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Impact of brick kiln emission on *Cassia tora* - A case study in Katihar District

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ABSTRACT

Brick kiln emission adversely affect nearby vegetation. Chlorophyll content of leaves decreases near Brick kiln. In the present study, effect of Brick kiln emission on chlorophyll content in the leaves of *Cassia tora* was studied. It was observed that the chlorophyll content in leaves decreased near brick kilns. Loss of chlorophyll was greater at a distance of 100 meter from brick kiln in comparison to loss of chlorophyll at a distance of 50 meter. Study was carried out near three brick kilns of Katihar district. Percentage loss in chlorophyll content was recorded as 9%, 4% and 3.4% at a distance of 50 meter and 12%, 7.6% and 7.4% at a distance of 100 meter from Brick kiln.

Key Words - Brick kiln emission, Chlorophyll, *Cassia tora*, vegetation

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INTRODUCTION

Due to industrialization and urbanization demand of brick is increasing. This lead to vast development of brick industries. Brick kiln emission is one of the major cause of air pollution. Air pollution has become a serious environmental stress to plant life (Rajput and Agrawal, 2004). Biswas *et al.* (2018) reported that brick kiln emission adversely affect the environment of surrounding. The emission of brick kiln contain carbon dioxide, carbon monoxide, sulphur oxides, nitrogen oxides, heavy metals like Pb, Co, Ni, Cr and particulate matter (Assadi *et al.* 2011). It was estimated that annual emission of brick kiln industries were about 80 tons of particulate, 30 tons of carbon, 7 tons of NO_2, 5 tons of sulphur oxides (Asgher and Singh, 2003). Smith (1981) reported that sensitive species of plants show visible signs of damage to sulphur oxides at a concentration of 1850µg/m^3 for 1 hour, 500µg/m^3 for 8 hours. Sulphur dioxide causes foliar injury, physiological disorders and biochemical alterations on vegetation (Irshad *et al.* 2011). Short term investment of SO_2 damaged photosystem-II, decreased the fluidity of thylakoid membrane and affected the process of electron transport (Liu *et al.* 2007).

Considering the damaging effect of brick kiln emission on vegetation the present work was under taken to evaluate the adverse effect of brick kiln emission on chlorophyll content of *Cassia tora*.

MATERIAL & METHODS

Fresh leaves of *Cassia tora* were collected 50m and 100m away from brick kilns of Katihar. Three brick kilns Bidhiraj industries Pvt., Dehariya road, Rose bricks, Amlatola road and Amba bricks, Katihar Manihari road were selected for the study. Fresh leaves of *Cassia tora* were also collected one km away from brick kilns. Leaves were brought to

laboratory and chlorophyll isolated from each sample. From each site, 5 samples of leaves were collected.

Estimation of chlorophyll: 250gm of fresh leaves were cut into small pieces and put into 25ml of 80% Acetone and kept for 24 hours in dark. The absorbance was taken with 645nm and 663nm in Spectrophotometer. Total chlorophyll was estimated by the formula as described by Arnon (1949):

$$Total\ Chlrophyll\ (mg/g) = \frac{20.2(A\ 645) + 8.02\ (A\ 663)}{1000\ X\ W}\ X\ V$$

Where,

A_{645}= Absorbance at 645nm

A_{663}= Absorbance at 663nm

W = Weight of leaves

V = Volume of Chlorophyll extract

RESULT

Leaf samples collected one km away from brick kiln were considered as control. Brick kilns were labelled as A for Bidhiraj industries, B for Rose bricks and C for Amba bricks.

Table 1- Chlorophyll content of leaves near Bidhiraj industries and Control

Sample leaves	Site	Chlorophyll content	Av. Chlorophyll (mg/g)
Sample-I	50m away from brick kiln	0.30 mg/g	0.296 mg/g
Sample-II		0.28 mg/g	
Sample-III		0.31 mg/g	
Sample-IV		0.30 mg/g	
Sample-V		0.29 mg/g	
Sample-I	100m away from brick kiln	0.27 mg/g	0.266 mg/g
Sample-II		0.25 mg/g	
Sample-III		0.28 mg/g	
Sample-IV		0.26 mg/g	
Sample-V		0.27 mg/g	
Sample-I	Control	0.39 mg/g	0.386 mg/g
Sample-II		0.37 mg/g	
Sample-III		0.39 mg/g	
Sample-IV		0.38 mg/g	
Sample-V		0.40 mg/g	

Table 2- Chlorophyll content of leaves near Rose bricks and Control

Sample leaves	Site	Chlorophyll content	Av. Chlorophyll (mg/g)
Sample-I	50m away from brick kiln	0.33 mg/g	0.346 mg/g
Sample-II		0.34 mg/g	
Sample-III		0.36 mg/g	
Sample-IV		0.35 mg/g	
Sample-V		0.35 mg/g	
Sample-I	100m away from brick kiln	0.32 mg/g	0.310 mg/g
Sample-II		0.31 mg/g	
Sample-III		0.31 mg/g	
Sample-IV		0.32 mg/g	
Sample-V		0.29 mg/g	
Sample-I	Control	0.39 mg/g	0.386 mg/g
Sample-II		0.37 mg/g	
Sample-III		0.39 mg/g	
Sample-IV		0.38 mg/g	
Sample-V		0.40 mg/g	

Table 3- Chlorophyll content of leaves near Amba bricks and Control

Sample leaves	Site	Chlorophyll content	Av. Chlorophyll (mg/g)
Sample-I	50m away from brick kiln	0.34 mg/g	0.352 mg/g
Sample-II		0.35 mg/g	
Sample-III		0.36 mg/g	
Sample-IV		0.35 mg/g	
Sample-V		0.36 mg/g	
Sample-I	100m away from brick kiln	0.32 mg/g	0.312 mg/g
Sample-II		0.31 mg/g	
Sample-III		0.30 mg/g	
Sample-IV		0.31 mg/g	
Sample-V		0.32 mg/g	
Sample-I	Control	0.39 mg/g	0.386 mg/g
Sample-II		0.37 mg/g	
Sample-III		0.39 mg/g	
Sample-IV		0.38 mg/g	
Sample-V		0.40 mg/g	

Fresh leaves of *Cassia tora* were collected 50 meter and 100 meter away from the three brick kilns. Leaf samples were taken from 5 different plants at each spot. Chlorophyll content of leaves were determined. It was observed that chlorophyll content in leaves decreased near brick kilns.

