4.2 Effect of Manganese Dust on Plants

Accumulation of excessive manganese (Mn) in leaves causes a reduction of photosynthetic rate (Kitao et al., 1997). Mn is readily transported from the root to shoot through phloem to other organs after reaching the leaves (Loneragan 1988). Necrotic brown spotting on leaves, petioles and stems is a common symptom of Mn toxicity (Wu 1994). This spotting starts on the lower leaves and progresses with time toward the upper leaves (Horiguchi 1988). With time, the speckles can increase in both number and size resulting in necrotic lesions, leaf browning and death (Elamin and Wilcox 1986). General leaf bronzing and shortening of internodes has been documented in *Cucumis sativus* (cucumber) (Crawford et al., 1989, a and b). Anathor common symptom is known as "crinkle-leaf", and it occurs in the youngest leaf, stem and petiole tissue. It is also associated with chlorosis and browning of the tissue (Wu 1994; Bachman and Miller 1995). Roots exhibiting Mn toxicity are commonly brown in colour (Le Bot et al., 1990; Foy et al., 1995) and sometimes crack (Foy et al., 1995). Chlorosis in younger leaves by Mn toxicity is thought to be caused through Mn-induced Fe deficiency (Horst 1988). Excess Mn is reported to inhibit synthesis of chlorophyll by blocking a Fe-concerning process (Clarimont et al., 1986). Manganese toxicity in some species starts with chlorosis of older leaves moving toward the younger leaves with time (Bachman and Miller 1995). This symptom starts at the leaf margins progressing to the interveinal areas and if the toxicity is acute, the symptom progresses to marginal and interveinal necrosis of leaves (Bachman and Miller 1995).

4.3 Effect of Iron on Plants

Iron as an essential element for all plants has many important biological roles in the processes as diverse as photosynthesis, chloroplast development and chlorophyll biosynthesis. Iron is a major constituents of the cell redox system such as heme proteins including cytochromes, catalase, peroxidase and leghemoglobin and iron sulfur proteins including ferredoxin, acontiase and superoxide disumutase (SOD) (Marschner 1995).

4.4 Effect of Cement Dust on Plants

The cement industries also plays a vital role in the imbalances of the environment and produces air pollution hazards (Stern 1976). These dust particulates are causing large scale deforestation destruction of biota (Panda, et.al., 1996) and other natural resources. Among these deposition of cement kiln dust in large quantities around cement factories causes changes in soil's physical and chemical properties (Asubiojo, et.al., 1991; Saralabai 1993). The effect of such deposition affects the growth and biochemical characteristics of field crops has also been widely studied (Prasad and Inamadar 1990; Prasad et al., 1991). According to Farmer (1990) cement industrial region are confronted with the problems of alkalization due to high deposition of alkaline cement dust and their ash in the pollution complex. In addition, the growth of quarrying and open-cast mining suggests the deposition on vegetation may be increasing.

4.5 Effect of Bauxite Dust on Plants

Bauxite mining is one such major open cast mining activity which has significant negative impact on the local environment. The major threats of this activity are dust pollution, vegetation loss, forest fragmentation and biodiversity loss, negative impact on water resources, generation of wastelands and social impact. The study revealed that the legal and illegal mining activity has initiated serious environmental degradation in the region. Though mining initially provided job opportunities for limited inhabitants and generated revenue to Government, it would last only for a short period. However, the damage caused to the local ecology as a result of the changed land use is permanent (Rohan and Samant, 2012).

4.6 Effect of Marble Dust on Plants

The paper describes the effect of marble dust on plants. Trees species growing were selected and various morphological characteristics were studied such as leaf area dry weight ratio (LADWR), Dust retaining capacity (DRC) and Chlorophyll content. In the study the effects of marble dust on selected tree species was observed. LADWR was recorded maximunm 217.90 cm2 g-1 dry wt. in Polyalthia longifolia and minimum 98.74 cm2 g-1 dry wt. in Ficus religiosa in Nindar whereas The DRC was observed maximum 178.51 mg cm-2 in Azadirachta indica as well as minimum recorded 66.41 mg cm-2 in Thevetie pervvianain. However the Total Chlorophyll Content was also determined and it was found maximum in Bougainvillea i.e. 2.949 mg g-1(fresh wt.) whereas minimum 0.784 mg g-1 (fresh wt.) in Ficus religiosa (Saini, et.al., 2011).

