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Air Pollution and its effects on Agriculture

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Abstract

The problem of air pollution has attracted special attention in India due to tremendous increase in size of population, industrialization and urbanization since last few decades. The major air pollutants of concern are identified as sulphur dioxide, nitrogen dioxide, ozone and particulate matter. Thermal power plants and transport sector is the biggest contributor of air pollution in the country. Ambient air around large industrial sources and metropolitan cities has already shown pollutant levels above the standards set by Central Pollution Control Board. India. Experimental studies conducted at Varanasi situated in upper Gangetic plains of India have indicated significant losses of agricultural production at current ambient pollutant levels in urban, suburban and rural areas. The intensity of losses, however, depends upon the pollutant concentration, duration of exposure, climatic and edaphic factors, plant species and cultivars. Pollutants either affect the plants directly by causing visible injury or indirectly growth or yield reductions without visible injury.

Key Words: *Environmental, Pollution, Agriculture.*

Introduction

The people of India mainly depend on agriculture from the ancient time. Air Pollution is a type of environmental pollution, which can further be classified into two sections- Visible air pollution and invisible air pollution. Another way of looking at Air pollution could be any substance that holds the potential to hinder the atmosphere or the well being of the living beings surviving in it.

Air Pollution contributes the adverse weather which destroys Crops, animals and agriculture. A pollutant may have a natural origin or manmade. Therefore pollutants as classified as primary and secondary. It is well known that agriculture is the single largest user of freshwater resources, using a global average of 70% of all surface water supplies. Except for water lost through evapotranspiration, agricultural water is recycled back to surface water and/or groundwater. However, agriculture is both cause and victim of water pollution.

Primary pollutants are generally produced by the natural processes such as volcanic eruptions and burning of organic fuels like coals, wood, dried crop wastes and cow dungs.

Air Pollution

Air pollution is a serious issue in India. Millions of death takes place every year due to air pollution. One of the worst agents of aerial pollution is the smoke being belched out by the chimneys of the factories and emitted by vehicles. While it cannot be totally eliminated because of the industrial expansion of the ever increasing number of motor vehicles, some measures can be taken to minimize the menace. Already enough damage has been done to human environment. Agricultural activities are yet another source of air pollution. Spraying of pesticides and insecticides, use of chemical fertilizers and manures and burning of field waste pollute the atmospheric air. Nuclear energy programme also pollutes the air. Air pollution can further be classified into two sections- Visible air pollution and invisible air pollution. Another way of looking at Air pollution could be any substance that holds the potential to hinder the atmosphere or the well being of the living beings surviving in it.

Effects of Air Pollution on Agriculture

Air pollution not only contributes to respiratory diseases in humans and damages buildings, it can also effect on agriculture. The effects of air pollution on plants develop over time and can't be undone. Some Agricultural plants are more susceptible to pollution damage than others.

Ozone

Ozone injury is evident on the upper side of the leaf and is identified by a flecked appearance consisting of many small chlorotic areas; ozone affects leaves of intermediate age. Photochemical smog is really a combination of two oxidants, ozone (03) and peroxyacetylnitrate (PAN). PAN is formed as a result of the interaction between hydrocarbons (chemicals containing only carbon and hydrogen) and nitrogen dioxide (NO2), both produced in the process of combustion (gasoline, diesel, coal, fuel oil). Injury levels vary annually and white bean, which are particularly sensitive, are often used as an indicator of damage. Other sensitive species include cucumber, grape, green bean, lettuce, onion, potato, radish, rutabagas, spinach, sweet corn, tobacco and tomato. Although yield reductions are usually with visible foliar injury, crop loss can also occur without any sign of pollutant stress. High relative humidity, optimum soil-nitrogen levels and water availability increase susceptibility. Injury development on broad leaves also is influenced by the stage of maturity.

Sulfur Dioxide

This was one of the first air pollutants to be identified and has been extensively studied for over 50 years. Nationwide, the major source of SO2 is in the use of coal and oil fired power generation plants. Major sources of sulfur dioxide are Coal-burning operations, especially those providing electric power and space heating. Sulfur dioxide emissions can also result from the burning of petroleum and the smelting of sulfur containing ores. Sulfur dioxide injury results in an interveinal bleaching of leaves, or in some mild cases, a chlorotic pattern. The following crop plants are generally considered susceptible to sulfur dioxide: barley, buckwheat, clover, oats, pumpkin, radish, spinach and tobacco. Resistant crop plants include asparagus, cabbage, celery, corn, onion and potato.

