

# Effect of Stone Crushers Dust on Chlorophyll Content of Some Medicinally Valuable Plants from Sri Moolakkarai Village of Thoothukudi District.

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**Abstract-** The present investigation aims at studying the effect of stone crushers dust on chlorophyll content of some medicinally valuable shrubs. The dust deposition on the leaves affected the metabolic activities of these two plants. The moisture percentage of leaves was lower due to absorption of water vapours by dust particles. The pH of leaves at the polluted site was higher. There was maximum depletion of chlorophyll content in *Cassia auriculata* that showed the more sensitivity of the leaves of this plant towards stone crusher dust. It is suggested that stone crushers around Sri Moolakkarai Village of Thoothukudi District should take some suitable measures so that the vegetation around them is not affected so as to protect the biodiversity of this area.

Keywords: Stone Crushers, Dust, Chlorophyll Content, Pigments.

## INTRODUCTION

Every day, Every Hour and Every Minute millions of tons of organic matter are oxidized into its ultimate constituents: CO<sub>2</sub> and H<sub>2</sub>O which go back on the atmosphere and return to water. At this rate of destruction, all the organic matter on the earth will be consumed in a matter mere 20 or 30 years. But at the same time an equal amount of organic matter is synthesized by the green plants to compensate for the loss of organic matter ( Johnsen I. and S.E. Jorgensen 1989).

Green is the predominant colour of the plant kingdom. The green colouring of the plants is often termed as chlorophyll (Michelle Murphy 2014).

Chlorophyll is the most important primary photosynthetic pigment, which usually exists in Chloroplast and through which light energy gets converted into chemical energy. Besides Chlorophyll (primary pigment), Carotene and phycobillins (secondary pigment) also take part in photosynthetic. As Chlorophyll and other plant pigments are necessary in harnessing light energy by photosystems I & II, the effect of air pollutants on these pigments would greatly influence the Photosynthetic ability of plants. Destruction of chlorophyll due to air pollution has been recorded by a number of writers (Geeta and Namrata 2014)

Sri Moolakkarai has a number of stone crushers. In view of deposit of stone dust from these crushers on the vegetation in the nearby area, the present study has been carried out to envisage the effect of stone crushers dust on the chlorophyll content of leaves of two medicinally valuable plants .Viz. *Cassia auriculata* and *Calotropis gigantea*. The

main objectives of this study are to study the vegetations, dust deposit, pH, moisture content and total Chlorophyll content of the leaf sample.

## MATERIALS & METHODS:

### Study Area:

The selected stone crusher area is situated in the Sri Moolakkarai Village. It is 8km away from Srivaikundam Taluk on the southern side of the Vallanad Hills. There are 450 houses with total population of 1804. Of these 10% of them are Land Lords, 80% of them are Middle Class people and remaining 10% are Low Class people. There are about three stone crushers located on Sri Moolakkarai Road in a single strip of 1.5km. These units together crush 1000 tonnes of stones per week, resulting in enormous dust pollution. The raw material used in stone crushers is riverbed stone, which contains 20-40% of river sand of less than 2mm size. There are about 24 plant species, present in the surrounding area of the stone crushers. Out of these only two plant species were collected from site I. The control site is 400m away from stone crushers .II polluted site-10m away from stone crushers. The dust deposit, pH, Moisture content and total chlorophyll content were estimated using standard techniques.(Agarwall and Tiwari 1997, Maclachilan and Zalik 1963).

### Floral Studies:

Field trip were undertaken weekly for the exploration of flora and plant samples were collected and identified help of floras (Gamble 1956) .Binomials for the listed taxa are based on flora of presidency of Madras (Gamble 1956) . The herbaceous vegetation was recorded in 1x1m quadrant laid out at 5m intervals.

### Physico Chemical Characteristics of leaf samples:

### Determination of leaf pH

#### Principle:

pH of the sample is a measure of the hydrogen ion activity and it depends largely on relative amount of the absorbed hydrogen and metallic ions. Thus, it is a good measure of acidity and alkalinity of a leaf water suspension and it provides a good identification of leaf chemical nature.

#### Procedure:

The pH of the leaf was determined using systronic pH meter (digital in a leaf water suspension of 1:2:5 ratios).