5. Conclusion and Future Aspects

The physiological response of plants reveals many different direct routes of action through which dust can affect plants. Mining dust may also exacerbate secondary stresses, such as drought, insects and pathogens, or allow penetration of toxic metals or phytotoxic gaseous pollutants. Effect of mining dust on natural communities may alter the competitive balance between species in a community. These changes in the vegetation may also affect animal communities, from vertebrate's grazers to soil invertebrates. This may, for example, alter cycles of decomposition. Response of individual species may be positive or negative depending on the particular situation, and only detailed studies may reveal the main reason behind any observed changes. There have, unfortunately, been only a limited number of studies at the community level.

In is evident from this review of the literature that there are many gaps in our knowledge of the effects of mining dust. Until research into these areas in undertaken, the ability of those with responsibility for plant and crop protection, or preventing the deterioration of natural and semi-natural habitats, to address developments that may threaten sites will be inadequate. It is important therefore, that current trends in dust emissions are identified as well as the vegetation types that are likely to be affected by such emission.

Thus, it is evident from the several research reports that judicious use and presence of mining dust have toxic effect on plants, animals and other living organisms and affects the same after certain limits. Therefore, it is well needed to intensify the research program for better understanding of effect of mining dust on plants and allied areas to maintain the ecological harmony.

Reference

[1] Asubiojo, O.I., Aina, P.O and Oluwole, A.F (1991), "Effect of cement production on the elemental composition of soil in the neighbouhood of tow cement factories", *Water Air Soil pollution*, 57-58, 819-828.

[2] Bachman, G.R and Miller, W.B (1995), "Iron chelate inducible iron/manganese toxicity in zonal geranium", *J. Plant Nutri.*, 18, 1917-1929.

[3] Clarimont, K.B, Hagar, W.G, Davis, E.A (1986), "Manganese toxicity to chlorophyll synthesis in tobacco callus", *Plant Physiolo*., 80, 291-293.

[4] Crawford, T.W, Stroehlein, J.L, Kuehl, R.O (1989), "Manganese and rates of growth and mineral accumulation in cucumber", *J. Am Soc. Horti. Sci*., 114, 300-306.

[5] Demirevska-Kepova K, Simova-Stoilova L, Stoyanova Z, Holzer R, Feller U (2004), "Biochemical changes in barley plants after excessive supply of copper and manganese", *Environ Exp. Bot*., 52, 253-266.

[6] Elamin, O.M and Wilcox, G.E (1986**a**), "Effect of Manganese nutrition on muskmelon growth and manganese toxicity", *J Am Soc Horti. Sci*., 111, 582-587.

[7] Elamin, O.M and Wilcox, G.E (1986**b**), "Effect of Manganese nutrition on watermelon growth and manganese toxicity". *J. Am. Soc. Horti. Sci*., 111, 582-587.

[8] Farmer, A.M (1993), "Effect of dust on vegetation- A review. Environmental pollution", 79, 63-75.

[9] Fernandes, J.C, Henriques, F.S (1991), "Biochemical, physiological and structural effects of excess copper in plants", *Bot Rev*, 57, 247-273.

[10] Fennelly, P.F. (1195), "Primary and secondary particulates as pollutants". *Journal Air pollut. Contr. Assoc*., 25, 697-704.

[11] Foy, C.D, Weil, R.R, Coradetti, C.A (1995), "Differential manganese tolerances of cotton genotypes in nutrient solution", *J. Plant Nutrition*, 18, 685-706.

[12] Harris, P.R. (1975), "Quarrying in national parks". *Quarry management and products*. March 1975, 55-58.

[13] Hegedus, A, Erdei, S, Horvath, G (2001), "Comparative studies of H_2O_2 detoxifying enzymes in green and greening barley seedings under cadmium stress", *Plant Sci*., 160, 1085-1093.

[14] Horiguchi, T (1988), "Mechanism of manganese toxicity and tolerance of plants. IV. Effects of silicon on alleviation of manganese toxicity of rice plants", *Soil Sci. Plant Nutri*., 34, 65-73.

[15] Horstt, J (1988), ''Beschreibung der Gleichgewichtslage des ionenaustauschs an schwach saoren harzen mit hilfe eines models der oberflachenkomplexbildung", *Doctoral thesis, University of Karlsruhe, Kfk report*, 4464.

[16] J. Chatterjee, and C. Chatterjee (2000), "Phytotoxicity of cobalt, chromium and copper in cauliflower", *Environmental Pollution*, vol. 109, no. 1, 69-74.

