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Effect of Dust on the Leaf Attributes of Some Selected Tree Species at Stone Crusher Site

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Abstract: ***Crusher industries are one of the major source of dust pollution. Dust pollution represents a threat to both environment and the human health and cause serious health hazard owing to their ability to remain suspended for long periods of time and travelling long distances in the atmosphere. Trees can play a significant role in capturing these suspended dust pollutants. The main objective of this research paper has to study "Effect of stone crusher dust on the leaf attributes of the tree species growing along the industrial site". Five young and matured trees leaves have selected from different tree species from industrial site. The selected tree species are i.e. Azadirachta indica (Neem), Saraca asoca (Ashok), Syzygium cumini (Jamun), Tectona grandis (Sagaun).Samples of leaves have collected in a transparent polythene. The study leaf attributes are leaf area, specific leaf area, relative water content, leaf nitrogen content, leaf phosphorus content, leaf extract pH, total chlorophyll content, total carbohydrate and dust load. These are the parameters, which have used in this research. Results showed significant effect of site and species for dust on the leaf attributes. Every species have showed different results. Some species have showed the maximum amount of dust on leaf attributes and some species have showed the minimum amount of dust on leaf attributes. Based on results of stone crusher dust on plants, we can easily identify some of them as a biomonitor or a tolerance species in polluted area.***

Keyword: dust pollution, dust load, leaf attributes, biomonitor.

I. INTRODUCTION

Dust pollution refers to the presence tiny solid particles suspended in the air. These particles are often called as particulate matter (PM). Dust pollution represents a threat to both the environment and the human health (Prabhat Kumar Rai2016). PM cause serious health hazard owing to their ability to remain suspended for long periods of time and travelling long distances in the atmosphere. Stone crushing operation releases a substantial amount of fugitive dust, which not only pollute the environment, but also pose a health hazards to the workers and the surrounding population. The major sources of dust pollution include suspension of soil, agriculture related activities, road dust, vehicular exhaust, power plants, construction activities, brick kilns and cement factories etc. (Karanasiou A et al.2014). Environmental contamination and human exposure with respect to dust or PM pollution have dramatically increased during the last decade, particularly in developing countries like India (Rai, 2013; Rai and Panda, 2014; Rai, 2016). Dust interception is important for improving air quality near plants (Prajapati, 2012). Deposition of the crushing dust on pigmentation can changed chlorophyll content in plant (Jitin Rahul 2013). Plants play role in removal of particulate matters from ambient air of industrial as well as urban regions by intercepting and retaining them on their leaf surface. The foliage of plants acts as persistence absorber and filter of air (Freer-Smith et al.1997, Prustly et al. 2006, Nowak et al. 2006). Leaves of plants can effectively air particulates and reduce air pollution (Hofman et al. 2014, Lin et al. 2017). Leaf dust accumulation and its effect plant species (Leela et al. 2021).The particulate matters inflict foliar injuries, yield reduction and photosynthetic and transpirational changes (Kumar et al. 2020). The cuticular and epidermal characteristics of leaves respond quantitatively to dust pollution and can therefore be used as simple and practical bioindicators of pollution levels in a local environment (Kwak et al., 2020 and Molnár et al., 2020). Leaf is the most sensitive part to be affected by dust pollution instead of all other plant parts such as stem and roots. The response of the plant to dust accumulation may vary according to different species, as dust deposition fluctuates with plant species due to leaf orientation, leaf surface geometry, Phyllotaxy, epidermal and cuticular features, leaf pubescence, height and canopy of roadside plants. The objective of the study has to analyse the effect of stone crusher dust on the leaf attributes of tree species growing along the industrial site (Bharatkoop Stone Crusher area). Observed leaf attributes were: leaf area (LA), specific leaf area (SLA), relative water content (RWC), leaf phosphorus content (LPC), leaf nitrogen content (LNC), total chlorophyll content (Chl), total carbohydrate content and dust load (DL), leaf extract pH.

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II. MATERIAL AND METHODOLOGY

A. *Study Area*

The present investigation include one site, Bharatkoop. It is a small village of distt. Chitrakoot, (UP). Stone crusher mile\area of Bharatkoop is geographically located at latitude 250^0 21'N and longitude 800^0 77E.

B. *Species Selection*

Four species has selected *Azadirachta indica* (Neem), *Saraca asoca* (Ashok), *Syzygium cumini* (Jamun) and *Tectona grandis* (Sagaun) belonging to family Meliaceae, Fabaceae, Myrtaceae and Lamiaceae respectively. These species are presented along the stone crusher site.

C. *Material*

Five young and matured leaves have collected from selected tree species from industrial site. Leaves have collected in a seal packed transparent polythene. Leaves have collected in winter of December.

