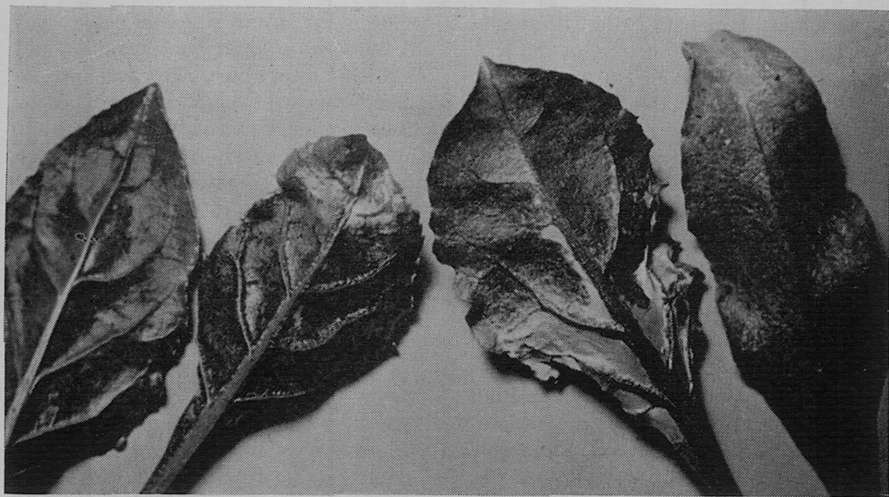

Figure 3. Sugar beet leaves from single plant fumigated with gasoline, ozone, and oxides of nitrogen

Youngest, on left, shows no injury. Next older, injury at tip. Next, injury at base. Oldest, on right, no injury

Pollution Control District. From these experiments (*5*) it was concluded that unsaturated hydrocarbons combined with ozone, in both the presence and absence of oxides of nitrogen, caused typical damage to vegetation. In this work, gases were allowed to react at high concentrations and were subsequently diluted. No observations were made concerning the pattern of damage, as it had not been noted, up to that time.

This method of mixing and diluting was subject to criticism, because reactions at high concentrations of pure substances might differ from those which occur at great dilution in the atmosphere. After many unsuccessful attempts, typical damage was produced on the five test plants—spinach, endive, alfalfa, oats, and sugar beets—by admitting the hydrocarbons and ozone into an 11,000-liter Plexiglas chamber through separate inlets placed at right angles in a horizontal plane with orifices 6 inches apart. A powerful electric fan was placed beneath the outlets and directed vertically upward to secure immediate and complete dispersion of the fumigants. The rate of air admitted to the chamber through an activated carbon filter was sufficient to produce, approximately, a 20-minute turnover. The temperature and humidity were held within reasonable limits by means of an evaporative cooler.

It is not intended to infer that these are the optimum conditions for fumigation. Further work is being carried on in this respect. They were, however, the first under which satisfactory results were obtained at reaction concentrations approaching those found in the atmosphere.

The results of these experiments have been reported in a recent paper (*3*) and in the Third Technical Report of the district (*12*). Typical damage on all five test plants was observed at 0.05 mg. per liter of hydrocarbons from gasoline vapor and at 0.04 mg. per liter of hydrocarbons from automobile exhaust gases in the presence of about 0.4 p.p.m. of ozone. This is less than the concentration of ozone recorded during heavy smog but several times the highest hydrocarbon concentrations measured. An excess of ozone, which could itself cause damage, is thus avoided.

In determining whether or not the damage was typical, the plants were examined macroscopically for general appearance, microscopically for anatomical effects, and for the location of the injury according to the cellular age and development as here described (Figure 3).

Because of important similarities between plant and animal cells, and because plant material is readily obtainable, the district plans to expand the present work on vegetation. Single cells will be isolated and the effects of various pollutants on them will be studied in an attempt to determine why certain cells are most sensitive.

Summary

A new method of diagnosis, based on the sensitivity of certain aged cells, has been added to the previously known macroscopic and microscopic diagnoses of damage to vegetation. This pattern of damage enables one to ascertain readily whether or not the injury was caused by smog. This pattern has been employed by the Los Angeles County Air Pollution Control District both in the field and in the laboratory, and by other workers in the field, to assay plant damage. It has aided in determining that gasoline and ozone, and automobile exhaust fumes and ozone, are capable of producing the same injury on plants as that which is observed in the field as a result of smog.

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Correction

In the article on "Reduction of Dental Caries and Goiter by Crops Fertilized with Fluorine and Iodine" [McClendon, J. F., and Gershon-Cohen, Jacob, J. Agr. Food Chem., 3, 72 (1955)] on page 73, Figures 1 and 2 were interchanged. The first figure on page 73 shows extensive caries and the second shows healthy molars.