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Abstract

An increase in quarrying, open-cast mining and road traffic suggested that dust deposition onto vegetation may be increasing. This review describe the effects of copper dust on crops, grass land, tress, forest and woodland, are identified. Copper dust may affect photosynthesis, respiration, transpiration. Visible injury symptoms may other occur and generally there is decreased productivity due to affect in chlorophyll pigment. In this review present investigation, comparative studies have been done to find the effect of dust pollutant generated from the exhaust of copper open-cast mining area on the chlorophyll content of leaves. This review recommendation for future research is made in order to overcome this deficiency.

Keywords: *Mining sites, copper dust, chlorophyll pigment, plant growth.*

1. INTRODUCTION:

Mining has been one of the most common activities since ancient times and continues to remain so in the modern world. Mining is an important part of our economy. Minerals extracted raw from earth, are processed to yield basic substances such as metals, chemicals, building materials, fuel, fertilizers etc. Industrialization, urbanization, economic growth and associated increase in energy demands have resulted in a profound deterioration of air quality in developing countries like India. Oxidise of nitrogen, sulphur, heavy metals and fly-ash constitute as the major proportions for the gaseous air pigmented particulate emissions from industries, automobiles, mining areas etc. the exposure of these pollutants to the leaves cause a reduction in the concentration of their photosynthetic pigments like chlorophyll, carotenoides and xanthophylls, which affects the plants productivity, germination of seeds, length of pedicles, and numbers of flowers inflorescence. Air pollutions have become a major threat to the survaival of plants in the mining areas and industrial areas. Rapid industrialization and addition of the toxic substance to the environment are responsible for altering the ecosystem (Mudd and Kozlowski, 1975; Niragau and Davidson, 1986). Copper is a ubiquitous pollutant in the environment due the emission and atmospheric deposition of metal dust released by human activities. In addition, soils may contain elevated levels of copper because of its widespread use as a pesticide, land application of sewage sludge as well as mining and smelting activities (Alaoui-Sosse *et al.,* 2004). Copper is an essential micronutrient for normal plant metabolism (Sharma and Agrawal, 2005). Copper is involved in a number of physiological processes.

2. CHARACTERISTICS OF DUSTS:

A number of characteristics of dust are important in considering its impacts. Dust can have both a physical and a chemical impact. Dust falling onto plants may physically smother the leaves. Thus the absolute level of deposistion is important. This is affected by dust emission rates, meteorology and conditions on the leaf surface, Dust can also physically block stomata. Krajickova & Mejstrik, 1984 noted that the stomatal diameter was 8-12µm for a range of crops. Dusts are of a wide variety of sizes (Fennelly, 1975). Particulates from motor vehicles can range from 0.01-5000µm diameter (Ninomiya *et al*., 1971), though most mining areas dust is in the range of 3-100µm diameter.

3. HEAVY METAL POLLUTED SOIL:

Heavy metals are elements that exhibit metallic properties such as ductility, malleability, conductivity, cation stability, and ligand specificity. Some heavy metals such as Co, Cu, Mn, Fe, Mo, Ni, V and Zn are required in minute quantities by organisms. Other heavy metals such as Cd, Pb, Hg, and As (a metalloid but generally referred as a heavy metal) do not have any beneficial effect on organisms and are thus regarded as the "main threats" since they are very harmful to both plants and animals. The presence of Copper may affect the availability of another in the soil and hence plant.

4. EFFECT OF COPPER MINING ON SOIL & PLANT:

Copper metal are available for plant uptake are those that are present as soluble components in the soil solution or those that are easily solubilized by root exudates. Although plants require certain copper for their growth and upkeep, excessive amounts of these metals can become toxic to plants. The ability of plants to accumulate essential metals equally enables them to acquire other nonessential metals (R. Djingova and I. Kuleff, 2000). As metals cannot be broken down, when concentrations within the plant exceed optimal levels, they adversely affect the plant both directly and indirectly.