D. *Methodology*

The four tree species have marked for the analysis of crusher dust on the leaf attributes. Dust load has measured following the methodology of Prustly et al. (2005). The leaf sample have washed in Petridis containing 50ml of distilled water with the help of brushes and forceps. The amount of dust has calculated by taking the initial and final weight of Petridis in which leaf samples have washed and total area of leaf in cm^2. RWC has determined by using Liu and ding (2008) method. Leaf area has determined by using graph method. Chlorophyll content has determined by using (DMSO) method. It has determined by taking 0.5 g of leaf (deveined) and 10 ml of (DMSO) will be added in a beaker, mouth of the beaker has covered with foil paper and put it in oven at 80^0. Incubation time varies according to the leaf (type, morphology), incubation have stopped after complete discoloration of leaf. The above solution have cooled to room temperature and O.D. has taken at 645 and 663 nm using spectrophotometer. Marked leaves have oven dried at 60^0 C for 72 h to estimate their dry weights. Using the leaf area and dry weight. SLA has determined. LNC has determined by using Microkjeldahl method as given by Piper, 1966. LPC has determined by using Ammonium Molybdate APHA - 4500 PD. Total carbohydrate has determined by the Phenol Sulphuric method. For the determination of leaf extract pH, leaf samples have homogenized with distilled water and pH of the slurry has measured using the pH meter. The leaves have collected in the winter of December.

III. RESULT

The results obtained by measuring the nine Physio-biochemical parameters or leaf attributes of plants namely: Dust load (DL), total chlorophyll content, total carbohydrate, leaf area (LA), specific leaf area (SLA), leaf nitrogen content (LNC), leaf phosphorus content (LPC), relative water content (RWC), leaf extract pH. Results showed significant effect of stone crusher dust on the leaves of selected tree species. Every tree species have shown different values of parameters.

Table.1 Results of leaf attributes and parameters on the leaf of selected tree species.

Parameters	Methods	*Azadirachta indica*	*Syzygium cumini*	*Saraca asoca*	*Tectona grandis*
Dust load	Prustly et al. 2006	3.33	5.291	0.76	0.083
Total carbohydrate	Phenol sulphuric	3.80	3.70	4.50	6.50
Total chlorophyll	DMSO extraction	41	0.70	0.84	0.6181
Leaf area	Graph method	10	83.50	98.50	275
Specific leaf area	Using the leaf area and dry weight.	169.26	77.52	285.62	63.79
Leaf nitrogen content	Microkjeldahl APHA-4500 Norg 2017	7252.00	4172	9688	1764
Leaf phosphorus content	Ammonium Molybdate APHA - 4500 PD	0.017	0.01	0.017	0.0088
Relative water content	Liu and ding (2008)	60.73	89.74	70.25	44.68
pH	Leaf extract pH meter	8.70	5.10	6.75	6.15

IV. DISCUSSION

The table 1 showed that leaves have collected from industrial site has different value of all the parameters in each species. In crusher site *Tectona grandis* (0.83) leaf has maximum amount of dust load where, *Azadirachta indica* (3.33) has minimum amount of dost load. Syzygium *cumini* has (5.29) of dust load on leaf. *Saraca asoca* has (0.76) of dust load on leaf. *Tectona grandis has max.* amount of total carbohydrate (6.50) and *Syzygium cumini* has min. amount of total carbohydrate (3.70). *Azadirachta indica* has 3.80 total carbohydrate and *Saraca asoca* has 4.50 total carbohydrate. *Saraca asoca* has max. amount of total chlorophyll (0.84), and *Azadirachta indica* has min. amount of total chlorophyll (41). *Syzygium cumini* has (0.70) total chlorophyll and *Tectona grandis* has (0.61) total chlorophyll. *Tectona grandis* has max. of leaf area 275 where, *Azadirachta indica* has min. leaf area 10. *Syzygium cumini* has 83 leaf area and *Saraca asoca* has 98 leaf area. Max. SLA has found in *Saraca asoca (*285*)* and min. SLA has found in *Tectona grandis* (63). *Azadirachta indica* has (169) SLA and *Syzygium cumini* has (77) SLA. *Saraca asoca* has max. amount of LNC (9688) and *Tectona grandis* has min. amount of LNC (1764). *Azadirachta indica* has (7252) amount of LNC and *Syzygium cumini* has (4172) LNC. *Tectona grandis* has max. amount of LPC (88) where, *Syzygium cumini* has min. amount of LPC (0.01). *Azadirachta indica* and *Saraca asoca* has same amount of LPC (0.017). *Syzygium cumini* has max. amount of RWC (89.7) where, *Tectona grandis* has min. amount of RWC (44.6). *Azadirachta indica* has (60.7) RWC and *Saraca asoca* has (70.2) RWC. *Azadirachta indica* has max. pH (8.70) and *Syzygium cumini* has min. pH (5.10). *Saraca asoca* has (6.75) pH and *Tectona grandis* has (6.15) pH.

