HORACIO N. BEÑATENA and ARNOLDO R. PUJOL

The Citrus Budwood Program in Concordia, Argentina

In the citrus area of Concordia there is at present no organization for developing a budwood program, as would be desirable. Nevertheless, the authors are working on a plan for selection of parent trees at the Estación Experimental in Concordia. It is the purpose of this paper to discuss the development and present status of the plan.

The plan was started in 1958, with the objective of establishing a plot of commercial varieties in which individual trees had been propagated from grown trees that were selected as being vigorous good producers, true to type, and free of the viruses that are economically important in the area. The viruses of tristeza and xyloporosis are not now of much economic importance in local groves because the rootstocks commonly used are trifoliate orange [*Poncirus trifoliata* (L.) Raf.], rough lemon (*Citrus jambhiri* Lushington), sweet orange (*C. sinensis* Osbeck) all of which are tolerant of the virus, and sour orange (*C. aurantium* L.), which is used for lemon only. The viruses of exocortis and psorosis are, on the other hand, very important; so efforts have been made to obtain budwood from trees free of both viruses. Care has also been taken to select grapefruit trees with only mild symptoms of stem pitting, or no symptoms at all.

The procedures that have been followed in making the selections are as follows:

1. On the basis of previous records in commercial groves, select trees that are of good size and production, not less than 12 years old, and, preferably, on trifoliate orange rootstock. This last criterion is easily met because the majority of groves in the vicinity of Concordia consist of trees that were budded on this rootstock. In this way, trees free from exocortis virus can be obtained at the beginning.

2. Preliminary inspection of the tree with the objective of eliminating plants that are diseased or have poor horticultural characteristics. The factors considered include small size, poor production, off-type fruit, and scaling of bark of the rootstock or of the trunk or branches.

3. Inspection for foliar symptoms of psorosis and elimination of trees that show them. Such inspection includes summer and fall flushes as well as the spring flush.

4. Grafting buds from the candidate tree into 5-10 sweet orange seedlings, which are subsequently observed for foliar symptoms of psorosis.

To date, a record has been made of 58 plots including a total of 28,000 plants. Included in this list of plants are the Valencia, Hamlin, and Washington Navel varieties of sweet orange, Marsh seedless grapefruit (*C. paradisi* Macf.), the Comun de Concordia, Campeona, and Dancy varieties of mandarin (*C. reticulata* Blanco), Malvasio tangerine (*C. reticulata* x *C. sinensis*), Satsuma mandarin (*C. unshiu* Marcovitch), Genova lemon [*C. limon* (L.) Brum. f.], and Nagami kumquat (*Fortunella margarita* Swingle).

In the beginning, trees in nursery rows were grafted with buds from candidate trees that had passed steps 1, 2, and 3. The results indicated that there had been an advantage in using budwood from selected sources rather than at random. An unexpected development occurred, however. It might be thought that trees in the nursery row propagated by grafting with buds from trees that had survived the greatest number of inspections would prove most likely to be free of foliar symptoms of psorosis, but this was not so. In some cases, a larger number of the sweet orange seedlings grafted with buds from a candidate tree developed foliar symptoms, but in other cases only a single tree in the nursery row or in the group of corresponding test plants developed foliar symptoms. Essentially the same results were obtained when the test plants were pruned back so that several growth flushes were forced during a two-year period. The explanation for this erratic development of psorosis symptoms was delayed for some time; until, in fact, foliar symptoms were observed in two plants propagated from buds of nucellar seedlings of the Natal variety imported from Limeira, Brazil, and in some others propagated from budwood selected in Florida, and presumed to be free of psorosis virus. Two explanations seemed possible. First, the rootstock was a carrier of psorosis virus before it was grafted. Second, the grafted plant acquired the disease in the nursery.

Many seedlings of sweet orange and rough lemon were then in-

spected for foliar symptoms of psorosis. About 3-5 per cent of the seedlings were found to have such symptoms. We were led to the conclusion that psorosis virus was disseminated in the nursery by a method other than that of propagation with buds carrying psorosis virus. Consequently, we have established the policy of accepting as free of psorosis virus those candidate trees whose nursery descendants have an incidence of less than 5 per cent of psorosis, provided a repetition of the test for psorosis is negative. With this criterion, we have established a plot of parent trees, the planting of which was begun in September, 1962, composed of Valencia Late, Washington Navel, Condado, Vernia, and Moro de Catania orange, Marsh seedless grapefruit, Comun de Concordia, Malvasio, Campeona, Dancy, Capurro, and Satsuma mandarin, Genova and Lisbon lemon, and Nagami kumquat. The plot will be increased in size when new selections of these and other varieties have been made.

The possibility of the existence of a vector of psorosis virus reduced the value of the budwood selection program in Concordia. Nevertheless, the material already obtained is an improvement over that available in the past. The program will furnish buds for distribution among nurserymen. It is the opinion of the authors that the principal means of dissemination of psorosis is by propagation from buds that carry the virus. Consequently, the establishment of a budwood program should lead to considerable reduction in the dissemination of psorosis, a disease that can be considered the greatest problem in one of the principal citrus-producing zones of Argentina.