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EFFECTS OF OXIDANT AIR POLLUTANTS ON AVOCADO TREES

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The polluted atmosphere near a metropolitan area contains ozone, peroxyacyl nitrates (PAN) and the reaction products of ozone and unsaturated hydrocarbons. These are all phytotoxic materials and often cause extensive visible damage to sensitive crops but the full extent of damage from continued exposures of a crop such as avocado is not known. Damage expressed as visible symptoms may be insignificant compared to the effects on photosynthesis, respiration and other metabolic processes which are ultimately reflected in yields and fruit quality.

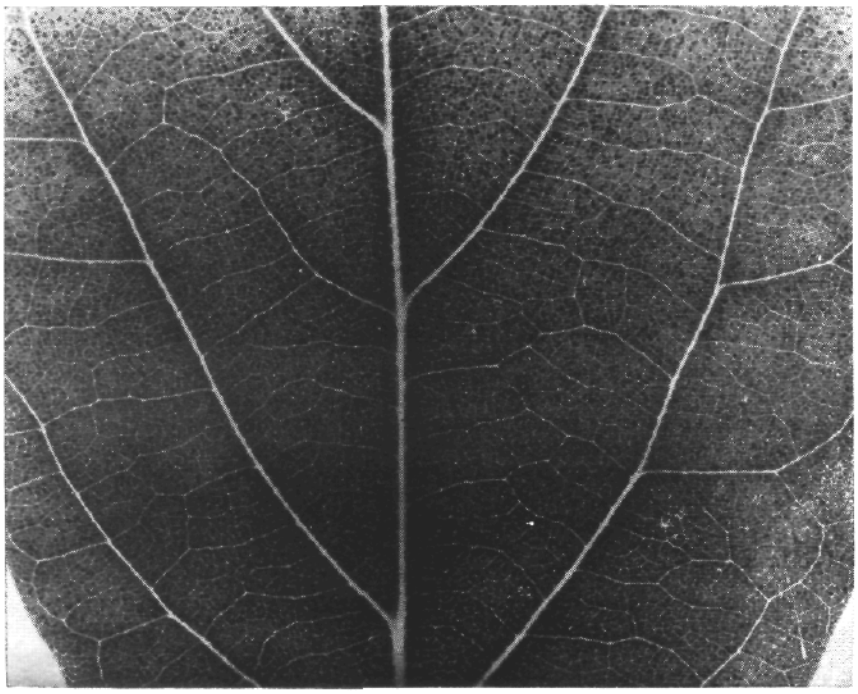

Figure 1.—Ozone "stipple" visible only on upper surface of avocado leaf. Plants exposed to 0.3 ppm ozone eight hours a day for one week.

Little is known about the effect of peroxyacyl nitrates on avocado, except that exposure of up to 30 hours to 1.0 ppm caused no visible leaf damage. Ozone and the ozone-olefin reaction products, applied to avocado seedlings daily for three months at concentrations comparable to those found in the atmosphere cause a significant suppression of tree growth, reduce leaf size, inhibit the rate of water use and encourage

premature senescence of leaves resulting in excessive defoliation. Ozone and polluted ambient air caused numerous brown necrotic spots visible only on the upper side of recently matured avocado leaves when seedlings were exposed to concentrations of 0.3 ppm for one or two days. This injury was identical with ozone "stipple" on grapes described by Richards et al, (1). The "stipple" like lesions and other symptoms of damage from air pollutants were eliminated by filtering all air supplied to the trees through activated carbon. Trees placed in the filtered air for eight months at the Los Angeles State and County Arboretum and at Riverside grew normally with no evidence of leaf damage.

The ozone type "stipple" was invariably confined to small islands of discolored palisade cells scattered throughout the leaf blade. The upper epidermis covering the lesion and spongy mesophyl cells below the lesion appeared to be undamaged. Similar leaf damage may occur when trees are transplanted, injured mechanically or sprayed with malathion. However, microscopic examination of such lesions from mechanical injury showed that the epidermis and spongy mesophyl cells were damaged also. Microscopically the ozone type leaf damage closely resembles the damage described by Haas and Brusca (2) and designated simply as a "glass house effect" since he was unable to determine the true cause.

Although it is known that the toxicants in smog can cause damage to avocado trees the visible symptoms resemble so nearly those caused by other environmental conditions that it is virtually impossible to estimate the amount of damage that does occur in the field. Direct damage to fruits of some varieties of avocados has been suspected to be a result of smog, but there is no good evidence to substantiate this belief. Here again there is very strong evidence from work with other fruits that weather conditions, i.e., low relative humidity and high temperature, may be much more important than air pollution in bringing about corkiness and styler end spot.

LITERATURE CITED

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2. Haas, A. R. C. and J. N. Brusca. Leaf malady of avocado trees. California Agriculture 11(10):14-15. 1957.