

HOW DO YOU THIN A ROOT ROT REPLANT BLOCK?

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The question posed by the title was asked by Stanley L. Shepard as we were looking over a test plot on his Carpintería ranch. It made us realize how far we have come in recent years toward a solution of the Avocado Root Rot disease.

Starting with a few Duke variety seedlings about nine years ago, a perfectly satisfactory yielding avocado orchard has replaced the original diseased trees. This test plot using the partially resistant Duke seedlings as rootstocks is now nearly a full bearing block and has demonstrated the efficacy of replanting in certain conditions, Figure 1.



Figure 1. Stanley L. Shepard of Carpintería standing among crowded, heavy bearing, nine year old Hass trees on Duke seedlings that were replanted on the site of original orchard killed by root rot.



Figure 2. Mr. Shepard points to inarched union where two Duke seedlings were joined together to support the Hass top in the nine year old replant trees.

To review, a block of Rincon variety trees on typical Mexican-race rootstocks became infected with the root rot disease by runoff water from a neighboring grove. After the dead trees were removed, Mr. Shepard planted five Duke variety seedlings in each basin as replants in about 1963. The theory was that since we (5) had found that about one-fourth of the Duke seedlings showed some resistance and that there were no visible symptoms of this resistance, so if five were planted, surely one or two would be resistant and could serve as the rootstock for a new tree. It worked. After two or three years one or more seedlings in each basin had grown well, they appeared healthy and were top worked to Hass by Mr. Shepard.

After the grafts were established, the trees grew modestly and began producing well for their size. Where two or more seedlings grew well in a basin, Mr. Shepard grafted both seedlings into a single Hass top (Figure 2). His method of grafting these seedlings together was a form of inarching where he made flat cuts on both seedlings, pressed them together so their cambiums would match, and thoroughly wrapped them with plastic grafting tape. Usually the top of the seedling was left on during the healing-in stage and was removed later (1). These inarches not only used the vigor of both seedlings to supply the top, but also helped to brace the young tree from wind damage.

By 1971, the ninth year after starting, the eight trees, that resulted from the initial five

seedlings in each basin, produced about 25 field boxes. A very light crop was set for 1972, as in most orchards in the area. A very large crop is set for 1973 and the trees are crowding to the point of shading out lower limbs at their 15 foot by 15 foot spacing. They obviously need to be thinned; thus, Mr. Shepard's question that we have used as the title.

We should hasten to add, that we do not believe this result can be duplicated everywhere else that root rot is a problem. There are some unique components in this situation which illustrate the complexities and the possibilities of combining treatments and environmental conditions to maintain avocado orchards in infected root rot locations.

First, *the soil* in this block is Milpitas fine sandy loam—an old terrace soil with two to three feet of top soil above a partially impervious clay pan. Although it is rated as a severe hazard soil series for root rot in general (2), this particular site is probably closer to moderate hazard. Thus, soil type is a major determinant of how successful replanting will be.

Next, *the care* of the orchard by the farmer is a major factor. Careful irrigation, so as not to put too much water on too often, but also not to allow the young growing trees to suffer, is a must. These trees were watered by using a combination of basin irrigation and overhead sprinklers. Other aspects of care — fertilizer, weed control, etc. — were optimum.

Third, *the degree of resistance* of the rootstock is important. The seed for this trial came from both the Santa Barbara County Variety Orchard and the Howard tree near Hemet; both are proven sources of Duke seed that exhibit as much resistance as any source of seed tested in California (5). Subsequent trials in adjacent land using the rooted cuttings of Dukes that have the highest degree of resistance (5) show even better growth than these original seedlings, Figure 3.

Fourth, is *the use of preplant fumigation*. The original Duke seedlings were planted in infested soil without preplant fumigation and grew slowly for the first several years as a result. Subsequent trials in the same soil and orchard have shown the use of vapam or other suitable preplant fumigant well worth while in getting the young replants off to a good start (3, 4). A trial of gibberellic acid to stimulate growth of the replants gave conflicting results in this same block and we concluded it was not worth the efforts of treatment.

A fifth factor is *the effect of the inoculum potential*. Continual re-infection from subsurface and/or surface movement of water containing the fungus spores into the replants' rootzones make it more difficult for them to grow vigorously. In this block, few badly diseased trees occurred above nor were there relatively large amounts of runoff water or seepage moving into the block. Thus, the population of the fungus, over time, was relatively low or, to say it another way, the inoculum potential was not high.

The sixth factor noted, is *compatibility* between the rootstock and top varieties. An occasional individual tree with a Hass graft has deteriorated after two or three years, but the Duke seedling has re-sprouted.



Figure 3. Rooted cuttings of Duke planted three years ago grow vigorously in old root rot diseased soil. A Duke cutting is shown behind Mr. Shepard, with a recently Hass topworked Duke cutting in the foreground.

When these were re-topworked to Bacon, a Mexican race variety, the new top has grown well to date. Thus, care must be taken to be sure that compatible varieties be used, so as not to mistake some of the young tree decline as root rot when it really is incompatibility. More work needs to be done on this factor.

All in all, Mr. Shepard has demonstrated that root rot orchards can be replanted using the moderate amount of resistance now available, provided the site is favorable, and the care is appropriate. The newer selections of resistant rootstocks, particularly rooted cuttings of Duke 7 and G-22, should make this combination of treatments even more feasible in favorable locations. Much more field work is needed to better identify where replanting is likely to be successful in all parts of California. Meanwhile, Mr. Shepard will be proceeding to trim back the temporary trees in order to remove them in several years on a pattern of every other tree on the diagonal.

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