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Effect of air pollutants on chlorophyll content of some crop plants near Rattan India Amravati thermal power project Amravati, Maharashtra, India

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Abstract
The present investigation was carried out to evaluate the impact of air pollutants on chlorophylls content of crop plants *viz Cajanus cajan, Gossypium herbaceum, Cicer arientium, Triticum, Pennisetum glaucum* cultivated in the vicinity of Rattan India Amravati Thermal project Amravati. The crops grown near to the Sant Gadge Baba Amravati University were selected as a control. The crops grown near to the polluted site shows reduction in chlorophyll contents. *Cicer arientium* and *Pennisetum glaucum* were more sensitive to the air pollutants showing severe decrease in chlorophyll pigments i.e 0.021 and 0.062 ug/ml respectively. However, the level of total chlorophyll content was found to higher in *Cajanus cajan* (1.25 ug/ml) belongs to non polluted site as compare to *Cajanus cajan* (0.80 ug/ml) of polluted site.
Conclusion: The crops cultivated in the vicinity of industrial zone shows reduction in chlorophyll contents as compare to the crops grown in least polluted area. The continues increase in environmental air pollution leading to decrease in crop productivity.

Keywords: air pollutants, chlorophyll content, crops

Introduction
The maintenance of quality of air in the environment is a biggest challenge to the countries across the globe. To fulfil the increased demands of energy, food, shelter and other necessary requirements. The fast growth in industrial sector is responsible for damaging the quality of air particularly in developing countries of the world. The oxides of nitrogen and sulphur and particulate matters constitute as the major proportions for the gaseous and particulate emissions from industries and automobile (Agbaire and Esiefarienrhe, 2009) [1]. The continues increase in the level of pollutants in environment deteorites the quality of air which may leads to various health issues especially respiratory disorders in human and also found to cause various effects on plants growth and development. Sulphur dioxide, fluorides and peroxyacyl nitrate recorded as common air pollutants that cause the change in color of leaf tissue into white, yellow and broun. As the chlorophyll is one of the principal photoreceptor in photosynthesis (Joshi and Swami, 2007) [5]. The exposure of air pollutants to the leaves responsible for decrease in the level of photosynthetic pigments like chlorophyll and carotenoids which causing reduction in the productivity of plants. (Nithamathi, C P., and Indir A V, 2005) [8]. The photosynthetic ability of plants get adverly affected when they are exposed with high level of air pollutants (Govindaraju. M *et al*., 2010) [4]. The continues assessment of impact of air pollutants on plants growth and development playing crucial role to detect the sensitivity of plants and this will help to monitor the level of air pollutants in study area.

Material and Method
Sample Collection
The fresh leaves samples of crop plants under study viz *Cajanus cajan, Gossypium herbaceum, Cicer arientium, Triticum, Pennisetum glaucum* were collected from the polluted site of Rattan India Thermal Power Project, Amravati (M.S) India. For the control (Non-polluted Site) the random samples of crop plants cultivated near to Sant Gadge Baba Amravati University was collected.

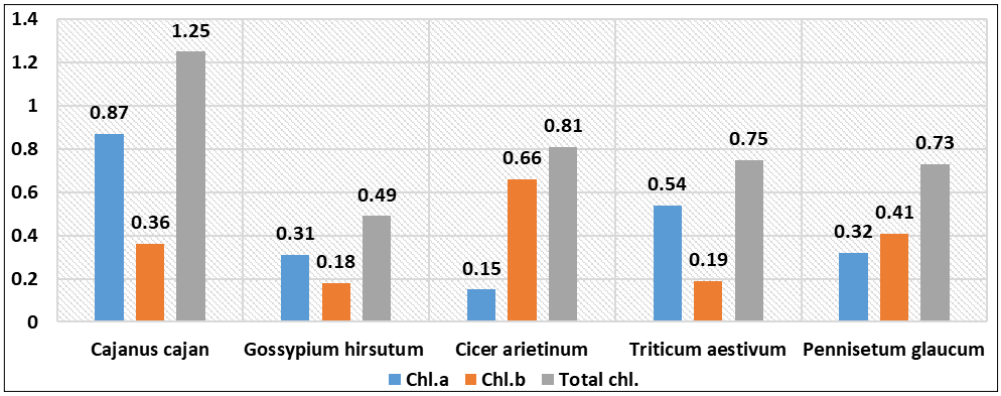
Extraction and determination of Chlorophyll contents.
Chlorophyll ‘a’, ‘b’ and total chlorophylls were extracted from the leaves of crop plants selected for the study by using the method of Maclachlam and Zalik (1963) [7]. One gram of fresh leaf samples were macerated in 10ml of 80% (v/v) acetone and centrifuged at 1000 rpm for 10 minutes to clear the suspension supernatant, which contained soluble pigment and was used for the determination of chlorophylls. One ml of solution was used for detection of chlorophyll content by spectrophotometer; absorbance of the extract was recorded at 663 and 645nm on spectrophotometer against 80% (v/v) acetone blank.

