

Effects of Dustfall on Vegetation

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Abstract: *Dust pollution is important issue to be considered to maintain the safe quality of ambient air. Crushing units operating for production of large quantity of aggregates deposits dust particles in surrounding atmosphere. The plants and land exposed to heavy dust pollution shows variations according to the density of falling dust particles. The cover formed by deposition of dust particles decrease the pigmentation of plant leaves. The physical and chemical properties of plant tissues can change by such large dust pollution. The behavior of plant body cells depends upon the chemical properties of dust particles. Chemicals such as lead, iron, compounds of calcium etc. present in dust particles deposits on plant body and thereafter undergo changes with respect change in atmospheric conditions. Grasslands surrounded by crushing industries are being covered by large dust particles. The selected area for this research is under the influence of many crushing units. This experimentation has focused on the effect of dust pollution on plant bodies exposed to heavy dustfall. The effect of dust particles on grassland, crops, and trees were observed for few weeks. The experimental study carried out for South Katraj region shown unwanted results.*

Keywords: South Katraj, dust deposition, vegetation, effects of Crushing Industries.

1. Introduction

The protection of healthy environmental is become an important issue. Rapid deforestation and loss of vegetation helps to damage healthy environment as well as natural resources. The vegetation cover and forests are very important to balance the ecosystem. The plants show variations in their behavior such as growth, productivity etc. accordingly change in regional atmospheric conditions. Such plants and their issues are needed to undergo some research work which can save our healthy environment. Dust particles emitting from different sources affects plants life in different ways. Extra vegetation cover can minimize dust formation as well as its distribution from dust emitting sources.

The shape and area of plant leaf decides its exposure towards the accumulation of dust particles. Leaf is a structural unit of a plant produced on a stem which carry photosynthesis. The accumulation of dust particles and formation of a hard cementitious layer on plant leaves may reduce the rate of photosynthesis. Leaf Cells and the cell structure get damage due to excessive dust deposition. The small pores found in epidermis plant leaves are known as stomata. Stomata are an important in case of controlling the vapor exchange and nutrients. Stomata also carry evapotranspiration though which the requirement of water for different functions in plant body is controlled. Crushing units around selected study area generate huge dust which directly accumulates on plant leaves. Dust consists of many chemicals as it is emitted by crushing of rocks laid over this area. The contaminations of dust particle affect nutritional quality of plants and vegetables^[1]. The dust storms are responsible for the distribution of heavy dust particles. Heavy dust generation contains different sizes of dust particles ranging from 0.001-10000 μm .

2. Literature Review

As a research of Prasad and Rao stated in 1980, there are several pollutants in air and trees receive such pollutants which harm their different functions. They have proved the

effect of air pollution in petroleum-coke treated plant, *Phaseolus aureus*^[2]. D. V. Armburst (1986) experienced the loss of dry weight in cotton plant (in *Gossypium Hirsutum*) took place due to reduction in rate of photosynthesis^[3]. Loss of rate of photosynthesis was noticed due to dust deposition on cotton plants^[3].

Plant cells contain carbohydrate which is useful for many functions of plant anatomy. Chlorophyll is green pigmented material found in green plants. It is also known as chlorophyll a and chlorophyll b. The efficiency of plant functions decides the quantity of plant pigmentation and chlorophyll present in plant body^[2].

The study of Fowler et al. in 1989 have stated that dust particles and gaseous pollutants shows more effect on open woodlands than in crops having shorter height. The growth and other developments of plants are affected by dust and other gaseous pollutants. The physical and chemical properties of dust particles show different effect of plants^[2]. Jahan and Iqbal (1992) observed reduction in leaf blade area of five tree species as a result of extensive dust and SO₂ pollution.

The study of Uzma Younis et al. shown variations of dust deposition on plant body and such variations took place due to many factors like shape, structure and size of plant leaf. The observation was carried at different sites in and around Multan^[4].

Pune city shows tropical stunted semi evergreen vegetation pattern which include all types of tropical species indigenous and exotic both. The city has a tree cover distributed throughout the urban-scape. Approximately 380 species of trees are observed in Pune city. A tree census is being conducted by Pune Municipal Corporation. Almost 70% of tree census was completed up to June 2011. According to the tree census, 23.33 lakhs trees are present in 170 km² areas. Katraj, Parvati and Sinhadgad area around Pune city have the maximum forest cover as compared to other forest areas in the city^[5]. Many trees from selected study area are under the influence of heavy dust pollution

which is being spread over South Katraj region. Forest area of city is going to reduce due such activities.

