Protection of Plants

When it became apparent that an immediate reduction in plant-damaging air pollution was not probable, a search began for some method of reducing the effects on vegetation. Among the protectants studied were dusts, sprays, and nutrients. Kendrick (1) reported some effect from two commercial dusts, Zineb and Maneb. Subsequently, Freebairn (2) reported that vitamin C was also effective.

In the meantime, similar work had been started at the Aboretum under a Public Health grant. The first results of this project were published in 1963 (3) and showed that reduced glutathione was effective in alleviating the effects of natural air pollution. Subsequent studies showed that gum guaiac was an effective material for removing from the air both naturally occurring air pollution and ozone alone. (4).

Recent experiments have shown that gum guaiac dusted directly on leaves will protect the plants from heavy ozone concentrations. One leaf of a pair of primary leaves of a pinto bean was dusted with the gum and the plant then exposed several hours to a high concentration of ozone. The undusted leaf was severely injured while the dusted leaf showed only slight damage. In another experiment, using *Nicotiana glutinosa,* one half of each leaf was dusted with the gum and the plant then exposed to a high concentration of ozone. The undusted halves were severely damaged while the dusted halves showed little to no injury, depending on the leaf age. Field studies of this material remain to be made, since no material pollution has occurred subsequent to these findings.

Reported here for the first time, propyl gallate is another substance which shows considerable promise. In one experiment, using again the primary leaves of pinto bean, one half of each leaf was painted with a 0.35% solution of propyl gallate in water, and the plant exposed to over 10 parts per million of ozone for 2½ hours. Definite protection was observed on the painted halves. Protection was noted in another experiment, when one of the primary leaves of the pinto bean was sprayed with the 0.35% propyl gallate and the plant exposed to a lower ozone concentration. At this concentration of propyl gallate, some spray injury has been noted.

Presently in progress are studies using lower concentrations of both the ozone and propyl gallate. Also plants have been sprayed and exposed to the atmosphere, but so far insufficient pollution has occurred to cause any injury to the unprotected plants, therefore, no conclusions can be drawn at this time. As soon as conditions of sufficient pollution prevail, field tests will be made. In these it is planned to use White Cascade petunia, found to be one of the most sensitive plants so far observed.

Beside the work being done by public institutions, studies are also being made of protectants by some commercial organizations. These, too, are in a preliminary stage.

At the present time, no recommendations can be made concerning these new materials. It is hoped that field studies can be made as soon as conditions permit, and helpful information released to the public concerning the use of any products of practical value.

Pinto bean leaf which was exposed to a high concentration of ozone after half of the leaf had been sprayed with a weak solution of propyl gallate.

REFERENCES

1. Kendrick, J. B. Jr., E. F. Darley, J. T. Middleton, *Chemical Protection of Plants from Ozonated Olefin Injury.* Phytopathology 44:494-495 (1954).

2. Freebairn, H. T. and O. C. Taylor, *Prevention of Plant Damage from Air Borne Oxidizing Agents.* Proceedings American Horticultural Science, 76:693-699, (1960).

3. Lanz, A., and W. S. Stewart, *Studies on Chemicals to Protect Plants from Smog Damage.* Lasca Leaves, 13:2 (1963).

4. Noble, W. M., *The Reduction of Oxidants by Gum Guaiac.* Lasca Leaves, 14:74-75, (1964).

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