



By Chelston W. D. Brathwaite
Department of Biological Sciences,
University of the West Indies.

ALL over the world today, man is becoming increasingly concerned about the quality of the environment. This concern has expressed itself in the organization of International Conferences on the environment, the passage of anti-pollution legislation, demonstrations and placard waving. Although green plants also are affected by the quality of the environment, they express their concern in less dramatic ways. Air pollution injury to plants have only recently been recognised. In 1943, a new plant disorder known as silver leaf was observed on the leaves of many herbaceous plants in Los Angeles, California. In 1950, it was demonstrated that the condition was associated with air pollution. Since then, research results have shown that in highly industrialised areas, air pollution injury to crop plants may severely reduce their growth and subsequent yield.

The contaminants which affect plants are mainly gaseous but particulate pollutants are also important. Two of the most common gaseous pollutants which cause injury in plants are ozone and peroxyacetyl nitrate (commonly called PAN). These gases are formed from reactions between hydrocarbons and oxides of nitrogen both of which are derived from automobile engines and some industrial plants. Ozone causes condensation of chloroplasts and collapse of plant cell walls. PAN is very toxic to a large variety of plants, especially vegetables. The gas causes plasmolysis of cells and glazing of the lower surface of leaves.

Nitrogen dioxide not only combines with hydrocarbons to form PAN and ozone but by itself causes severe injury to vegetation. It is formed from the combustion of coal, natural gas and gasoline. Symptoms of nitrogen dioxide injury appear as irregular white or brown spots on the leaves of plants.

Sulphur dioxide is derived from petroleum refineries and industrial plants. The gas causes both acute and chronic injury in plants. Acute injury is characterised by clearly marked dead tissue in the leaf margins while chronic injury is seen as brownish red spots in the leaf. Combinations of these gases usually result in more severe injury to plants than when either of them occurs alone (Synergism).

The principal source of fluorides emitted to the atmosphere is fertilizer manufacturing. Concentrations of fluoride as low as 0.1 p.p.m. are toxic to some plants resulting in necrosis of leaves.

While particulate pollutants are of less importance, they too can cause some injury to plants. Naturally deposited dust from cement factories may be responsible for chlorosis and death of tissue in a large number of plants. Injury results from the toxicity of alkaline solutions formed when these dusts are deposited in the presence of moisture. They also interfere with the photosynthetic and respiratory activity of the leaves.

Not all pollutants affect plants by causing easily visible symptoms. At low dosages plant growth may be greatly affected but no visible symptoms appear. The effect on plants here is more significant from an agronomic point of view because it is more difficult to diagnose. Air pollution effects are important agronomically for another reason; sometimes the symptoms resulting from air pollution injury to vegetation resemble symptoms of virus, fungal or bacterial infection of the plant.

As Trinidad and Tobago becomes a more industrialised society, we shall have to be aware of the environmental significance of our actions. The establishment of aluminium smelters and petrochemical complexes is going to lead to increased production of toxic gases and dusts in the atmosphere unless the necessary action is taken to reduce atmospheric pollution. In the interest of agriculture and the survival of plant life in general, the environmental aspects should be considered in any new plans for industrialisation.

AIR POLLUTION INJURY TO PLANTS

*A neglected aspect of
environmental concern
in the Caribbean*