Determination of Dust Deposit of leaf samples:

The leaves from control and polluted site were collected. The fresh weight of the leaves was taken. Then the leaves are washed with running water for 3 to 4 times and allow to air dry for 15 minutes. Then the weight of the leaves was taken. The dust deposit of the leaf samples were calculated from the following formula.

Formula:

A-B

a

Dust Deposit of the leaf sample mg/cm<sup>2</sup>

A-Initial Wt

B-Final Wt

a-area of the leaf

### Determination of Moisture % of the leaf samples

#### Procedure:

It is generally estimated as % Moisture content on dry weight basis. Keep the leaf sample of known weight in hot air oven at the temperature of 105°C- 110°C for 24 hours. Reweigh the sample and find out the loss in its weight. Calculate the percent moisture content of leaf (dry weight basis) as follows.

#### Formula:

Weight of leaf before heating = Xg  
Weight of leaf after heating for 24 hours = X1g  
Moisture present = X-X1g  
% Moisture Content (dry weight) =  $\frac{X-X1}{X1} \times 100$

### Determination of Total Chlorophyll contents:

The Chlorophylls are readily extracted from fresh green tissues of plants by acetone. Take an optical density (OD) with spectrophotometer at 670nm. Calculate the total Chlorophylls content by using following formula.

Total Chlorophyll mg/g =  $\frac{C \times V \times 10}{A}$

C - Optical Density

V - Volume of acetone (10ml)

A - Area of the leaf sample in cm<sup>2</sup>

## RESULT AND DISCUSSION:

### Vegetation of the Study area:

The results of floristic and phytosociological study are summarized in the Table-2. The study area represents 24 plants species. It includes total number of 21 genera 14 families. The vegetation of this area are characterized by mixed type of herbs 17, shrubs 05, trees 02, (Table-1).

### Cassia auriculata:

The beautiful shrub with large bright yellow flowers. The bark gives valuable tanning materials. Bark is used as Astringent, leaves and fruits are Anthelmintic seeds are used to cure eye troubles, diabetes and chylous urine. Roots are used to cure skin troubles.

### Calotropis gigantea:

A large milky shrub very pale in colour, the branches, leaves and inflorescence covered with loose soft white wool, the large sessile leaves ovate or obovate, cordate at base, the flowers large and pale, the large fleshy follicles green and ventricose, the seeds with an abundant white milky coma. Bark yellowish white, wood white and soft. The bark gives a strong fibre and the silky coma is used stuff pillows. Leaves are rubbed on the skin of elephant for the treatment of kesarayer disease.

### Phsico chemical characteristics of leaf samples:

The amount of dust deposition pH Moisture content and total chlorophyll content are given in Table-3

### pH of the leaf samples:

The pH was observed to be maximum (6.50) in leaves of cassia auriculata at polluted site and minimum (7.05) in leaves of cassia auriculata at control site (400 m away). Alkaline condition may be due to the chemical composition of dust of stone crushers, which contains mostly the silica. Shashi and Baidyanath 2016, reported acidic pH (7-7.77) in Aegle marmelos, Anthocephalous cadamba, Ficus benghalensis, Ficus glomerata, Freligiosa and Mangifera indica due to the kiln dust pollution. Bhonery et. al 2002 reported acid pH (6.45-6.7) in Mangifera indica, Psidium guajava, Syzygium cumini, Dalbergia sissou, of control site of Haridwar and alkaline pH (7.5-7.67).

### Dust Deposition of leaf samples:

The maximum dust deposition was recorded in the levels of Calotropis gigantea (135mg/cm<sup>2</sup>) of polluted site minimum (48mg/cm<sup>2</sup>) calotropis gigantea of control site. Dust deposition of different plants varied due to the surface area of leaves, has also been reported for various tree species by Bhonrey et. al 2002.

### Moisture content of the leaf samples:

Dissolved nutrients play an important role in the growth of a plant. Available of these nutrients is directly corrected with the moisture content. The availability of dissolved nutrients was less due to less moisture content resulting in early senescence of spruce needles (Madeleine et.al.2015). In present study also it was observed that there was a depletion in moisture content of the leaves of Cassia auriculata and Calotropis gigantea. The maximum loss of moisture content was recorded in Calotropis gigantea (68.39%) and minimum in Cassia auriculata (44.80%) same result also noted in the leaves of Psidium guajava, Syzygium cumini, Dalbergia sissou, and Mangifera indica (Bhonery et. al 2002).

