INTRODUCTION

At the global level, the operation of natural cycles brings about a fair balance among the interacting forces. Industrialisation, large scale transportation, combustion of fuels and other natural processes not only introduce substances that are detrimental to humans, animals, plants and the environment in general but also disturb the above balance. Earlier, pollution of air was not considered a major problem but in recent times the wealth of available literature points out that the combined effects of discharge of pollutants from industries and urbanisation have a terrible impact on human and plant health. Air pollution was recognized as a problem after the smog incident at London in 1952 in which there were many casualties. A concised introductory account to air pollution is being presented.

Air pollutants:

Air pollution problem in India is of a recent origin as compared to its western counterpart where it surfaced around the middle of the nineteenth century. Atmospheric pollutants can be classified into gaseous and particulate matters. Particulate dusts and chemical substances are the major pollutants in any air pollution. Smoke which is formed due to incomplete combustion consists of both the types. For
instance, carbon fly ash is a particulate matter whereas $SO_2$ and $CO$ are gases in smoke. Apart from smoke, the widespread air pollutants are the various types of particulate matters such as dusts, fumes and mists.

The suspended matter in air is known as aerosol. The aerosols, generally range from $0.01 \mu m$ to $100 \mu m$ in diameter. The chemical composition of aerosol is quite complex. The size of some common aerosols, dusts and fumes varies considerably ($0.001$ to $1000 \mu m$). Particles below $1 \mu m$ are smoke from various sources, fumes from chemical and metallurgical industries, carbon black and sulphuric acid mist (Garg and Ghosh, 1986).

Gaseous contaminants in the atmosphere ($N_2$, $CO_2$, $O_2$, $SO_2$, $NO$, $NO_2$, $HF$, $CO$, $H_2S$, PAN (Peroxy acyl nitrates) are generally from different sources such as combustion of fuels and processing of raw materials and chemicals. By far the most common pollutants are $SO_2$, $CO$, $H_2S$, $NO_X$, hydrocarbons and their oxidation products and halogens and their derivatives.

Published experimental results are mostly confined to the quantum of settled particulate matter from factories such as cement plant and the resulting changes in plant growth and yield. But in the vicinity of cement factories apart from the settled dust, suspended particulate matter and $SO_2$ in combination may pose a greater threat to vegetation. Leaves of plant may act as an efficient dust filters and show
differential responses depending upon the physical and chemical characteristics of particulate matter (Madhoolika Agrawal and Najma Khanam, 1989; Arul and Vivekanandand, 1991).

From the ambient air quality data published as early as 1979 by National Environmental Engineering Research Institute (NEERI), Nagpur, it is apparent that the \( \text{SO}_2 \) and particulate matters are the major pollutants in India. Subsequent to emission, air pollutants may remain in air for a considerable period of time and disperse from densely populated and industrial areas to more remote and sparsely populated nearby rural areas. During its long distance transport primary products may undergo transformations or may help generation of secondary pollutants but are ultimately deposited on the soil or on the surface of the vegetation. When deposited near the source, pollutants may cause adverse effects on various components of the ecosystem (soil, water, air, plants and animals).

The particulate material (dust) falling on leaves may cause foliar injuries, reduction in yield, changes in photosynthesis, transpiration and uptake as well as accumulation of mineral elements from the soil (Czaja, 1966; Lal and Ambasht, 1982; Agrawal et al., 1988; Madhoolika Agrawal and Najma Khanam, 1989; prasad et al., 1991). The effects of environmental pollution on leaf morphology were studied by Sharma and Butler (1973, 1975), Inamdar and
Chaudhary (1984) and Chaudhary et al. (1984). Recently an Air pollution act has been passed by the Government of India to control and improve the ambient air quality.

Smith (1990) pointed out that regional scale air pollutants (oxidants, acid deposition and trace metals) exhibited direct and interactive effects on forest ecosystems in the temperate zone. They caused growth reductions in some forest species and were involved in the decline of susceptible tree species at ambient levels in specific regions (Schulze, 1989; Smith, 1985).

The primary air pollutants that cause injury to vegetation are O$_3$, SO$_4$, F, nitrogen oxides and PAN (Dassler and Bortitz, 1988; Jacobson and Hill, 1970). Other phytotoxic pollutants include ethylene, ambient oxidant complex, herbicides, chlorine, ammonia, hydrogen chloride, mercury vapours, dusts, fly ashes, heavy metal particulates, sulphuric acid mist, hydrogen sulfide and carbon monoxide (Dassler and Bortitz, 1988; Heck et al., 1970). Much of the SO$_2$ and NO$_2$ might leave the atmosphere as acidic precipitation. The available literature points out to neutral, negative and positive effects of simulated acid rain on crops (Irving, 1983). The effects of acid rain were serious on forests and poorly buffered aquatic systems and soils (Allen, 1990).
Air pollutants in nature are likely to be found in combination rather than being alone. Additivity, synergism and antagonism of mixtures of air pollutants have been reported (Ormrod, 1982). However, pollutant concentration, duration of exposure and other factors might influence the occurrence of symptoms in a vegetation.