[17] Kitao, M, Lei, T.T and Koike, T (1997), "Effect of manganese toxicity on photosynthesis of white birch (*Betula platyphylla var. japonica*) seedlings", *Physiol Plant*, 101, 249-256.

[18] Le, Bot. J, Kirkby, E.A and Beusichem, M.L (1990), "Manganese toxicity in tomato plants: effects on cation uptake and distribution", *J. Plant Nutria*., 13, 513-525.

[19] Loneragan, J.F (1988), "Distribution and movement of manganese in plants". In: Graham RD, Hannam RJ, Uren NC (eds) *Manganese in soils and plants, Kiuwer, Dordrecht*, 113-124.

[20] Marschner, H (1995), "Mineral nutrition of higher plants", 2nd edn. *Academic press*, Toronto.

[21] Mohnish Pichhode and Kumar Nikhil (2015) **a**, "Effect of Copper Dust on Photosynthesis Pigments Concentration in Plants Species", *International Journal of Engineering Research and Management (IJERM)*, Vol.2, No.2 pp.63-66, February, 2015 (Online).

[22] Mohnish Pichhode and Kumar Nikhil (2015) **b**, "Effect of Copper Mining Dust on the Soil and vegetation in India: A Critical Review", *International Journal of Modern Sciences and Engineering Technology (IJMSET)*, Vol.2, No.2 pp.73-76, February, 2015 (Online).

[23] Nriagu, J.O (1989), "A global assessment of natural sources of atmospheric trace metals". *Nature*, 338, 47-49.

[24] Nikki Phipps (2000), "The Bulb-o-licious Garden" : A bulb lover's guide to growing your favorite plants. Ed. by Nikki Phipps (2000), Publisher: lulu.com (July 19, 2010), ISBN-10: 055755733X, ISBN-13: 978-0557557332.

[25] Panda, A.K.S, Murlidhar, J and Shahoo, B.N (1996), "Seasonal water quality assessment of jajang iron and mining area", *Jr. of Industrial Pollution Control*, 12 (1), 9-14.

[26] Peplow, D (1999), "Environmental impacts of mining in Eastern Washington. Center for water and watershed studies fact sheet", *University of Washington. Seattle.*

[27] Prasad, M.S.V and Inamdar, J.A (1990), "Effect of cement kiln dust pollution on blackgram (*Vigna munga*, L. hepper)", *Proc. India Acad. Sci., (Plant Science)*, 100, 435-443.

[28] Prasad, M.S.V, Subramanian, R.B and Inamdar, J.A (1991), "Effect of cement kiln dust on *Cajanus cajan* (L.) Mill. Species", *Indian Jr. Environ. Hlth*, 33, 11-21.

[29] Reeves, R.D and Baker, A.J.M (2000), "Metal-accumulating plants", In: Raskin I, Ensley BD (eds) *Phytoremediation of toxic metals: using plants to clean up the environment*. Wiley, New York, 193-229.

[30] Rohan, J. Lad and Jay, S. Samant (2012), "Studies on the Impact of Bauxite Mining Activities on Environment in Kolhapur District", Proceeding *of International Conference SWRDM-2012", Department of Environmental Science, Shivaji University, Kolhapur*, pp.188-192.

[31] Saini Yashoda, Nagendra Bhardwaj, Radha Gautam, (2011), "Effect of marble dust on plants around Vishwakarma Industrial Area (VKIA) in Jaipur, India",

J. Environ. Biol.32, 209-212 (2011) ISSN: 0254-8704, CODEN: JEBIDP.

[32] Saralabai VC (1993), "Effect of cement kiln exhaust (Electrostatic precipitator dust) on growth, root nodule biochemistry and crop productivity in legumes through simulation studies" *Ph.D thesis, Bharathidasan University, Thiruchirapalli*. 1993.

[33] Stanton, W. (1989), "Bleak prospects for limestone", *New Scientist*, 122(1664), 56--60.

[34] Stadtman, E.R and Oliver, C.N (1991), "Metal-catalyzed oxidation of proteins", *J. Bio. Chem.* 266: 2005–2008.

[35] Stern, A.C (1976), "Air pollution, Measurement, monitoring and surveillance of air pollution", 3rd ed., *Academic press, New York.*

[36] Thomas, F, Malick, C, Endreszl, E.C, Davies, K.S (1998), "Distinct response to copper stress in the halophyte, *Mesembryanthemum crystallium", Physiol. Plant*, 102, 360-368.

[37] Wu, S (1994), "Effect of manganese excess on the soybean plant cultivated under various growth conditions", *J. Plant Nutri*., 17, 993-1003.

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