

Testing plants for resistance to

OAK ROOT FUNGUS

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WHETHER IT IS CALLED oak root fungus, shoestring fungus, or mushroom root rot fungus, *Armillaria mellea* in soils can be destructive in orchards, vineyards, and home gardens. The fungus attacks over 600 species of plants and though it usually attacks woody plants, it may also attack certain herbaceous plants including dahlia, rhubarb, potato, and strawberry. *Armillaria* is found throughout the world in temperate and mild-temperate zones, and is considered to be native to California where it attacks root systems of many plants, but especially the native oaks. Such plants, though frequently infected, are not often killed by the fungus unless they receive summer irrigation or the soil level around them is changed. Following either of these conditions, they may die, and *Armillaria* is frequently a contributing factor. Even more important is the fact that, when infected trees are removed and some or all of the root system is left in the soil, the fungus will move rapidly through the dead root systems thus creating a reser-

voir from which the fungus can later attack nearby plants, or young orchard trees set out at such sites. Such plants are frequently susceptible and may be killed rapidly.

In addition to its wide host range and the fact that it can remain active in woody material in the soil for long periods of time, *Armillaria* has been difficult to control with chemicals. Fumigants such as carbon bisulfide and methyl bromide are helpful, but their effectiveness is limited by moisture, clay pans, rocks, large roots, and living plants in the treated area. Because of the difficulties involved with fumigation, one approach to control has been a search for resistant plants. Among those plants that show resistance to the fungus are some orchard and nut crops: French pear, northern California black walnut, cherry, and several plum selections, which can be used as rootstocks. Although these plants show resistance, they are not immune and hence, occasionally become infected. No resistance was known for apples, peaches, almonds, or grapes, however, and in 1929 Dr. Harold E. Thomas,

formerly of the Department of Plant Pathology, U. C., Berkeley, began testing various plants at the University of California Deciduous Fruit Station at San Jose to determine their resistance to the fungus. In addition to many species of fruits and nuts, many ornamental plants were included in the early tests. In 1953, after the interruption of the war years, the plots were renovated and have been in active use since that time.

Tests are made on ten of each species in the plot. Although the soil is known to be infected with the fungus, additional inoculum is added at the time of each planting to make certain that the fungus is present. Furthermore, a number of different *Armillaria* strains have been used as inoculum so that the plant will be exposed to many of the variants of the fungus which occur throughout California. Test plots are irrigated, weeded and cared for under the supervision of Alfred Amstutz, director of the station. After 8 to 10 years of record-keeping on all plants in the plot, those still living are pulled from the soil and their roots are examined and rated for resistance to the root rot fungus.

Recently, another area of the station, which is also infested, has been released to the *Armillaria* testing program. A cooperative project is now being conducted in this area with the Department of Pomology, U. C., Davis and involves testing of twelve walnut rootstocks for possible resistance to the fungus.

A total of 320 species of plants have been or are being tested. Of these, 230 species are ornamental plants. Of the ninety orchard trees (fruits and nuts), 19 have been apple species and 42 have been species related to peaches, plums, and cherries. The results of the tests were first published as a mimeograph about 1940 and since then, the list has been revised six times and is now published as Extension Service Publication AXT-6, entitled, "Plants Resistant and Susceptible to *Armillaria mellea*." This publication is available at offices of Farm Advisors in counties throughout the State.

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A portion of a row of *Casuarina stricta* in the *Armillaria* plot is shown below. The tree in the center of photo is being killed by the fungus. Row of plants in foreground is *Melaleuca hypericifolia*.

