

AIR POLLUTION EFFECTS ON VEGETATION

Within a living cell, many chemical and physical reactions occur. Air pollution can stress cells leading to various stages of impairment. Vegetation "breathes in" air to be used in photosynthesis. Gases, vapours, and particulate matter (dusts) enter the cell through stomata, which regulate breathing in plants. Generally, vegetation growing under optimum conditions is most susceptible to air pollution since under active growing conditions, the stomata are open more frequently, allowing air pollutants to enter the leaf.

As the air pollutant concentration builds up in the leaf, stomata will close, greatly slowing the growth process, and also trapping pollutants in the leaf. Studies have proven that a correlation exists between the degree of air pollution effects and the degree of stomatal openings.

Plant leaves react to concentrations of air pollutants in four basic ways:

- (1) Necrosis and Bleaching of leaf margins: This is caused by sulphur dioxide and sulphuric acid mists which arise primarily from the combustion of sulphur containing fuels (oil or coal).
- (2) Glazing of leaf surface: This is mainly caused by oxidants like nitrogen dioxide and compounds formed from Photochemical Smog. This is the smog which develops over cities where automobile use is high, such as Los Angeles, California.
- (3) Chlorosis: A loss of chlorophyll will show up as white or bleached areas on the leaf. This is caused by mercury, and sulphur dioxide (mainly). Once the chlorophyll is lost, photosynthesis is retarded, slow growth and possibly death follow.
- (4) Flecking or stippling: This usually occurs on the upper surface of the leaf and is caused by strong oxidants such as ozone. Ozone is a irritating gas caused by photochemical smog and high electric currents in electrical systems.

Air pollutants have been traced from sources by observing the effects on surrounding vegetation. The main pollutant in the nickel smelters of Sudbury, Ontario is sulphur dioxide which causes Necrosis and Chlorosis to some of the nearby vegetation.

Some plants are more susceptible to air pollution than others. (e.g., rose, tobacco, alfalfa, tomato and various fruits are very susceptible). Extent of damage to individual plants depends on: humidity, stage of growth and especially concentrations of the pollutant and the time of exposure. A short term "very high dose" may cause as much or greater harm as a "low dose" over a long period of time. High concentration short term doses usually cause more harm than low concentration long term doses, since the plant will attempt to adapt to the pollutant over a long time period.

It is difficult to access the cost of air pollution effects on vegetation, but a recent estimate of losses in citrus crops of California was 132 million dollars (Brandt and Heck "Effects of air pollution on vegetation", Chapter 12, Volume 1 of Air Pollution).

Over the past 10 years the public has become much more aware of air pollution. This has resulted in an effort to control and reduce pollution so that our environment will remain healthy.

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