BAILEY SLEETH

Indexing Citrus for Viruses in Texas

A CITRUS BUDWOOD CERTIFICATION PROGRAM (3) was started in Texas in 1948. Its primary purpose was the elimination of psorosis from nursery planting stock. Since this program was a voluntary one, progress was slow. Some citrus nurserymen did not take part in the program and grower demand for certified psorosis-free planting stock was not sufficient to eliminate the use of noncertified nursery stock. Much progress toward the elimination of psorosis from planting stock has, however, been made mainly through the persistent cooperative efforts of the Rio Grande Valley Nurserymen's Association. This is evidenced by the 595 parent-budwood-source citrus trees that have been registered (3) by the Texas Department of Agriculture as psorosis-free and by the numerous progeny scion groves that have been established. At least 90 per cent of the citrus nursery stock grown in Texas is now propagated from buds from registered psorosis-free trees, from their progeny as scion groves, or from trees adjacent to registered trees that have continued free of psorosis leaf symptoms. Meanwhile, Texas citrus growers have become concerned about other virus diseases such as tristeza, exocortis, and xyloporosis, which are serious hazards when certain varieties are used in scion-rootstock combinations.

The Texas Agricultural Experiment Station and the Citrus Research Investigations group of the U.S. Department of Agriculture, ARS, Crops Research Division, at Weslaco, Texas, in a cooperative effort, have broadened the virus-indexing program to include tristeza, exocortis, and xyloporosis along with psorosis. The Citrus Research Investigations group has been chiefly interested in obtaining sources of virus-free

scion material for research purposes; the Texas Experiment Station has concentrated on providing and maintaining virus-free sources of scion material for citrus nurserymen as well as for research use.

Indexing Procedure

The rootstocks selected as virus indicators were those that have been satisfactory in Texas (1, 2): Mexican or West Indian lime for psorosis and tristeza, Rangpur lime for exocortis, and Orlando tangelo for xyloporosis. In some instances, xyloporosis was indicated by symptoms on Rangpur lime and Rough lemon. Usually 3 to 5 seedlings of the same variety were budded with buds from a single tree. The development of typical virus disease symptoms in one or more budlings in a plot eliminated the parent tree from the indexing program.

Our indexing program is based upon the principle that detection of a single virus in a tree automatically eliminates it from the indexing program. In actual practice, trees were checked first for psorosis and tristeza viruses, then for exocortis, and last for xyloporosis. Most of the trees that have been indexed for exocortis and xyloporosis were trees registered as psorosis-free, or progeny of such trees. Since these apparently healthy trees were growing on sour orange, a tristeza-sensitive rootstock, they were considered to be free of tristeza virus. A slight modification in the indexing procedure has been to use a budling with an Orlando tangelo top on Rangpur lime rootstock for testing for both exocortis and xyloporosis on the same test tree. It is planned to use this combination to recheck doubtful trees and to index trees in the foundation planting and scion groves.

Results

Old-line red, pink, and white grapefruit trees in Texas appear to be consistently and uniformly infected with either exocortis or xyloporosis or both virus diseases (Table 1). Of 92 grapefruit trees tested in the present indexing program, only 2 old-line grapefruit trees, 1 pink and 1 red, are seemingly free of the 2 viruses and these are being carefully rechecked. Three red and 3 white young-line grapefruit trees of recent nucellar origin were found free of all 4 viruses. These 6 trees will most likely become the source of virus-free scion clones.

Incidence of virus infection was considerably less in the orange trees than in the grapefruit trees. Ten of 14 old line navel oranges, 8 of 20

TABLE 1. PREVALENCE OF EXOCORTIS AND XYLOPOROSIS VIRUSES IN CITRUS TREES NOT INFECTED WITH PSOROSIS OR TRISTEZA

Citrus varieties	Trees indexed	Citrus trees infected with exocortis/xyloporosis/neither virus		
GRAPEFRUIT:				
Red, old line	56	46	15	0
Red, young line	3	0	0	3
Pink, old line	16	15	4	1
White, old line	20	14	11	1
White, young line	3	0	0	3
ORANGES:				
Washington Navel, old line	14	4	3	5
Summerfield Navel, old line	8	2	0	5
Robertson Navel, old line	2	2	0	0
Unnamed navels, young line	6	0	0	6
Valencia, old line	20	7	6	8
Valencia, young line	13	0	0	13
Miscellaneous, old line	17	8	2	4
TANGERINE:				
Clementine, old line	5	2	0	3
Hybrids and nucellars, young line	15	0	0	15
MISCELLANEOUS:				
Lemons, old line	7	1	0	4
Mandarin, old line	6	1	1	4
Others, old line	7	1	2	4
TANGELO:				
Orlando, old line	3	0	0	3
Thornton, young line	2	0	0	2
Miscellaneous, old line	4	2	2	0
	227	105	46	84

old-line Valencias, and 4 of 17 trees in the miscellaneous group were virus-free. There are several orange trees still under test, which may be found to be nonvirus carriers; these are being rechecked. Young-line trees of both navel and Valencia oranges were virus-free.

Virus infection in tangerine, tangelo, lemon, and mandarin trees tested fall into a pattern similar to that found in the oranges, about ½ being virus carriers. Again the young lines, nucellar and gametic, were not infected with either exocortis or xyloporosis.

The elapsed time between budding the virus-indicator seedling in a plot of 3 to 5 trees with exocortis or xyloporosis-virus-infected buds and

the development of recognizable typical symptoms varied from 14 months to more than 4 years. In about 90 per cent of the cases, exocortis symptoms developed within 24 months after budding to Rangpur lime seedlings. There was little or no difference in rate of symptom development between bud-infected seedlings or budlings with scion tops. Xyloporosis symptoms developed in infected Orlando tangelo budlings in 18 to 36 months after budding. Xyloporosis symptoms on Rangpur lime were usually detected later than exocortis symptoms. In a few instances where rough lemon had been budded with xyloporosis infected buds, symptoms were not observed until nearly 4 years after budding. Xyloporosis symptoms were obtained when 9- to 12-month-old Orlando tangelo scion tops on Rangpur lime rootstock were used as a virus test indicator. Xyloporosis symptoms frequently developed in 18 months and if exocortis virus was present its symptoms usually appeared in another 6 months. In some instances, a longer time interval was required. Budlings of Orlando tangelo scion on Rangpur lime rootstock were effective as test plants and reduced the time required for xyloporosis symptoms to develop.

Discussion

Periodic virus indexing of the trees in the Experiment Station's foundation planting and of trees in virus-free scion groves will be necessary to be certain that these basic sources of budwood continue free of virus diseases. The possibility that these scion sources may become infected through some vector or mischance in grove operation can not be overlooked. The intervals at which such indexing will be made has not been definitely established.

The foundation planting at the Experiment Station will be under continuous field inspection and any abnormal appearing trees will be immediately indexed for virus infection and removed if appearances warrant such action. We plan to reindex the foundation planting at 5-year intervals. Nurserymen's scion groves will be field inspected at least once a year for suspicious appearing trees. Since scion groves will eventually involve a large number of trees, it will not be feasible to index all trees at frequent intervals. In a suggested plan under consideration, a 10 per cent sample of the trees in a scion grove will be put in an indexing program each year so that by the end of 10 years all trees will be in the process of being indexed. After 10 years the indexing program will be evaluated and revised if advisable.

Literature Cited

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