIGMENT CONTENT AND POLLEN FERTILITY OF SOME PLANTS AROUND MATHURA REFINERY

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The loss in chlorophyll a and b content of *Cajanus cajan* Millisp was 9.1% and 2.8% and in *Brassica nigra* Koch it was 8.5% and 2.5% respectively. *Acacia nilotica* Del showed the least reduction in chlorophyll a and b content i.e. 6.9% and 2% respectively. The loss in the pollen fertility of *Cajanus cajan* Millisp *Brassica nigra* Koch and *Acacia nilotica* Del was found to be 46%, 21.2% and 10.2% respectively.

**Keywords**: Air pollutants; Pigment content; Pollen fertility.

Mathura Oil refinery is an asset to the Nation but at the sam tinu it is not less than a curse as the pollutants emitted from it are responsible to growth and development of ambiant rietation to a great extent. The effluents discaged in to the atmosphere by the oil Refinerles thiefly the are oxides of sulphur, carbon and nitrogen, hydrocarbons, ammonia and organic acids. Out of them most important phytotoxic air pollutant which has been found to cause deteriorating effects on vegetation even at a very low concentration.

$SO_2$ enters leaves through stomata[1,2], and then passes into the mesophyll cells where it iractivates the enzymes of photosynthesis[3] and affects both cyclic and noncyclic photophosphorylation[4] It also injures the reacting centres of Pigment system II and inhibits the electron transport system[5] the chlorophy II and carotenoid pigments of the cells are also effected by sulphur dioxide[6-8]. In narrow leaved plants, $SO_2$ has been found to injure the tips of foliage e.g. Pinus and Grasses whereas in broad leaved plants it attacks the margins and interveinal area of the leaves[9]. $SO_2$ has also been found to inhibit the germination of pollen tube[10], thereby bringing about a loss in pollen fertility.

The aim of the present investigation is to study the effects of $SO_2$ emitted by Mathura Oil Refinery[11] on the chlorophyll content and pollen fertility of *Cajnus cajan* Millisp, *Brassica nigra* Koch and *Acacia nilotica* Del.

**Material and Methods**

In order to observe the effects of sulphur dioxide on the chlorophyll contents and pollen fertility of *Cajanus cajan* Millisp. *Brassica nigra* Koch. and *Acacia nilotica* Del, a comparative study was done on the plants growing on two sites (site A and site B), Site A is the area of Vrindaban forest (non polluted) and site B represents the surrounding area of Mathura Refinery (polluted) where the vegetation is under continuous influence of pollutants mainly $SO_2$.

Thechlorophyll content of the selected plants growing at site A and B was determined in the leaves collected from each plant at an interval of 10 days. Chlorophyll pigments were extracted in 80% acetone and Chlorophyll content was determined by measuring optical density by spectrophotometer and then by using the following formula of Duxbury[11] and Yentsch[12]:

$$\text{Chl. a. (mg/g fresh wt.)} = \frac{12.3\,D\,663 - 86\,D\,645}{d \times 1000 \times W} \times V$$

$$\text{Chl. b. (mg/g fresh wt.)} = \frac{19.3\,D\,645 - 3.6\,D\,645}{d \times 1000 \times W} \times V$$

$$\text{Total Chl. (mg/g fresh wt.)} = \frac{7.6\,D\,480 - 1.49\,D\,510}{d \times 1000 \times W} \times V$$

Pollen fertility, for the shidy or the plant samples were collected from each plant on both the sites at an interval of 10 days.

The data given in Table 1 clearly indicate that sulphur dioxide reduced the total chlorophyll content of the studied plants growing in the licinity of Mathura Oil Refinery. This loss was as much as 26.22% in*Bracica nigra* and as low as 4.16% in *Acacia nilotica.* One of the most remarkable feature observed during this study was that the average loss of chlorophyll a was 8.1% whereas that of chlorophyll b was 2.4%.

It is evident from Table-2 that the pollen fertility of the plants growing at site B considerably reduced by the action of $SO_2$. The maximum loss was recorded in *cajanus cajan* (46.08%) and the minimum *Acacia nilotica* (10.05%) whereas average loss of pollen fertility was 26%.

Higher dence of tossis incurret in Chlorophylla may be due to the fact that the superroxide redicals produced inside the cell by the activity of $SO_2$ destroy a

**Table 1.** Chlorophyll content (mg $g^{-1}$ front) of the plants growing at site A and B.

| Name of plants | Site A | | | Site B | | |
|---|---|---|---|---|---|---|
| | Chl *a* (mg/g) | Chl. *b* (mg/g) | Total Chl. | Chl *a* | Chl. *b* | Total |
| *Cajanus Cajan* | 6.417 | 7.187 | 13.604 | 5.834 (red. 9.08%) | 6.985 (red. 2.1%) | 12.819 (red.5.73%) |
| *Brassica Nigra* | 2.146 | 2.425 | 4.517 | 1.966 (red. 8.38%) | 2.364 (red. 2.1%) | 3.330 (red. 26.27%) |
| *Acacia Nilotica* | 1.085 | 2.245 | 2.330 | 1.012 (red. 6.73%) | 1.221 (red. 1.93%) | 2.233 (red. 4.16%) |

**Table 2.** Pollen fertility of the plants growing at site A and B.

| Name of plants | Pollen Fertility | |
|---|---|---|
| | Site A | Site B |
| *C. cajan* | 89.42±7.7 | 48.23±4.0 |
| *B. nigra* | 85.20±9.2 | 67.26±4.2 |
| A. nilotica | 97.32±2.1 | 87.54±5.6 |

chlorophyll more readly[5]. Besides, sulphur dioxide also brings about the breakdown of chloroplast and mesophyll cells which may be considered as the main cause of the reduction in the chlorophyll content of the plants. Malhotra and Hocking[13] reported a direct relation between the chlorophyll content and rate of photosynthesis of a plant thus a loss in the chlorophyll content will bring about a reduction in the rate of photosynthesis of a plant. This decreased rate of photosynthesis directly or indirectl impact on dry matter production leading to the reduced the growth plants.

Pollen grains being very sensitive to $SO_2$ lose their fertility on being exposewre to its low concentration[14], which likely to decrease the fruit output of plants.

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