NEMATODE ON NEMATICIDES

infestation of nematodes and these compounds were subjected to a severe performance test. Growers would seldom encounter such high nematode inoculum levels under their normal field growing conditions.

We therefore feel that several of these compounds show promise as nematicides for the control of root-knot on potato. They have both advantages and disadvantages in comparison to conventional fumigants now being used. Potential advantages include:

- Application could be accomplished with seeding and avoid an additional mechanical application and waiting period after treatment.
- Some of the compounds have residual insecticidal properties which could lessen insect control programs.
- A granular material is more easily handled than a liquid fumigant.

Disadvantages include:

- Contact nematicides have a high level of toxicity to humans in comparison with standard fumigants.
- The pesticide has a potential of persistence in soil and environmental contamination residue problems in soil and tubers.

Research will continue in 1975 on the potentials of this method of nematode control in various growers' fields in southern California. In these yield trials, comparisons will be made between the contact materials and the currently used soil fumigants.

John D. Radewald is Extension Nematologist, Fujio Shibuya and Jerry Nelson are Staff Research Associates, Cooperative Extension, University of California, Riverside. Otis A. Harvey is Farm Advisor, Riverside County.

CALIFORNIA'S CITRUS VARIETY IMPROVEMENT PROGRAM

Forrest Cress • Walter Reuther • E. C. Calavan

CALIFORNIA CITRUS GROWERS and nurserymen today can draw from a unique bank that should be of progressively increasing value to them in future years as its holdings grow.

This bank, developed through the Citrus Variety Improvement Program (CVIP), serves as the California citrus industry's primary source of virus-free germ plasm from which to develop and maintain healthy, productive, bearing orchards of important commercial varieties.

The CVIP germ plasm bank has reached the stage where its budwood — registered to be free of known viruses and similar pathogens and true to its variety — now can be sold in quantity to the state's citrus growers and nurserymen.

To date, more than 30,500 "clean and true" buds have been sold from the CVIP bank. Many of these buds are being used in nurseries to produce more budwood. Larger amounts of CVIP budwood will be available in the future, putting into practice more than 35 years of accumulated research knowledge on the prevention of citrus virus and virus-like diseases.

The University of California, in cooperation with the Nursery and Seed Services of the California Department of Food and Agriculture, started the CVIP in 1958 upon the urging of the statewide Citrus Research Advisory Committee.

By the 1950s, it was obvious to researchers and growers alike that virus diseases were an important factor in reducing orchard vigor, yield, and fruit quality in California and all other major citrus-growing areas of the world. An estimated one-half million California citrus trees had been destroyed by tristeza (quick decline). Other diseases such as exocortis and psorosis, as well as stubborn disease (thought at that time to be a virus-caused malady), were reducing yields in mature orchards, generally by about one-third, were significantly affecting fruit quality, and were confusing the evaluation of rootstock performance.

The University was asked to lend California citrus growers a helping hand. Sources of virus-free budwood of desirable commercial varieties were needed to help check the spread of disease in the state's citrus orchards.

The CVIP began as a joint effort of UC Riverside's plant pathology and horticultural science departments. It was planned in consultation with the Nursery and Seed Services of the California Department of Food and Agriculture. The UC program continues to operate today in close cooperation with the Nursery and Seed Services citrus registration and certification program.

Broad policy of the CVIP is set by a committee. Its dozen or so members include University of California at Riverside agricultural scientists, U.C. Cooperative Extension, and U.S. Department of Agriculture personnel.

Although CVIP is the most advanced program of its kind in the world, it is an avoidance procedure, one which is lengthy and involved.

Several major steps are involved in the CVIP procedure. First, "parent source trees" are selected. Most of them are chosen for trueness to type, good growth, high fruit production, and lack of obvious infection by viruses or by Spiroplasma, the mycoplasma-like pathogen that UCR researchers recently have shown to be the cause of stubborn disease. After a rigorous program of testing for infection, "clean" source trees are propagated in a protected screenhouse at the Rubidoux quarantine facility in Riverside and also maintained in "foundation blocks" at the U.C. Lindcove Field Station. These trees are under continuous inspection and testing by both U.C. and State Nursery and Seed Services personnel for freedom from viruses and the stubborn disease Spiroplasma, trueness to type, fruit quality, and yield performance.

Nurserymen or growers who qualify under state regulations can purchase budwood from the foundation block trees to establish a nursery increase block or certified block. Trees from these blocks that pass another rigorous testing program then can be registered and used by nurserymen as sources for growing their own certified stock. These young trees bear the desirable characteristics of their variety and are free of known virus diseases and of the stubborn disease pathogen. California's growers now can order trees derived from Lindcove propagations from several nurseries.

