

REPORT ON THE PROGRAM FOR PRODUCTION OF AVOCADO NURSERY TREES FREE OF SUNBLOTCH

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The casual agent of avocado sunblotch has not been isolated but the characteristics of the disease have led to acceptance that it is caused by a virus. The apparent absence of spread from diseased to healthy trees by insect vectors or in other ways that plant viruses are transmitted, characterizes sunblotch as a disease that can be controlled by avoiding infected trees in the selection of budwood and rootstock seed-source trees for production of nursery stock. The need for a regulated program for avoiding this disease has been recognized for many years by avocado nurserymen and members of the staff of the University of California. As long as there was no such program, avoidance of sunblotch in new trees depended largely on the ability of individual nurserymen to select non-infected (healthy) propagative material. In their selection of budwood parent trees, nurserymen were careful not to propagate from trees showing sunblotch symptoms but on occasions, budwood was used from infected trees not showing obvious or detectable symptoms. When this occurred, the progeny trees developed sunblotch symptoms, some by the time they were ready for transplanting and others after they had been placed in permanent plantings.

Studies at the University in the 1950's revealed that some normal-appearing avocado trees are infected but are symptomless carriers of sunblotch virus. It was disclosed further that all seedlings grown from a symptomless carrier source are infected through seed transmission of the virus but, like the parent tree, none ever develop symptoms of sunblotch. When these seedlings are used as rootstocks, the scion growth becomes infected from the rootstock and develops typical symptoms. This phenomenon explained several recorded instances of very high percentages of disease in nursery plantings where the nurserymen were certain that healthy budwood sources had been used. With discovery of this kind of seed transmission of the virus it became evident that in the production of avocado nursery trees it is necessary to establish that both the budwood and seed parent trees are free of sunblotch infection. This can be done only by graft inoculating from the parent trees to known healthy avocado seedlings and observing the latter for evidence of infection. This test is referred to as "indexing" and consists of inoculating from each prospective propagative source to a group of suitable "indicator" avocado seedlings.

Unlike most plant viruses which, if present, can be detected quite easily by tissue-graft inoculation to indicator host plants, sunblotch symptoms develop slowly and irregularly on inoculated seedlings. Under optimum conditions an occasional test seedling will develop symptoms within two months but usually the time required for symptoms to appear is much longer. Further, the average time for symptoms to appear on test

seedlings inoculated from a symptomless carrier source is more than one year. For these reasons, experience has shown that in a given test where none of the inoculated index seedlings develop symptoms, they should be observed for a period of two years before concluding that there has been no infection. It has also been learned that use of 10 or more index seedlings for each test aids in earlier detection of infected sources and increases the reliability of this kind of test.

In past years, as a service to avocado nurserymen who requested assistance, University personnel have made the necessary indexing tests on some selected mother trees to determine if they were infected with sunblotch. Recognizing the desirability of broadening this service so that eventually all of the avocado nursery stock grown in California would be derived from healthy sources, a regulated program toward this goal has now been initiated. Planning and operation of this program is a project of The Nurserymen's Section of The California Avocado Society in conjunction with the California Department of Agriculture and University of California at Riverside.

From previous tests by the University, a few sunblotch-free trees of commercial scion varieties and a larger number of trees of rootstock varieties are available for use in the initial phases of the sunblotch registration program. In order to simplify the necessary procedures and to meet the regulations of the California Department of Agriculture, the Executive Committee of the Nurserymen's Section of The California Avocado Society agreed on the following plan:

1. Preparation of a preliminary list of commercial scion and root-stock varieties to be included in the program.
2. Collecting all available information on the location of existing, suitable source trees of these varieties. When possible, trees previously tested and determined not to be infected will be selected for use. Previously untested trees brought into the program will be put under test immediately by inoculating from each to 15 healthy indicator seedlings.
3. Location of sources of seed from known sunblotch-free trees to provide healthy seedlings for use in (a) new indexing tests, and (b) as rootstocks for sunblotch-free trees of commercial varieties to be grown for distribution to avocado nurserymen for establishment of registered increase blocks of trees to serve as future sources of budwood and rootstock seedlings.
4. Propagation and production of stock trees which can be registered immediately or are "candidates" for registration for distribution to nurserymen who make application for them.

