FUMIGATION AND/OR SOLARIZATION SOIL TREATMENT FOR VERTICILLIUM WILT OF APRICOT

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In response to industry concerns regarding the impending loss of methyl bromide as a soil fumigant, a long-term field experiment was done during 1992-1997 to test effects of establishing apricot (*Prunus armeniaca* L. cv. Patterson on apricot rootstock) trees with black polyethylene mulching under the semi-arid conditions of California's San Joaquin Valley. The main objective of the trial was to evaluate effects of the mulch (solarization) treatment, alone and combined with methyl bromide/chloropicrin soil fumigation, on development of Verticillium wilt, caused by *Verticillium dahliae*. The six-year field experiment was done to evaluate and compare the long-term effects of in-season solarization using black polyethylene film with pre-plant soil fumigation using a standard, 50:50 methyl bromide:chloropicrin mixture on establishment of apricot trees and development of Verticillium wilt. Because the use of in-season polyethylene mulches has not been well-studied in apricot, effects of mulch treatments on several tree growth and physiological parameters also were determined.
All soil treatments reduced numbers of *V. dahliae* propagules in soil. Although foliar symptoms of Verticillium wilt were not apparent during the course of the experiment, destructive sampling of the apricot trees showed vascular discoloration due to *V. dahliae* in 1.4-43.1% of scaffolds and 17.6-72.2% in trunks, as previously observed. Both solarization and fumigation treatments significantly reduced incidence of vascular discoloration of host tissue due to *V. dahliae* . Solarization and fumigation treatments increased flowering and fruit yields during the course of the experiment, and yields were inversely correlated to numbers of *V. dahliae* propagules in soil and to incidence of vascular discoloration. Other effects of the soil treatments included differences in tree vegetative growth, weed infestation, and conservation of irrigation water.

None of the pre-plant disinfestation treatments reduced numbers of *V. dahliae* in soil to undetectable levels over the duration of the experiment. Methyl bromide/chloropicrin fumigation of soil in 1991 initially reduced *V. dahliae* to undetectable levels, but the fungus had recolonized treated soil by 1995, presumably due to recolonization by surviving propagules. As found previously, very few *V. dahliae* propagules were found deeper than 30 cm in soil. Also as found in a previous study, evidence of infection by *V. dahliae* was readily apparent through vascular discoloration of excised scaffolds and trunks in destructively sampled trees. This lends support to our recent findings that annual appearance of foliar symptoms may not arise from new root infections each year, but rather from previously nonapparent infections perennating in trunk and scaffold tissues. Also supported are results indicating that Verticillium wilt may reduce yields, even when symptoms are confined to scaffold, trunk, and/or root tissue, such that foliar symptoms are not observable.

Black polyethylene film mulch was effective in controlling Verticillium wilt, increasing apricot fruit yields, and conserving soil moisture. Clear polyethylene film would perhaps be more effective than black in controlling pests through solarization, due to greater thermal

conductivity and retention in soil, but apricot trees in hotter areas did not tolerate the hotter treatment. The mulches, and to a lesser extent, soil fumigation, were also effective for controlling weeds in the tree rows. Mulched trees were slightly more stressed than nonmulched trees, as indicated by leaf moisture potential readings, vegetative growth parameters, and possibly by increased flowering and fruit set responses. When film mulches were removed, signs of tree stress were no longer evident.

FURTHER READING

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