3. Methodology

3.1 Materials and Methods

The geographical area of State of Maharashtra is around 3, 07,713 km² among which 61,939 km² is surrounded by green and beautiful forests^[6].

Pune district has geographical area equal to 16151 km² from which forest have occupied 1846.10 km² which is almost equal to 11 % under three forest divisions. Those total forests are classified as tropical stunted semi-evergreen forests, stunted semi- evergreen shrub forests, moist deciduous and dry deciduous forests^[1]. South Katraj region made up of hilly ranges known as Ghats like Bopdev Ghat, Dive Ghat etc. Selected study area of South Katraj is a undulated land below Bopdev Ghat and Dive Ghat. Both ghat ranges connect Pune to Saswad town at its South End.

Photographical observation of selected plants was carried for 7-8 weeks. In the beginning of experimentation, selected

study area was surveyed for effect of dust on plants and few plants were marked for further observations. Crushing units running at South Yewalewadi and Wadachi Wadi are responsible for this dust pollution. The density of trees is reducing in South Katraj since last decade.

4. Results and Discussion

4.1 Effect of dust pollution on Vegetations

The heavy dust pollution was found in selected study area as the area is producing large quantity of aggregates. Dust pollution is the result of crushing industries which deposits huge dust on plant body. Some marked trees were observed time to time to study the effect of dustfall on plant life. In the observations, it was found that trees have shown large variations in their physical appearance. The heavy dust fall on the plants is shown in Figure No.1 which shows the difference between external appearance of the plant at Nigadi Pradhikaran Pune and plants which were exposed to heavy dustfall in chosen study area. The loss of vegetation was found nearby crushing unit



Figure 1: Showing Plants Exposed to different weather conditions

The dust pollution damaged many plants as dust particles deposited on plant body and formed hard layer as climatic changes took place. The hard layer formed by dust particles resist the development of trees which is shown in figure no.

2. The continuous heavy dustfall and speedy wind laden is responsible for loss of leaves from stems. Loss of green grasses is often seen nearby crushing units.



Figure 2: Showing Plant Exposed Heavy Dustfall and its impact of Plant body

Stocking and processing of aggregates harmed cover of vegetation around cluster of crushers. Dust particles emitting from sorting activity of crushed stone pieces settled on open land. Processing of aggregates on conveyor belt increases the dust emission rate. Figure No. 2 shows a plant under heavy dust pollution in selected study area. Dusty plants lost their green leaves and were seen with injured stems. Dust storms forming due to huge dust and speedy wind damaged many trees. South Yewalewadi is under developing stage since last decade. Rate of deforestation was increased for development of

nearby area. Many crushing units and necessary earth moving equipments were established at elevated locations. Impact of stone crushers was observed on crops, the rate of yield production was found to be decreased. Dust particles

entered in soil pores which blocked the circulation of air inside the soil. The lack of air circulation affected the functions of plant roots. It reduced the growth of crops. The rate of dustfall on plants leaves near Iskon temple area was found to be higher due to activities taking place at many construction sites. The heavy vehicular traffic carrying aggregates and building materials is also responsible for heavy dust pollution in this area. This area has very less density of green trees.

Dust particles have covered green surfaces of plants

leaves as shown in Figure No. 3. The loss of pigmentation was observed due to dust accumulation on plant leaves. Such effects reduced the rate of photosynthesis.

