California Avocado Society 1957 Yearbook 41: 80-81

OAK ROOT FUNGUS ON AVOCADOS

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Oak root fungus, or armillaria root rot, (**Armillaria mellea**) continues to be a problem to the avocado grower although the general subject has not been discussed in the Year Book since 1941.

Armillaria is a soil fungus which is always associated with roots or other woody material in the soil. It does not live in the absence of fairly large pieces of plant material as do most common soil fungi. It would be possible to eliminate Armillaria from a given block of soil by screening out all woody material of ½ inch diameter or larger. In fact, this method has been used as a portion of a treatment on several hundred acres of peach land in northern California.

From an infected root, the fungus is able to send out slender, dark brown structures resembling small roots. Because of this resemblance, the structures are called rhizomorphs. The rhizomorphs are able to penetrate directly into healthy roots and establish new infections.

If a susceptible crop is planted, either on recently cleared land where the native vegetation was infected, or as a replacement for a previous crop which was removed because of infection, the roots of the new crop will eventually come near or actually contact the infected roots which were left in the ground. There are numerous records of this happening and only a few years ago it was demonstrated to us near Corona. The grower of a new avocado planting dug a short distance below a few diseased trees and found the infected avocado roots in contact with infected sumac roots.

Even if only one tree in a new planting picked up infection, Armillaria could spread from tree to tree as the trees became older and the roots intermingled.

Early in the history of avocados in California, the crop was considered to be immune to armillaria root rot because up to the late 1920's no one had reported the disease. Apparently it was a recognized practice to replace diseased citrus or walnuts with avocados.

Opinions as to the susceptibility of avocados varied a great deal. In 1928, Dr. Coit stated that only two cases were known to him and that the crop was considered highly resistant. In 1935, Mr. Palmer reported that the avocado was susceptible and that many trees were killed in a grove in San Diego County before the owner knew what was wrong. Mr. Smoyer reviewed the subject again in 1941 and urged the growers to use caution in replacing infected citrus with avocados because the latter were susceptible and trees could be killed.

Notes left by the late Dr. D. E. Bliss of the University of California Citrus Experiment Station reveal that he isolated Armillaria from several specimens of avocado roots sent to him from 1941 to 1950. In his opinion, avocado was generally resistant and it was unusual to hear of trees being killed. An exception was noted in an avocado nursery near Santa Paula where, to quote from his notes, he found "numerous walnut roots in the soil below 1 foot depth that were filled with Armillaria. Some of the avocados had already died of the disease. There was a spot in the nursery where few seedlings remained and it was here that infection was observed." The rootstocks involved were Topa Topa and Ganter. To strengthen the case for resistance, he noted a 15-year-old planting of avocados near Rivera that appeared to be in a healthy condition. These avocados had replaced a walnut grove which had been removed because of Armillaria infection.

Mr. LaRue called our attention to a large 25-year-old avocado near Redlands which was planted in the same hole from which an infected citrus has been removed.

In the last few years typical armillaria root rot has been found at Corona, the San Gabriel Valley, Santa Paula, and Carpinteria. In all cases only a few trees were involved and these were relatively young, ranging in age from 1 to 6 years. No cases have been found in San Diego County.

Some inoculation experiments have been done which assist in determining the relative susceptibility of avocados. In 1941, Mr. Smoyer reported the preliminary findings of Dr. H. E. Thomas wherein avocados were planted in an armillaria disease garden at the University of California Deciduous Fruit Station at San Jose. Infection was found on avocado indicating that it was not immune and might be as susceptible as citrus. Lists of disease ratings supplied by Dr. Thomas 5 years later indicated that damage to avocado was rare and suggested that infected citrus might be replaced with avocado. A recent list of plants from the same experimental plot does not include avocado.

Dr. Bliss conducted three inoculation experiments. One was involved with 3 avocado trees in the 15-year-old grove at Rivera mentioned above. A year after inoculation, disease lesions were found at all sites of inoculation. This demonstrated that the trees were not immune. He concluded that there was no reason to believe that other trees in the grove were not infected but that they might be highly tolerant due to the fact that trees appeared healthy.

A second experiment involved inoculation of a few Topa Topa and Ganter stocks transplanted into the glasshouse at Riverside from the nursery at Santa Paula mentioned above. One Topa Topa had no sign of infection three years after inoculation. The remaining trees of both varieties were either dead or badly infected.

The third experiment was on Mexicola and Nabal seedlings. Three out of eight of the Mexicola and six out of eight of the Nabal seedlings became infected during the three year period of the experiment.

From the above observations and experiments it is apparent that avocado is not immune to armillaria root rot, but under certain conditions it appears to be resistant or tolerant to the point that infected trees may live many years without adverse effects on growth or yield. Relatively few trees are killed and these seem to be confined to age

groups under 5-6 years. No reports are at hand to indicate that older trees are killed. The relative importance of environment, host variety, fungus strain, or the interaction of these factors in disease development, is not known.

Experiments now under way at the Citrus Experiment Station are designed to explore some of these factors. Plantings of some 13 varieties of **Persea americana** and five other species of Persea have been made in an oak root fungus disease garden on the station grounds. Established seedlings were transplanted in the spring of 1955 and were inoculated with various strains of Armillaria in February, 1957. Disease development will be noted for the next few years in the hope of finding highly resistant or even immune root stocks.