Chlorophyll content in leaf samples near Bidhiraj Industries Pvt. found 0.296mg/g at a distance of 50 meter from brick kiln and 0.266mg/g at a distance of 100 meter (Table 1). Decrease in chlorophyll was greater at a distance of 100 meter. Chlorophyll content in leaves near Rose brick was as 0.346mg/g at a distance of 50 meter and 0.310mg/g at a distance of 100 meter (Table 2). Chlorophyll content near Amba bricks was recorded as 0.352mg/g and 0.312mg/g at a distance of 50 meter and 100 meter respectively (Table 3). In control plants, chlorophyll content of leaves was recorded as 0.386mg/g. Loss of chlorophyll in leaves near Bidhiraj Industries occurred 0.09mg/g and 0.12mg/g at a distance of 50 meter and 100 meter respectively. Loss of chlorophyll content in leaves near Rose bricks was observed as 0.04mg/g and 0.076mg/g at a distance of 50 meter and 100 meter respectively. Loss of chlorophyll in leaves near Amba bricks was recorded as 0.03mg/g and 0.074mg/g at a distance of 50 meter and 100 meter respectively (Fig. 1).

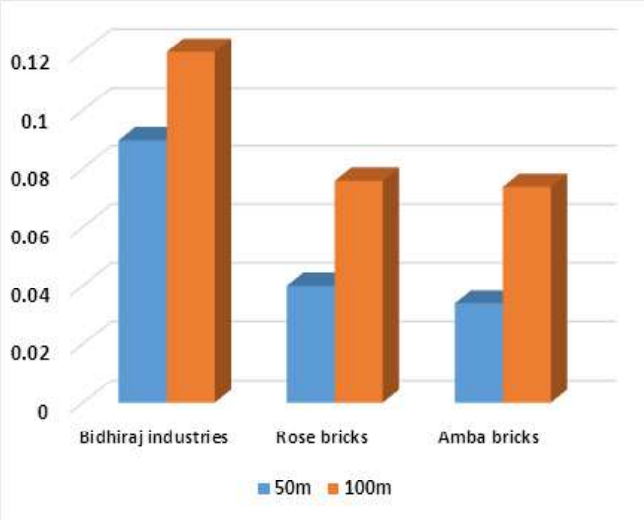

Fig. 1- Loss of chlorophyll (mg/g)

Percentage loss of chlorophyll was observed as 9% and 12% near Bidhiraj industries at a distance of 50 meter and 100 meter respectively. 4% and 7.6% near Rose bricks at a distance of 50 meter and 100 meter respectively. 3.4% and 7.4% near Amba bricks at a distance of 50 meter and 100 meter respectively (Fig. 2).

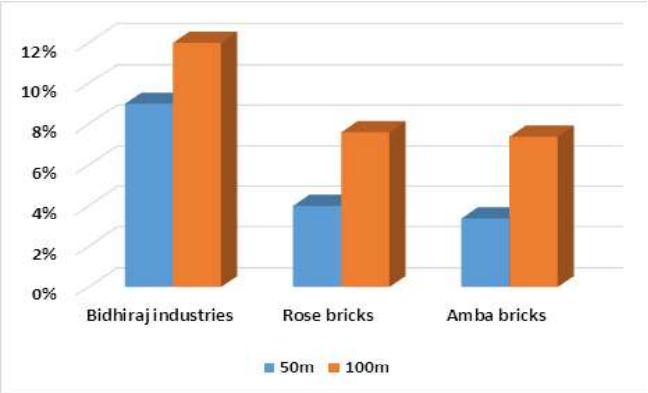

Fig. 2- Percentage loss of chlorophyll near brick kilns

CONCLUSION

Brick kiln emissions have damaging effect on vegetation. In the present work, effect of brick kiln emission on chlorophyll content in leaves from *Cassia tora* was studied. Chlorophyll content in leaves decreased near brick kilns. Loss of chlorophyll in leaves was greater at a distance of 100m in comparison to a distance of 50m.

Chlorophyll content in leaves near Bidhiraj industries was observed as 0.296 mg/g and 0.266 mg/g at a distance of 50 meter and 100 meter respectively. Chlorophyll content in leaves near Rose bricks was observed as 0.346 mg/g and 0.310 mg/g at a distance of 50 meter and 100 meter. Chlorophyll content of leaves near Amba bricks was observed as 0.352 mg/g and 0.312 mg/g at a distance of 50 meter and 100 meter respectively. In control plants, chlorophyll content was recorded as 0.386 mg/g. Loss of chlorophyll per gram leaf was recorded as 0.09 mg and 0.12 mg near Bidhiraj industries at a distance of 50 meter and 100 meter. Loss of chlorophyll per gram leaf was recorded as 0.04 mg and 0.07 mg near Rose brick at a distance of 50 meter and 100 meter respectively. Loss of chlorophyll content per gram leaf was recorded as 0.034 mg and 0.074 mg at a distance of 50 meter and 100 meter respectively.

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