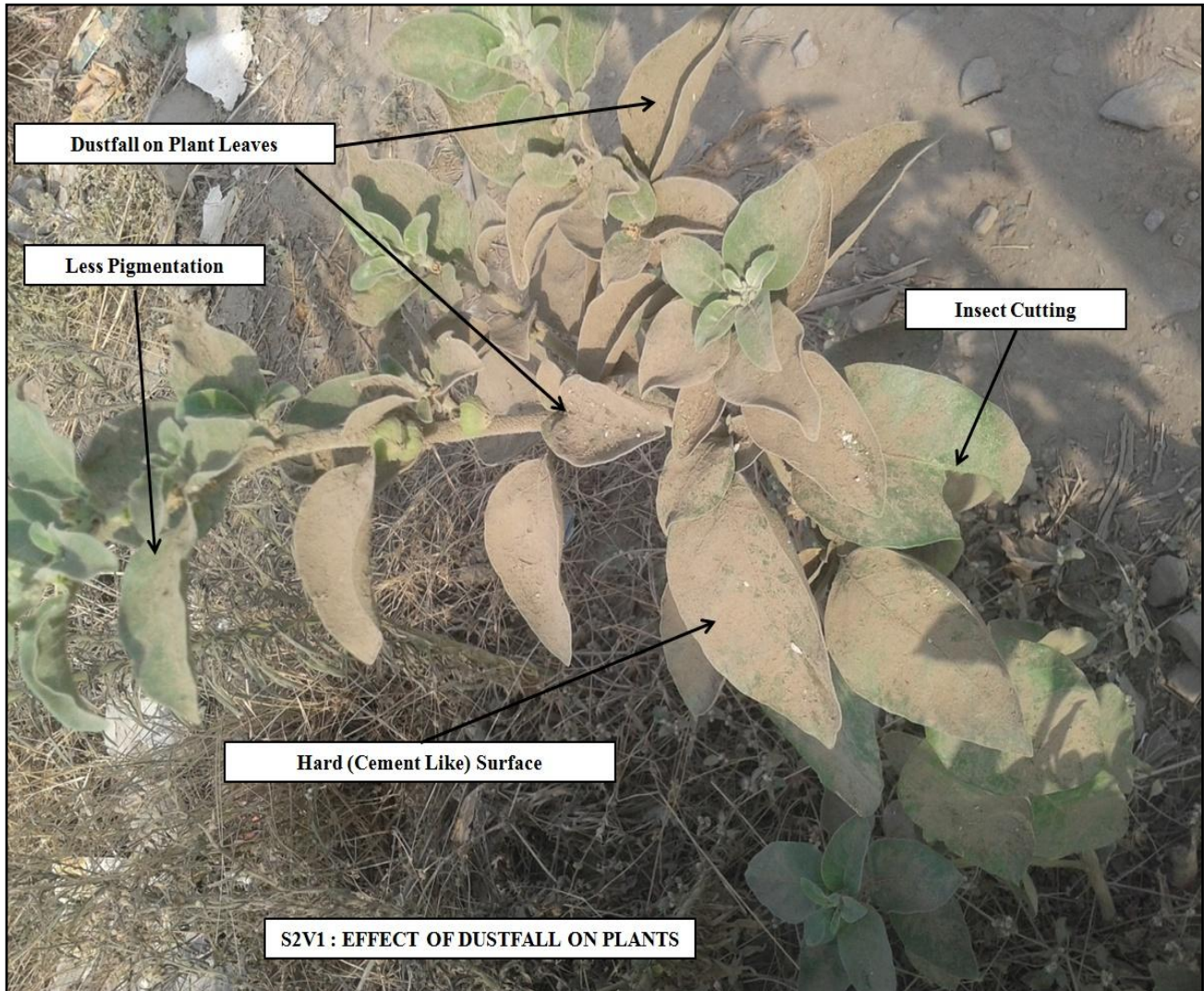


Figure 3: Showing Plant Exposed Heavy Dustfall near Iskon Temple at Yewalewadi

Layers of dust particles formed hard cementitious coverings on plant leaves. The formed cementitious products of dustfall reduced development of plant body.

The plants exposed to this heavy dust polluting area remain deposited by huge dust. The dust particles deposited on plant body provided shelters for insects and other micro-organism which cut plant body for their food.

The higher rate of dust emission in a study area allowed higher dustfall on vegetation which is responsible for reduction in growth of green grasses in the area.

Dust particles collected on grasses have dried out the green land. The loss of vegetation during site preparation of crushing units emits large dust particles and results in deforestation.

Figure 4 is showing the impact of dustfall on plant body within the study area at Yewalewadi. This figure showing a plant with large leaves exposed to dustfall. The dustfall on leaves were observed for few weeks. The rate of dustfall and changes in behavior of plant leaves were noticed. Photographical observation carried for this plant shown several changes in external appearance.

The accumulation of dust particles damaged many green cells of leaf. Marginal yellow and brown patches representing the damaged cells of leaves. Such patches formation found to be harmful for plant leaves which reduced the pigmentation. The rate of photosynthesis depends on chlorophylls presents in plant cells. The loss of cells structures affects the rate of photosynthesis and growth rate of plant affected.

