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Soil-borne avocado diseases of economic importance in Mexico

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SYNOPSIS
Four fungal soil-borne avocado diseases of economic importance in Mexico are discussed. These are produced by Phytophthora cinnamomi, Phymatotrichum omnivorum, Verticillium albo-atrum *and* Armillaria mellea*. All are destructive, but the most frequently found is* P. cinnamomi *in almost all avocado growing areas. Symptoms of each disease is described and reference is made to alternate hosts. Soil humidity, pH, other factors and tree varieties influence disease development.*

INTRODUCTION

Four economically important fungi are present in Mexico on avocado, producing root rots and consequently death of the trees at different ages. The aggravating situation is the fact that these fungi can colonise the soil for a long period of time and in the case of *Phymatotrichum omnivorum up* to the depth of 240 cm (5). This fungus is also capable of affecting up to 2 000 host species (1) and in the case of *Phytophthora cinnamomi* the number of hosts surpasses 900 (10).

Verticillium albo-atrum and *Armillaria mellea* could be considered equally destructive as the other two fungi, except that their presence in the fields are not as frequent and consequently their economic importance is not as problematic. However, the potential capacities of these fungi should not be underestimated and for this reason they are discussed.

MATERIALS AND METHODS

Work done by different investigators in Mexico (3,4,7) has been analysed with respect to four important soil-borne fungal diseases of avocado.

RESULTS AND DISCUSSION

The most important soil-borne disease of avocado is without doubt *Phytophthora cinnamomi,* because of its effect on production and high cost of control and prevention. The other three fungi have been associated with the death of entire avocado trees to a lesser degree. These are *Phymatotrichum omnivorum, Verticillium alboatrum* and *Armillaria mellea.*

P. cinnamomi is a fungus maintained in the soil and in Mexico it has also been found affecting pine trees. Wooded areas cleaned for avocado plantations may be naturally infested or the fungus may be brought in with planting material. This fungus is very destructive where soils have deficient drainage. Trees with an advanced infection tend to be chlorotic and wilting in appearance and may even have abundant fruit-set. Defoliation usually sets in from the growing points and may rapidly continue downward. The absorbing root system turns black and rootlets can easily be broken. Some areas have been abandoned, because most avocado trees have been destroyed, as for example in El Pueblito in the state of Queretaro (4).

The distribution of this fungus in Mexico has been widespread on avocado and found in the states of Mexico, Michoacan, Nuevo Leon, Puebla, Queretaro and Zacatecas (7). Because of soil habitat the fungus prospers in humid, acidic soils, where it can maintain itself for long periods of time. Microflora competition and orchard management may be an important factor for its survival (8).

P. omnivorum is another root rot infecting fungus with long endurance in soils, specially alkaline in nature. It has been registered on avocado in the state of Michoacan by a group of students and also in the state of Tarnaulipas (7). In many avocado growing areas the pH of the soil is on the acidic side, which does not favour the presence of this fungus. In some cases the fungus may be introduced with the planting material from infested nurseries, where alkaline soil may be used. This fungus has a somewhat limited distribution, and apparently is present only in some southern states of the US bordering on Mexico and in Mexico (5). Besides avocado, it has been found affecting peaches, grapes, nuts, cotton and alfalfa in Mexico (2). It is a very destructive fungus producing progressive chlorosis and leaf drop. The infected roots can be found with typical rhizomorph-like strands on its surface.

Verticillium albo-atrum is the causal agent of the wilt of avocado trees. It has been noted by student groups in the state of Michoacan, although it is not considered as dangerous as *P. cinnamomi.* The sclerotia of this soil-borne fungus invades the roots and may cause a partial or total wilt. The leaves remain on the tree turning grey-brown, giving a scorched appearance The wilting may be sudden and the death of the tree is almost inevitable within 15 days. The attacked roots present brown vascular streaks on young xylem tissue, with some cortical root rot. All these symptoms have been well documented by Zentmyer (9). Grafted varieties seem to be more resistant than native type trees. This needs to be well substantiated and it is evident that more work needs to be done in this area. This fungus is not host-specific and plants such as potatoes, tomatoes, alfalfa, stone fruits and others are well known to be easily affected and should not be planted in close proximity.

Another fungus which produces root rot is *Armillaria mellea,* but its presence in avocado orchards seems low. The fungus was detected only in unattended orchards in the state of Michoacan (6). Chlorosis and wilt is slow, together with defoliation. During the rainy season the fungus presents yellow-orange fructifications on stems or roots. In many cases this may be mistaken for *P. cinnamomi* infection and detailed analysis of the

diseased tree is required to give a good diagnosis. Forest trees may harbour this dangerous pathogen and should be inspected and not tolerated close to commercial orchards.

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