Fluoride

Fluoride toxicity is indicated by a bleaching of the tips and margins of leaves; dead tissue may flake off producing a ragged edge. Fluorides absorbed by leaves are conducted towards the margins of broad leaves (grapes) and to the tips of monocotyledonous leaves (gladiolus). Little injury takes place at the site of absorption, whereas the margins or the tips of the leaves build up injurious concentrations. Resistant plants include alfalfa, asparagus, bean (snap), cabbage, carrot, cauliflower, cucumber, eggplant, pea, pear, pepper, potato, tobacco and wheat.

Ethylene

Ethylene is primarily produced by certain chemical industries and by automotive combustion. This is a plant growth hormone, and as a result can have an effect at very low concentrations. The presence of ethylene may cause leaf -drop or failure of certain flowers to open.

Ammonia

Ammonia is NH4+. It will quickly convert to Nitrate. This will lead to good growth in the plant, Strong,green, thick, stem and leaves. If you use more, plant will not take-in other nutrients and just become happy with N. Ammonia taken up by plants is most likely to be directly assimilated and this uptake can have a strong effect on the nutrient imbalances of the plant. With root uptake in particular, anions are taken up in preference to cations. These effects interact with acidity *per se*, and are compounded by the strong correlative co-deposition of ammonia with sulphur. Evidence for uptake of gaseous and wet deposited ammonia by leaves is presented. Assimilation of ammonia by leaves releases protons which can cause cellular acidosis, and has important implications for acid-base regulation in cells. This regulation depends on intrinsic features of the plant's metabolism that is in turn dependent on the ecology of root versus leaf nitrogen nutrition under normal conditions.

BLACK CARBON

The direct impacts of Black Carbon on radiation and crop growth are straightforward: BC is an absorbing aerosol that reduces both direct and diffuse light available to plants and— all else equal—should therefore lower yields. (The main sources of BC in India are domestic biofuels—wood, dung, and crop residues for cooking—and fossil fuels. Biomass burning is also the main source of OC emissions, whereas sulfates are formed from gas-to-particle conversion of sulfur dioxide, SO_2, a main component of coal-fired power plant emissions. Scattering aerosols also reduce total surface radiation but increase the diffuse fraction; research has shown that plants are often able to more efficiently use diffuse light for photosynthesis. So we can say that the net radiative forcing of OC (once thought to be pure scattering) is in reality close to zero, and that the relative abundance of BC and sulfates is the main determinant of overall aerosol radiative forcing. We therefore include Black carban C and SO_2 emissions (as the main precursor for sulfate aerosols) in our model, and omit OC.

Chlorine

Chlorinated water is potentially dangerous to plants, but only if the chlorine levels are significantly high. Chlorine is a toxic chemical. It is normally yellowish-green gas. Its symbol on the periodic table is Cl. Chlorine has an atomic number of 17. Chlorine is used for producing safe drinking water. A plant growing in normal water will grow and not die however a plant growing in water with high levels of chlorine will not grow and die.

Hydrogen Chloride

Its effects were promoted by the increase of metal temperature. When the temperature was below 5000C, HCl effect was negligible, while its effect increased significantly when the metal temperature was over 5600C. In order to simulate the gas environment in the WTE facility, another corrosive gas - SO2 was included in the synthetic gas in addition to HCl.

Conclusion

The major air pollutants, sulfur dioxide, PAN, ozone, and fluoride, all occur in Arizona. Our weather conditions and our production of sensitive crops indicate the potential for increased air pollution damage to vegetation. While the effects and symptoms of air pollution damage to vegetation are known, it is often difficult to rule out other types of injury, as herbicide, insect, and nutritional effects, and plant diseases due to fungi, viruses, and bacteria. Air pollution affects the farmer and homeowner alike. The reduced yields on crops and visible damage to ornamentals both result in economic losses.

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