SILVERIO PLANES, EUSEBIO GONZALEZ-SICILIA,
and FRANCISCO MARTI

Studies on Citrus Virus Diseases

In the Carcagente-Alcira (Valencia) area, some citrus trees began to decline shortly after the 1956 heavy frost that followed two years of exceptional rains. One explanation of the decline was that it was due to a root rot developing in the trees as a result of the exceptional rains. Another explanation was that the decline was due to tristeza, although this disease had not previously been observed in Spain. To test the latter possibility, a number of the declining trees were indexed by budding into Mexican lime [*Citrus aurantifolia* (Christm.) Swing.] seedlings.

Only a small number of index plants were used in 1958, and none of them developed symptoms indicative of the presence of tristeza virus. The first symptoms in Mexican lime were obtained in 1959, 10 per cent of the test seedlings developing vein clearing. In the succeeding years, a large number of tests have been carried out; the percentage of positive tests has increased, probably because other causes of decline have disappeared and the technique of the test has improved. In each instance in which vein clearing appeared, the Mexican lime seedlings also developed stem pitting.

As a result of the detection of tristeza in Spain, a committee consisting of research workers, citrus growers, nurserymen, and representatives of the citrus industry was created in 1960 to decide what to do. This committee, whose chairman is the Director General of Agriculture, is empowered to study the various suggestions that are made to solve the problems created by citrus virus diseases and to propose courses of action to the Ministry of Agriculture.

Among the studies presently being carried out at Estación de Fitopathología and Estación Naranjera de Lerante Burjasot are the following:

TOLERANT ROOTSTOCKS.—The only rootstock presently being used in Spain that is tolerant to tristeza is sweet orange [*C. sinensis* (L.) Osbeck], and it is used only to a limited extent. Sweet orange as a rootstock has been studied with respect to soil type and variety of citrus used as a scion, and it is therefore known where it can be successfully grown. It is presently the most frequently recommended tolerant rootstock.

Sweet orange, common mandarin (*C. reticulata* Blanco), Cleopatra mandarin [*C. reshni* (Engl.) Hort. ex Tanaka], trifoliate orange [*Poncirus trifoliata* (L.) Raf.], and Troyer citrange (*C. sinensis* x *P. trifoliata*) are presently being tested for suitability as rootstocks under local conditions. Trees on these rootstocks have been grafted with buds from trees affected by tristeza in order to test their tolerance under local conditions to the strain of tristeza virus present in the area.

SELECTION OF MOTHER TREES.—Trees of each commercially grown variety are being selected on the basis of freedom from symptoms of virus diseases, trueness to type, and productivity. The intent is to use these trees as a source of budwood for propagation of disease-free nursery stock. Each tree selected is indexed on three sweet orange seedlings to test for freedom from psorosis virus, on three trifoliate orange seedlings and three Rangpur lime (*C. limonia* Osbeck) seedlings to test for freedom from exocortis virus, and on three Orlando tangelo (*C. sinensis* x *C. paradisi* Macf.) seedlings and three Palestine sweet lime (*C. limettioides* Tanaka) seedlings to test for freedom from exocortis virus. A total of 107 trees are involved in these selections.

There are some trees about 30 years old on trifoliate orange rootstock in Spain. All these trees have been examined for symptoms of exocortis and the Childs' color test has been applied to each of them. Seventeen trees of the Washington Navel variety and two trees of the Hamlin variety seem to be free of exocortis virus and therefore can be used as a source of budwood for propagation of the varieties on rootstocks susceptible to exocortis.

VECTORS.—Several surveys for aphids have been made in the citrus area of Spain and the following species have been found: *Toxoptera aurantii* (Fonsc.), *Aphis gossypii* Glov., *Myzus persicae* (Sulzer), *A. fabae* Scop., and *Piraphis pirinus* Ferrari. *T. aurantii* and *A. gossypii* are the species most often found, the first appearing principally on the spring flush and the second principally on the fall flush.

FACILITIES.—Two screenhouses, with an area of 180 square meters, have been built for experimental work and for indexing.