



Fig. 2. Effect of diazinon and ozone alone and in combination on the unifoliate leaves of pinto bean.

already in the literature that interactions between pesticides and air pollutants may have an enormous impact on agriculture. There is ample documentation that both pesticide use and ambient ozone are widespread in California. The potential for interactions occurring in the environment is therefore extremely high. It is not unreasonable to believe that many of the reports of phytotoxicity in the agricultural industry, previously blamed on pesticides or air pollutants alone, are in fact the result of interactions. Pesticide effectiveness may also be influenced by air pollutants. Pinto beans have been reported to be sensitized to ozone injury by the presence of phenamiphos, fensulfothion, aldicarb, and oxamyl. The effectiveness of 2,4-D has been demonstrated to be reduced when applied in the presence of ozone. The current data for pesticide-air pollutant interactions are alarmingly scarce considering the numbers and quantities of pesticides in use.

Air pollution-pesticide interactions may profoundly affect the Integrated Pest Management approach to pest control. This type of information would be necessary in order to put together a viable pest management program for locations with significant air pollution. It would be of little value to recommend particular pesticides for pest suppression unless their interactive potential is known. Pesticides that interact to produce less damage may be of great value in minimizing air pollution losses and should be incorporated into IPM programs for areas with significant air pollution.

Future research must be directed toward identifying air pollution-pesticide interactions and quantifying interactive responses. Research should be carried out both in controlled experimentation and in the field if this information is to be utilized to improve the current situation.

Robert R. Teso is Economic Entomologist, Ronald J. Oshima is Plant Pathologist and Specialist, and M. Ingrid Carmean is Agricultural Inspector, California Department of Food and Agriculture, Statewide Air Pollution Research Center, UC, Riverside.

Publication on grapevine nutrition

A 40-page practical guide for diagnosing nutrient deficiencies or excesses, *Grapevine Nutrition and Fertilization in the San Joaquin Valley* (Publication No. 4087) discusses the role and utilization of minerals important in grapevine nutrition, describes symptoms of problems, and recommends corrective measures. Twenty-one color photographs show fruit, leaf, or shoot symptoms of deficiencies or excesses of nitrogen, potassium, magnesium, zinc, boron, iron, manganese, and salt.

Laboratory diagnostic procedures and tissue sampling methods are described, and values are given for interpreting laboratory analyses.

Of special interest to growers in the San Joaquin Valley, the manual also contains information applicable to other grape-growing areas in California.

Price—\$5.00—includes postage and handling within the United States only. (California residents, add sales tax.) Orders of less than \$10.00 must be prepaid. Please make check or money order payable to The Regents of the University of California. When ordering from outside the United States, request a Pro Forma Invoice and state postal charges desired—air or surface mail. Address: Agricultural Sciences Publications, University of California, 1422 Harbour Way South, Richmond, California 94804.