Regulations Affecting Control of Citrus Virus Diseases in California

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RESEARCH throughout the world suggests that control of citrus viruses requires unusual effort. Moreover, the complex nature of the citrus virus problem indicates the need for well-integrated programs of research, education, and regulation.

Discovery of psorosis virus in California in 1933 and subsequent recognition of its leaf symptoms was followed by the adoption, in 1937, of an official program of registration for citrus budwood sources found free of psorosis symptoms. This first program of registration could have prevented the planting of many orchards now known to be heavily infected with psorosis virus. An ideal situation existed for eliminating a virus transmitted primarily by man through propagation of citrus nursery stock. However, the popularity of nucellar lines contributed to lack of interest in the registration program because nucellar lines supposedly left all of the old virus troubles behind.

The discovery of quick decline (tristeza disease) in California, and the loss of several million trees on susceptible rootstocks awakened the industry to the economic importance of virus diseases and the need for controls. Postwar expansion and the relocation of many California citrus plantings occurred in large measure before the virus detection methods essential for effective regulatory programs were devised. As a result, our

citrus industry is still troubled with many of the virus problems of past years.

Regulatory programs designed to reduce the effects of citrus virus diseases have made considerable progress in California. To that end, the California Department of Agriculture closely coordinates its regulatory programs with local County Agricultural Commissioners, research workers of the University of California, the United States Department of Agriculture, and agricultural industry groups. For example, the following programs were undertaken.

QUICK DECLINE INTERIOR QUARANTINE (SECTION 3407, IN TITLE 3, CALIFORNIA ADMINISTRATIVE CODE.—This program, established in 1947, now delimits the area in southern California where tristeza virus is known to be readily spread by aphid vectors. Citrus nursery stock within the area can not be moved to points outside. Permits are required for the movement of citrus nursery stock from any source into, or within several major centers of commercial citrus lying outside of the quarantined area, in which natural spread of tristeza is slow or not apparent. These are termed "suppressive areas" as defined in the quarantine regulation and as Meyer Lemon-Free Districts. Only nursery stock propagated from sources which have been tested and are tristeza-free are eligible for the permits.

MEYER LEMON FREE DISTRICTS (SECTION 3630, IN TITLE 3, CALIFORNIA ADMINISTRATIVE CODE).—All Meyer lemon plants within the boundaries of these districts are declared a public nuisance and are subject to removal. Most Meyer lemon plants growing within the eight districts specified in this regulation have been removed. If a suitable replacement for Meyer lemon can be developed, consideration will be given to prohibiting further propagation of the Meyer lemon in California under authority, Section 108.6, Agricultural Code of California. The problem of maintaining the identity of a replacement plant similar in morphological characteristics to the Meyer lemon would be offset by eliminating the continued propagation of Meyer lemon which is generally infected with tristeza and tatter-leaf viruses.

CITRUS PEST CONTROL DISTRICTS (CHAPTER 89, STATUTES 1939, STATE OF CALIFORNIA).—The Citrus Pest District Control Act, last amended in 1964, is sponsored by the California Citrus Industry. This act provides for the formation of local districts for the control and eradication of citrus pests, collection of taxes, manner of operation, and reimbursement for trees removed.

The pest control work of these districts may now be legally extended

to the detection of tristeza virus by index testing. Thus far, the Central Valley Agency has tested over 30,000 trees which were suspected of carrying the virus. More than 12,000 trees have been found infected, and most of them have been removed. A second round of surveys by index testing shows very few infected trees remaining, thus indicating the success of the program.

REGISTRATION OF CITRUS TREES FOUND FREE FROM SYMPTOMS OF PSOROSIS (SECTIONS 3007-3010, IN TITLE 3, CALIFORNIA ADMINISTRATIVE CODE). This interim program includes index testing on seedlings of Mexican lime for detection of tristeza and vein-enation viruses, and on Pineapple sweet for the detection of psorosis (1). In 1965, the regulation was amended to include Etrog citron as an additional indicator plant for the detection of exocortis. As of June 30, 1966, there were 3,404 trees registered under the terms of this program. We estimate that an additional 1,900 trees may be registered this year.

The results of the index testing in this registration program demonstrate its value in contributing to the control of virus diseases. Since 1962, 33 trees growing outside of the quarantined area were found infected with tristeza and were eliminated as reservoirs of virus infection. In addition, 21 trees, including both old-line and nucellar varieties, were found infected with psorosis. Index testing with Etrog citron (60-13 and Arizona 861) commencing January, 1966, has thus far shown 18 of the trees now under test to be infected with severe strains of exocortis virus. The maintenance of identity requirement of the quarantine led to finding trees in a nursery row showing symptoms of stubborn disease. Inspection of the two registered parent trees showed symptoms suggestive of stubborn disease which otherwise might have remained unrecognized.

CITRUS REGISTRATION AND CERTIFICATION (SECTIONS 3000-3003, IN TITLE 3, CALIFORNIA ADMINISTRATIVE CODE).—This is a long-range program to provide propagating sources free of known viruses; it has been under development since 1956. Trees in this program are selected by horticulturists and plant pathologists of the University of California. Both short- and long-term index tests to detect known citrus viruses are included. As originally scheduled, the certification of nursery stock propagated under the terms of this regulation should become available by 1970 (1).

From 1962 to 1964, this program progressed smoothly with few problems, but in 1965, the finding of exocortis virus and stubborn disease caused a moratorium to be placed on the propagation of candidate trees. As a result of improved testing procedures developed by the University

of California, the release of budwood from the University of California's foundation block at Lindcover, in the spring of 1967, is again planned.

Seven mother blocks, with a total of 565 candidate trees, are now established by citrus nurserymen. An additional 661 trees are under propagation. The first registrations of 43 trees were made this year in the University's foundation block at Lindcove. Registered trees include Carter, Frost nucellar, Gillette, and parent old-line navel oranges; Campbell nucellar, Cutter nucellar, and Frost nucellar Valencia oranges; Frost nucellar Eureka, Prior, and Lisbon lemons; Frost nucellar and Redblush nucellar grapefruits; Clementine, Kara, and Kinnow mandarins; and Minneola and Orlando tangelos.

NEMATODE CONTROL PROGRAM (2).—Recent research in the field of nematology has added greatly to the prestige of the nematode as a plant pathogen. The burrowing nematode, causing spreading decline of citrus in Florida, and the recognition of nematodes as virus vectors are examples. Although citrus viruses have not been linked to nematodes, the possibility is apparent.

California's nematode control program requires that all fruit and nut trees, grapevine, berry, and vegetable plant nursery stock be inspected using laboratory procedures for the detection of nematodes. These required inspections may be waived if the growing ground has been fumigated under supervision in accordance with the Department's approved treatment and handling procedures.

This program, initiated in 1956, has reduced the occurrence of harmful nematode pests in nursery stocks for commercial planting, and infomation as to the distribution and occurrence of nematode species has been obtained through this work.

All of our regulations are based on the results of research and are changed to conform with the most recent knowledge gained by citrus virologists. Success in achieving our objective of controlling citrus viruses by suppression and exclusion required close coordination of effort. Considered collectively, these regulatory programs are contributing to the control of citrus virus diseases in California.

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