

INFECTED SYMPTOMLESS AVOCADO TREES AND THEIR POSSIBLE USE IN AVOIDING SUNBLOTCH DISEASE

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On several occasions in past years, avocado nurserymen have reported unusually high percentages of sunblotch-infected nursery trees. This was observed when buds from apparently healthy trees were propagated on certain lots of rootstock seedlings. In some instances it was known these same sources of buds produced healthy trees when propagated on other rootstock seedlings. These developments indicated that infection resulted from seed transmission of the virus through certain lots of seeds. Such transmission was unexplained because experimental tests in which many seedlings were grown from seeds taken from severely diseased trees show that the virus passed through the seeds only in rare instances.

In 1951 the writer had an opportunity to study an avocado planting where there were many sunblotch-affected trees in several scion varieties grown on a single rootstock source. Some of the budwood used had come from trees at the Citrus Research Center which had been tested and shown to be free of sunblotch and buds for other diseased trees came from sources that had never given any indication of being infected.

The outcome of the investigations of this situation and other studies and observations made later was that some rootstock parents were found to be symptomless carriers of sunblotch virus. Furthermore, seedlings grown from these symptomless carrier trees were also infected but none of them displayed any symptoms of sunblotch. However, when used as rootstocks the virus moved from the rootstock into the scion and caused typical sunblotch symptoms. It was later determined that 1) 100 percent of the seedlings from these sources were symptomless carriers of the virus; 2) none of them ever showed symptoms even when inoculated by grafting large amounts of diseased tissue on them; and 3) an occasional seedling grown from an avocado tree that showed sunblotch symptoms proved to be infected through the seed but all infected seedlings from such sources developed typical sunblotch symptoms. In these latter groups the seedlings which did not show symptoms were not infected, in other words they were not symptomless carriers.

It was shown further that infected, symptomless seedlings originating from a symptomless-carrier tree also transmitted the virus through its seed thus producing symptomless, infected progeny. This was demonstrated through the third generation of trees beginning with a large, old tree that had been used as a source of seeds for commercial propagation.

For some time there was no explanation of the origin of the symptomless-carrier trees that produced symptomless but infected seedling progeny. Then it was discovered that

some avocado trees which initially show sunblotch symptoms make a recovery by producing vigorous, symptomless growth. When this occurs early in the life of the tree the symptomless shoots then take over and form the entire top of the tree. A tree in the process of recovery is shown in Figure. 1. Study of recovered growth demonstrated that the virus was present in it even though no symptoms were present. Trees grown from buds recovered growth remained symptomless even when given heavy inoculations with sun-blotch virus. Seeds of recovered trees or off other trees propagated from them were found to produce infected symptomless seedlings. The presence of virus in these seedlings could be demonstrated by sub-inoculations from them to healthy seedlings. Also when such seedlings were worked to healthy buds, symptoms later appeared on the scion growth. Thus, these discoveries explained the origin of symptomless-carrier, seed-transmitting avocado trees even though it did not explain how or why such trees are able to pass the virus through their seeds to 100 percent of their progeny.



Figure 1. Recovery of Zutano tree from symptoms of sunblotch. The basal, decumbent limbs showed strong symptoms and effects of sunblotch. The upright, central portion showing no symptoms is from one shoot which arose from the lower part of the tree.

During the course of these and other studies on sunblotch disease several trees of commercial scion varieties were observed to recover from symptoms. These have been

preserved and further study made of them. Although no trees have been grown in field plantings for comparative yield studies, trees grown in nursery plantings have demonstrated that buds from symptomless carrier trees propagated on seedlings from symptomless carrier trees grow normally without any symptoms of sunblotch. Graft-inoculation of such trees has no effect on them. All attempts to induce them to show symptoms of sunblotch have failed.

Partial recovery from an acute phase of disease accompanied by varying degrees of protection against re-infection and recurrence of symptoms is not uncommon with plant virus diseases. Normally however, recovery results in the affected plant remaining in a mild, chronic phase of disease, sometimes displaying recognizable symptoms of the disease — stunting, or some other effects.

Recovery from symptoms of sunblotch is the most complete reaction of this kind that has been reported among plant virus diseases. The protection or resistance to re-infection and reappearance of symptoms appears to be complete and permanent. Investigators of plant virus diseases have searched and hoped for such a reaction in many instances for use in control or prevention of serious diseases. This of course applies to diseases which are spread naturally by vectors such as insects and nematodes and with economically important diseases for which there are no known means of control.

In the case of sunblotch disease of avocados, up to the present at least, there is good evidence that natural spread of the casual virus by vectors does not occur. Thus control is simply a matter of planting healthy, virus-free trees. This can be accomplished by indexing bud-wood parent trees to determine that they are healthy, and proper study of the rootstock parent trees to assure that they are not symptomless carriers which will transmit the virus through seeds to their seedling progeny.

If, as has sometimes happened in the case of other virus diseases, a vector of the sunblotch virus should make its appearance and begin to spread infection through the avocado plantings other means of control would be needed. Previous studies indicate that there is no varietal resistance to sunblotch. Thus, under such a circumstance as mentioned above, the phenomena of recovery and production of symptomless carrier seedlings through seed transmission of the virus provide material which would permit the deliberate production of infected trees which, based on studies so far completed, would grow and produce normally without being affected by sunblotch even though continuously exposed to infection.

Although it is hoped that there will never be a need to make use of these reactions for controlling this disease it appears that they provide a practical control should such an emergency arise. Plans are now being made to establish some field plantings of "immunized" trees to compare their production records with non-infected trees so as to complete the evaluation of them for practical use in case the situation should change to bring about a need of using such trees for preventing losses from the sunblotch disease.