Some of the direct toxic effects caused by copper metal concentration include inhibition of cytoplasmic enzymes and damage to cell structures due to oxidative stress (F. Assche and H. Clijstres, 1990; and C. D Jadia and M. H Fulekar, 2009). For instance, a reduction in the number of beneficial soil microorganisms may also indirectly affect the growth of plants.

Like all living organisms, plants are often sensitive both to the deficiency and to the excess availability of copper and its ions as essential micronutrient, while the same at higher concentrations and more ions such as Cu, Cd, Hg, as are strongly poisonous to the metabolic activities. Researchers have been conducted throughout the world to determine the effects of toxic copper on plants (Reeves and Baker 2000; Fernandes and Henriques 1991). Contamination of agriculture soil by copper has become a critical environmental concern due to their widespread occurrence and their acute and chronic toxic effect on plants grown of such soils.

5 COPPER EFFECTS ON PLANTS:

Copper (Cu) is considered as a micronutrient for plants (Thomas *et al.,* 1998) and place important role in CO2 assimilation and ATP (Adenosine triphosphate) synthesis. Cu is also an essential component of various proteins like plastocyanin of photosynthetic system and cytochrome oxidase of respiratory electron transport chain (Demirevska-kepova *et al.,* 2004). But enhanced industrial and mining activities have contributed to the increasing occurrence of Cu in ecosystems. Cu is also added to soils from Different human activities including mining and smelting of Cu-containing ores. Mining activities generate a large amount of waste rocks and tailings, which get deposited at the surface on ground and plant leaves. Excess of Cu in soil plays a cytotoxic role, induces stress and causes injury to plants. This leads to plant growth retardation and leaf chlorosis (Lewis *et al.,* 2001). Exposure of plants to excess Cu generates oxidative stress ROS (reactive oxygen species) (Stadtman and Oliver 1991). Oxidative stress causes disturbance of metabolic pathways and damage to macromolecule (Hegedus *et al.,* 2001). Copper toxicity affected the growth of *Tectona grandis, Mangifera indica, Butia monospermous, Madhuca indica*. Copper and Cadmium in combination have affected adversely the germination, seedling length and number of lateral roots in these plants (Neelima and Reddy 2002).

6. CONCLUSION AND RECOMMENDATIONS:

The physiological response of crops and trees outlined in this review reveal many different direct routes of action through which dust can affect plants. Copper dust may also exacerbate secondary stresses, such as drought, insects and pathogens, or allow penetration of toxic metals or phytotoxic gaseous pollutants. Effect of copper dust on natural communities may alter the competitive balance between species in a community. Substrate (soil and bark) chemistry may be altered, causing changes in the balance between species. These changes in the vegetation may also affect animal communities, from vertebrate grazers to soil invertebrates. This may, for example, alter cycles of decomposition. Response of individual species may be negative or positive 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.

It is evident from this review of the literature that there are many gaps in our knowledge of the effects of copper dust. A recent survey was undertaken of regional staff of environmental management group of Malanjkhand, Balaghat (M.P.) for observations of copper dust deposition onto sites of special scientific interest. Results indicated that the dust deposition occurred throughout the Malanjkhand, Balaghat on to a wide range of vegetation types and from a wide range of sources. This also illustrated further gaps in our knowledge, e.g. the deposition of copper dust onto lowland woodland and the effects of neutral/acidic dust, e.g. copper, coal, limestone on almost any habitate. Drift from agricultural liming and fertilization, which may have a significant eutrophicating effect on nearby woodland and forest also needs to be investigated. Until research into these areas is undertaken, the ability of those with responsibility for crop protection and forest, 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 copper dust emissions are identified as well as the vegetation types that are likely to be affected by such emissions.

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Mohnish Pichhode, M.Sc in Biotechnology, Department of Biotechnology, Sardar Patel College of Technology, Balaghat affiliated to Rani Durgavati Vishwavidyalaya, Jabalpur, M.P done his project work at EMG, CSIR-CIMFR, Dhanbad, Jharkhand, India in the year 2013 and publishing very significant and important review paper which will indeed helps in understanding the effect of copper mining on nearby plant and soil.

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