Calculation of chlorophyll contents
The amount of chlorophyll i.e. Chlorophyll a, Chlorophyll b and total Chlorophyll was calculated according to Arnon D. I. (1949) by using following formula:
Chlorophyll (a) in mg/g tissue = 12.7 (A663) - 2.69 (A645) × V / 1000 × W
Chlorophyll (b) in mg/g tissue = 22.9 (A645) - 4.68 (A663) × V/1000 × W
Total chlorophyll (mg per g tissue) = 20.2 (A645) +8.02(A663) × V/1000 × W

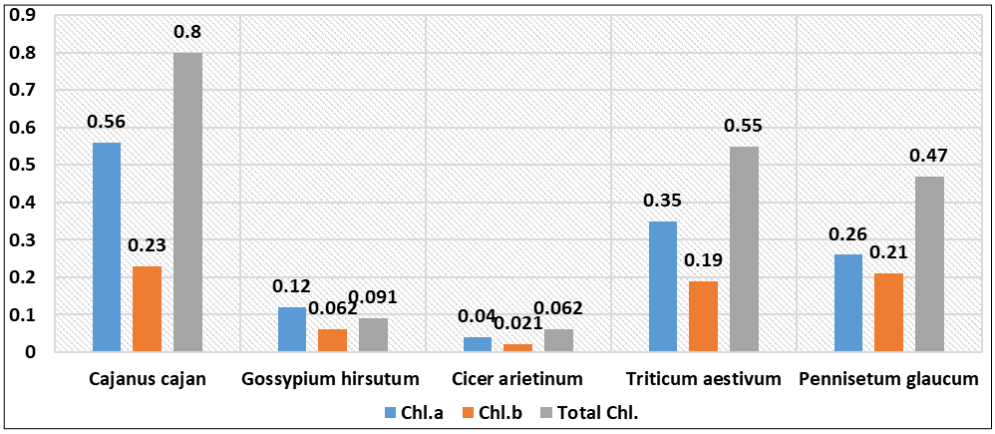
Observation and Results

Table 1: spectrophotometric determination of Chlorophyll 'a', Chlorophyll 'b' and total chlorophyll in ug/ml from control site (Non-Polluted) and polluted site under study.

S. No	Name of plant	Non-Polluted Site (Control)			Polluted Site		
		Chl.a	Chl.b	Total Chl.Ug/ml	Chl.a	Chl.b	Total Chl.ug/ml
1	*Cajanus cajan*	0.87	0.36	1.25	0.56	0.23	0.80
2	*Gossypium hirsutum*	0.31	0.18	0.49	0.12	0.062	0.091
3	*Cicer arietinum*	0.15	0.66	0.81	0.040	0.021	0.062
4	*Triticum aestivum*	0.54	0.19	0.75	0.35	0.19	0.55
5	*Pennisetum glaucum*	0.32	0.41	0.73	0.26	0.21	0.47



Graph 1: Variation in chlorophyll content from non-polluted site in ug/ml.



Graph 2: Variation in chlorophyll content from polluted site in ug/ml.

Discussion

The present investigation deals with the impact of air pollutants on the chlorophyll contents of crop plants selected under study. From the observations it was revealed that the *Cajanus cajan* belonging to polluted site was least affected as compare to the other crops selected for investigation. Moreover, the *Cicer arietinum* and *Gossypium hirsutum* was found to be more sensitive to the industrial pollutants leads to severe decrease in the chlorophyll contents i.e 0.021 and 0.062 ug/ml respectively (shown in graph No.2). Patidar S. *et al*., (2016) [9] reported that the significant decrease in chlorophyll pigment of samples of *Mangifera indica* belongs to polluted sites. However, the samples from non-polluted sites found to be increase in the content of chlorophylls in which *Cananus cajan* shows maximum chlorophyll 'a' contents (shown in graph 1). The *Cicer arietinum* shows highest chlorophyll 'b' concentration as compare to other crop plants belongs to non- polluted sites. The sensitivity and tolerance level of plants towards the air pollutants is variable and observed by many researchers. Higher the pollutants level leads to decrease in the contents of chlorophylls. The air pollutants, fly ash and dust particles shown severe impact on the physiological level of photosynthetic pigments. Moreover, the dusted leaf surface leads to decrease in photosynthesis (Kalyani V. 1995) [6]. The impacts of air pollutants on photosynthetic pigments depend on the sensitivity of plants. Increased level of automobile pollution responsible for decrease in chlorophyll content in higher plants reported by (Chandawat *et al*., 2011) [3].

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