### Total Chlorophyll content of the leaf samples:

The different pollutants play a significant role in inhibition of photosynthetic activity that results in depletion of chlorophyll content of the leaves of the different plants (Bamidele et al 2016). Agarwal and Tiwari 1997 have reported a decrease in the chlorophyll content of different species of trees due to the kiln dust pollution. They observed a decrease of 16.6% in total chlorophyll content of *Mangifera indica* and decreases of 56.23% in *Syzygium cumini* at polluted site. In present study more depletion in *Cassia auriculata* (71.36%) and less depletion (46.16%) in *Calotropis gigantea*. The difference may be due to the kind of stone crushed pollutant affecting the photosynthesis of these two plants. Same type of result was also observed by (Bhonery et. al 2002) in different tree species.

**Summary and conclusion:**

The dust depletion on the leaves affected the metabolic activities of these two plants. The moisture percentage of leaves was lower due to absorption of water vapours by dust particles. The pH of leaves at the polluted site was higher. There was maximum depletion of chlorophyll content in *Cassia auriculata* that showed the more sensitivity of the leaves of this plants towards stone crusher dust. It is suggested that stone crushers around Sri Moolakkarai should take some suitable measures so that the vegetation around them is not affected so as to protect the biodiversity of this area.

**Table:1 LIST OF PLANT SPECIES**

S.No	Scientific Name	Family
1.	<i>Cassia auriculata L.</i>	Leguminosae
2.	<i>Tridax procumbens L.</i>	Asteraceae
3	<i>Ocimum basilicum.L</i>	Labiatae
4	<i>Passiflora foetida . L</i>	Passifloraceae
5	<i>Euphorbia hirta L.</i>	Euphorbiaceae
6	<i>Cissius quadrangularis L.</i>	Vitaceae
7	<i>Indogofera tinctoria L.</i>	Leguminosae
8	<i>Boerhaevia diffusa L.</i>	Nyctaginaceae
9	<i>Prosopis spicigera L.</i>	Leguminosae
10	<i>Tribulus terrestris L.</i>	Zygophyllaceae
11	<i>Calotropis gigantean R.Br</i>	Asclepiadaceae

12	<i>Leucas aspera Spr.</i>	Labiatae
13	<i>Oldenlandia umbelata L.</i>	Rubiaceae
14	<i>Aerva lanata Juss.</i>	Amarantaceae
15	<i>Lepidogathis pungens, Nees.</i>	Acanthaceae
16	<i>Justicia simplex, D.Don</i>	Acanthaceae
17	<i>Aerva wightii Hook.</i>	Amarantaceae
18	<i>Croton sparsiflorus, Morong.</i>	Euphorbiaceae
19	<i>Phyllanthus amarus, Linn.</i>	Euphorbiaceae
20	<i>Phaceolus sp</i>	Leguminosae
21	<i>Ficus religiosa,Linn.</i>	Moraceae
22	<i>Cyperus kylinga</i>	Cyperaceae
23	<i>Cyperus sp</i>	Cyperaceae
24	<i>Euphorbia rosea, Retz</i>	Euphorbiaceae

**TABLE:2: Habit of the Vegetation**

SL.NO	Habit	No.of species	Percentage
1.	Trees	2	8.33
2.	Shrub	5	20.33
3.	Herb	17	70.33

**TABLE-3: pH ,Dust Deposition , Moisture content and chlorophyll content of *Cassia auriculata* and *Calotropis gigantea* due to stone crusher dust (Mean value of 6 replicates).**

Parameters	<i>Cassia auriculata</i>		<i>Calotropis gigantea</i>	
	Control	Test Plant	Control	Test Plant
pH	6.5	7.05	6.63	6.73

Dust Deposition Mg/cm <sup>2</sup>	57	120	48	135
Moisture(%)	65.02	44.80	68.39	57.42
Total chlorophyll Content mg/g	2.025	0.58 (+71.3 6)	3.25	1.75 (+46. 16)

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