Because of lack of space and facilities at the Citrus Research Center for conducting all of the required indexing tests, and availability of suitable facilities at the Teague Nursery at Corona and the Brokaw Nursery in Ventura, these sites were selected for some of the indexing. At these locations, certain selected candidate trees are being indexed under the supervision of personnel of the University, and the California Department of Agriculture. Using the somewhat limited supply of seeds available to provide suitable seedlings for inoculation, previously unindexed budwood and seed source trees of the selected varieties are being tested for sunblotch infection. To gain time, propagations

are made immediately from the candidate trees to virus-free rootstocks so that individual nurserymen may establish these in their increase plantings. At the completion of the indexing tests, the foundation block trees, if derived from sunblotch-free trees, can then be registered by the owners for further increase and use as sources for production of registered nursery stock. In a few instances the trees in the foundation stock planting can be registered by the owners immediately because it has already been determined that both the scion buds and the seeds used for the root-stocks are derived from healthy trees.

Many details of inspection, testing procedures, establishment of foundation stock plantings by nurserymen, etc., need not be presented here. Copies of the procedures and regulations can be obtained from Nursery Service, California Department of Agriculture, 1220 N Street, Sacramento 95814. Participation in this program is entirely voluntary on the part of the nurserymen. Because the program must be largely self-supporting a schedule of fees has been established in connection with registration of sunblotch-free mother trees established by each nurseryman, with the cost based on the approximate cost to the Department of Agriculture of the services rendered. Additionally, participating nurserymen have pledged to contribute to a University research fund at a rate of 50 cents per tree for each tree received from the initial propagation to be established in their foundation blocks as a registered tree or as a candidate for registration. This procedure will permit the University to provide technical assistance in the registration program. An attempt has been made to begin with standard or popular scion varieties and some sources of suitable rootstock varieties. For some time at least, the selection of varieties and sources of the mother trees must remain largely a committee action. As progress is made it is hoped that trees selected by individual nurserymen can be entered into the registration program. Also, it will include any new varieties or hybrids found to be of promise for commercial use.

Foundation stock trees obtained and established by nurserymen shall be maintained under specified spacing and isolation and registered by them, if they so desire, when tests have demonstrated that they are subject to registration. Progeny trees derived from registered foundation stock trees can also be registered if they are grown and maintained as prescribed by the Department of Agriculture.

Presently more than 30 candidate trees have been entered in the program. A few of these have been indexed recently and found not to have sunblotch. Some candidate trees were negative for infection when tested in past years but these are being reindexed. Other trees now are being indexed for the first time. The scion varieties include Hass, Fuerte, Bacon, Zutano, Reed, Duke, MacArthur, Anaheim, Rincón and miscellaneous less-known selections of some promise. For use as rootstocks, efforts are being made to establish several selections of Duke which show partial resistance to rootrot, and such well-known varieties as Canter and Topa Topa. Probably other known varieties will be added along with any newly discovered, promising rootstock selections.

Although several years will have elapsed before individual avocado nurserymen can propagate entirely from sunblotch-free scion and root-stock sources, participation in this program is a wise decision. Use of budwood from infected trees, and especially the chance selection of a symptomless carrier seed-source tree for production of rootstock seedlings, can cause substantial financial loss to the "guilty" nurseryman and/or the

"unfortunate" grower who unknowingly purchases and plants diseased trees. Sunblotch disease is not known to spread from tree to tree, except through possible natural root grafts between diseased and healthy trees and it can be eradicated eventually from California plantings. However, attaining this goal will require that all avocado nurserymen participate in the registration with the aim of eventually growing and distributing trees derived only from established healthy propagative material.