V. CONCLUSION

The study shows that dust generated from stone crusher industry causes different types effects on the leaf attributes of tree species. Leaves are most suitable organ of plants to hold the dust on its upper and lower surface. Dust holding capacity of leaf determined by its size, orientation and arrangement. Dust has physical and chemical properties which damages plants tissue and restrict plant growth. When dust particles interact with plants leaf they negatively affects morphological attribute such as leaf area as well as biochemical and physiological aspects of plants. Based on the result of stone crusher dust on plants, we can easily identify some of them as a biomonitor or use as tool for environmental biomonitor.

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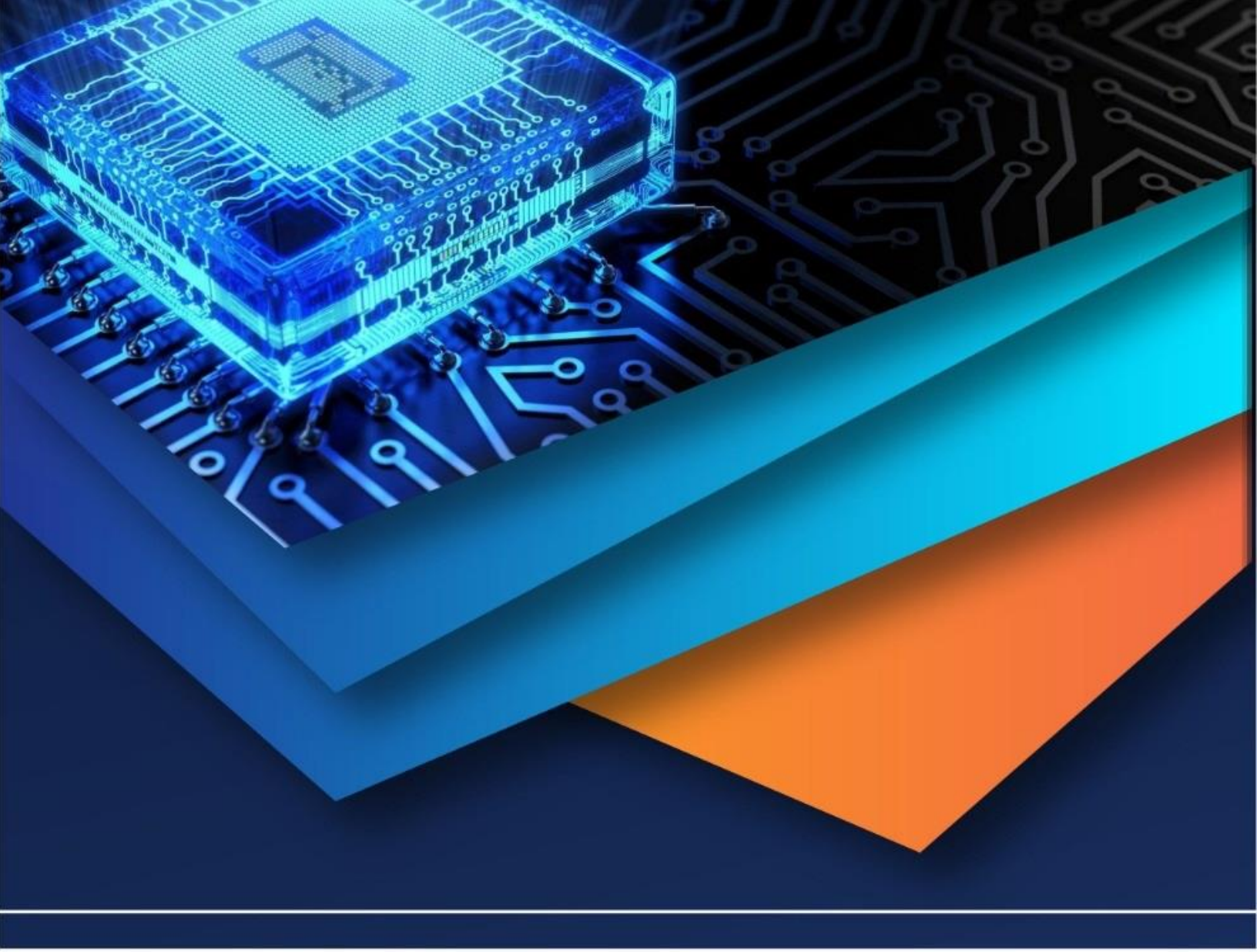

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