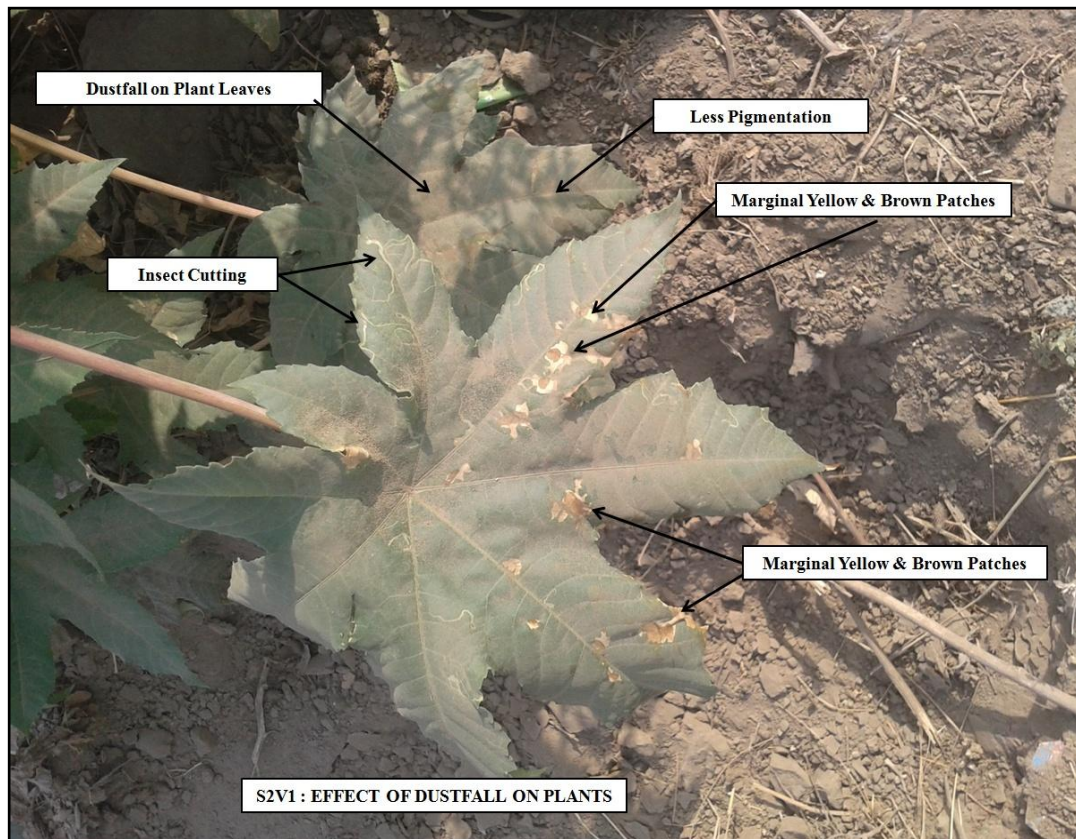


Figure 4: Showing impact of dustfall on Plant leaves

5. Conclusion

The effect of dust pollution on plants is observed in this study as it has reduced the vegetation in study area. The formation of dust layer on plant body damage plant tissue which may reduce rate of photosynthesis. Dust particles emitted from stone crushing activity reduces the pigmentation in plant leaves. Dust fall on open land reduces its fertility of soil. Deposition of dust particles exerts stresses on plant which reduces productivity of plants. Crushing activities are basically responsible for deforestation and loss of green land across the world. Preventive measures are necessary to stop deterioration of forests. Further research is needed to reduce the effect of dust pollution on living being.

References

- [1] Ghazala Shaheen, Afroz R. Khan, Muhammad Javed Khan, Masoom Fatima, Muhammad kashif Habib, "Effect of Dust Particles on the Growth of Vegetables and Orchards of Quetta City", ISSN 0976 – 044X
- [2] Saha and Padhy "Effects of stone crushing industry on Shorea robusta and Madhuca indica foliage in Lalpahari forest" – Atmospheric Pollution Research 2 (2011) 463-476
- [3] D. V. Armbrust, "Effect of Particulates (Dust) on Cotton Growth, Photosynthesis, and Respiration", Agronomy Journal Vol. 78. No. 6
- [4] Uzma Younis, Tasveer Zahra Bokhari, Muhammad Hasnain Raza Shah, Seema Mahmood and Saeed Ahmad Malik, "Dust Interception Capacity And Alteration Of Various Biometric And Biochemical Attributes In

Cultivated Population Of Ficus Carica L.", e-ISSN: 2278-3008.

- [5] Pune Municipal Corporation, "Revised city development plan for Pune - 2041, Maharashtra, under Jnnurm"
- [6] National Disaster Risk Reduction Portal, <http://nidm.gov.in/pdf/dp/Maharashtra.pdf>