During 1974, more than 385 trees were maintained in the primary foundation blocks at Lindcove. The protected foundation block in the screenhouse at Riverside provides an additional backup source of prime budwood. Other field plantings maintained in the CVIP today include hybrid, nucellar, and long-term index blocks, three blocks for testing latency and field spread of stubborn disease, two blocks to evaluate virus-free Meyer lemons CVI 319 and 333, and a block for testing virus tolerance of CVIP rootstock materials. Seven new selections were added to the program during 1974. All seven of these selections previously had been infected by virus before its elimination by the heat therapy method developed through the CVIP.

Quarantine regulations recently have been revised to permit the growing of the CVIP-developed, virus-free "Improved Meyer lemon" in all parts of California. Budwood of Improved Meyer lemon was developed as a long-range protection measure for the citrus industry. It is intended to replace the Meyer lemon trees found today in backyards throughout the state. This backyard ornamental is a "Typhoid Mary" of citrus, known to carry tristeza and other diseases which pose potential threats to the state's commercial citrus industry. The CVIP is now trying to introduce the virus-free improved variety. Ultimately, as the Improved Meyer lemon becomes readily available, legislation may be enacted making it illegal to grow the virus-infected variety. That is the hope of the CVIP committee.

Most of the program's indexing or screening procedures for virus and mycoplasma diseases are conducted in the semi-isolated facilities in Riverside. In addition to this indexing work, maintenance of foundation trees, and distribution of prime budwood to the industry, CVIP scientists have conducted research aimed at increasing the efficiency of indexing procedures. Also, new methods for eliminating viruses in citrus have been developed. Use of these new and improved methods has resulted in greater program efficiency and more and better citrus budwood sources for the industry.

A recently-developed short-term greenhouse index for cachexia disease is now being used, for example, while the long-term field test is being phased out. A new leaf punch disc method of indexing for tristeza also is now being used routinely, resulting in a considerable saving in time and greenhouse space.

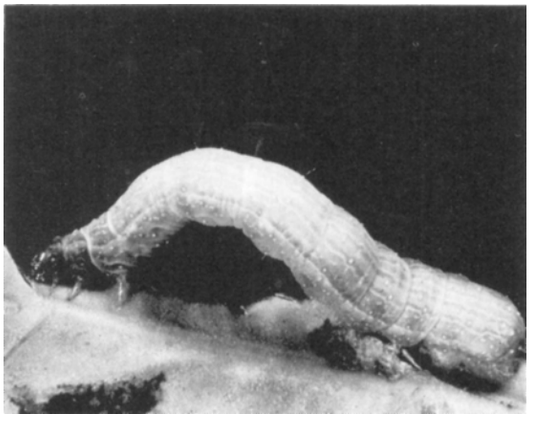
Citrus material produced by heat therapy, nucellus tissue culture, and shoot-tip graft techniques continue to provide virus-free clones not previously available. Recent CVIP research findings indicate that the pathogens of stubborn disease, tristeza, psorosis, and exocortis can be eliminated from citrus tissue by shoot-tip grafting. These findings are encouraging, because the CVIP researchers have found exocortis and stubborn diseases difficult to eliminate by heat therapy. Also, these techniques have made importation of foreign citrus clones practical.

Because disease prevention is never as dramatic as its cure, the CVIP and its accomplishments through the years have rarely drawn headlines or industry recognition. Yet, without the CVIP, California's citrus industry today might well be sharing the plight of several other major citrus-producing areas of the world that face disaster in the coming decade because they have no similar program under way.

Forrest Cress is Educational Communicator for Subtropical Horticulture; Walter Reuther is Professor of Horticulture and heads the Citrus Variety Improvement Program Committee; E. C. Calavan is Professor of Plant Pathology, heads CVIP pathological work, and has served as the programs committee chairman; U.C. Riverside.

CABBAGE LOOPER CONTROL ON SEEDLING LETTUCE

R. K. Sharma
•
N. C. Toscano
•
K. Kido
•
A. F. Van Maren



Cabbage looper

In the Imperial Valley, populations of the cabbage looper, *Trichoplusia ni* (Hubner) (photo) often build up on cotton and gradually spill into seedling lettuce in the fall. Looper infestations in lettuce are so heavy some years, that lettuce production would be in jeopardy unless efficiently controlled. Good insect control on lettuce is even more important because of increasing demands from the consumer for produce free of insect damage and debris.

Several insecticides such as parathion, malathion, Perthane and Phosdrin gave excellent control of the cabbage looper in the past. Over the years, however, resistance in the looper has been spectacular, and the control they now provide is poor. For this reason, new insecticides must be tested continuously.