AIR POLLUTION INJURY TO PINE TREES

Ozone probably causes more injury to pines than any other air pollutant in San Diego County.

There is an ozone layer in the upper atmosphere, but the ozone concentration high enough to injure plants is the result from photochemical reaction in lower atmosphere.

The oxides of nitrogen and hydrocarbons are emitted into the atmosphere from automobile exhaust, industrial combustions, gasoline fumes, and refineries. The photolysis of these fumes results in buildup of ozone.

Expression of ozone injury on pine trees depends on the concentration, length of exposure and age of needles. Ozone injury to pine trees can be recognized by a chlorotic mottling on the needles. The mottling starts at the tips of the older needles and progresses toward the base of the needle. Eventually the entire needle becomes yellow and necrotic. Normally a pine tree will have needles that are three- to five-years-old. However, in areas where chronic ozone exposure exists, these older leaves abscess and only mottled one-year-old leaves are on the tree.

OZONE SORPTION BY NINE SHADE TREE SPECIES

Prior research has shown considerable variation among and within several shade tree species in their ability to tolerate and survive under high ambient levels of the gaseous pollutant ozone.

Significant interspecific and intraspecific variation among nine shade tree species in their rate of foliar sorption of ozone at a concentration of 0.20 parts per million has been demonstrated by a U. S. Department of Agriculture researcher in a recent study.

If differences within and among species are great enough, he explains, we may be able to select and breed shade trees that are highly efficient in reducing ozone concentrations. Selected cultivars then could be planted in cities and in greenbelt areas to reduce high ozone levels.

First objective in his study was to measure the relative rates and magnitude of ozone sorption by white oak, white birch, Coliseum maple, sugar maple, red maple, redvein maple, Ohio buckeye, American sweetgum, and white ash. Second, he wanted to determine if differences in ozone uptake ability were present among four groups of red maple progenies that had shown significant variation in their relative tolerance to ozone. Third, he sought to determine the relationship of the rate of ozone uptake by foliage to ambient ozone concentration and to length of time of leaf exposure to ozone.
Results of his study showed that white oak and white birch leaves removed the largest quantities of ozone per hour. Red maple and white ash were the least efficient. Coliseum maple, sugar maple, redvein maple, Ohio buckeye, and sweetgum were intermediate in rate of ozone removal. Differences in ozone uptake also were significant among the four seed-source progenies of red maple. Although significant, the differences among the red maple progenies were not so great as differences in ozone uptake rate among most species. During a continuous eight-hour fumigation at 0.20 parts per million, the rate of foliar uptake of ozone by white birch seedlings decreased only 5 percent. Removal of ozone by red maple foliage dropped rapidly after six hours of continuous exposure, and after eight hours the rate had decreased to 40 percent of the original rate.


This comprehensive book gives essential information about nearly 700 species that can injure conifers, broad-leaved evergreens, and deciduous plants in North America. Dr. C. S. Koehler, U. C. Berkeley, collaborated with the authors, so there are numerous references and photographs of injurious insects in California. Nontechnical language is used throughout. The book is illustrated with 212 excellent, full-color plates showing pests and symptoms of injury.

For information, write to: Cornell University Press, 124 Roberts Place, Ithaca, N.Y. 14850.