RHIZOSPHERE ECOLOGY OF STRAWBERRY; ROOT PATHOGENS AND BENEFICIAL COLONIZERS

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With the loss of methyl bromide for soil fumigation at the end of the decade, a better understanding of which pathogens are responsible for yield losses in the field will assist in developing effective control strategies. In addition, a more comprehensive understanding of the rhizosphere ecology would be helpful not only for determining if deleterious rhizosphere colonizers contribute to yield reductions, but also for the identification of beneficial microflora that might be capable of improving root health.

Pathogens

A number of different fungi have been recovered from necrotic strawberry roots in the central coastal region of California and evaluated for pathogenicity. The most common pathogens recovered are members of the genus *Pythium* and binucleate isolates of *R. fragariae*. For *Pythium* species, *P. ultimum* was recovered the most frequently, followed by *P. irregulare* and *P. paroecandrum*. Isolates with spherical hyphal swellings and lacking homothallic oospore formation also were frequently recovered. Based on analysis of molecular markers some of these isolates were classified as heterothallic isolates of *P. ultimum* while the remainder were loosely placed into 7-8 additional putative "species" groups. Isolation of *P. diclinum* and 8-10 yet to be classified species were made infrequently. Depending on the species, definite differences in pathogenicity and virulence were observed; some isolates caused root necrosis and significant reductions in root/shoot growth while others had no apparent effect on the plant. Intraspecific variation in virulence was observed with some species.

Binucleate isolates of *Rhizoctonia* (*R. fragariae*) were recovered from a number of commercial fields in the central coastal growing area. Characterization of isolates by anastomosis group (AG) and molecular markers is in progress. While all isolates tested were pathogenic on strawberry, a range in virulence was observed within AG when soil was infested with defined amounts of inoculum. Although multinucleate *Rhizoctonia solani* also was recovered from necrotic roots, the frequency of isolation was very low.

A number of other fungal root pathogens were recovered from necrotic roots as well. One species of *Cylindrocarpon* was recovered that caused symptoms ranging from a generalized water soaking of the roots to significant necrosis depending on the isolate. Other yet to be identified fungal species also were

recovered from necrotic roots and are currently under evaluation for their contribution to root necrosis when strawberry plants are grown in nonfumigated soil.

Rhizosphere ecology

In an effort to gain a better understanding of the influence of rhizosphere microflora on root health and plant yield, an investigation was initiated to evaluate the general rhizosphere ecology of strawberry plants. A range of fungi, bacteria, and actinomycetes were recovered from the roots of plants grown in fumigated and nonfumigated soils at different times during the growing season. A number of these isolates were evaluated for their effect on plant growth using growth chambers set at temperatures similar to those encountered during December to March (the first three to four months after transplanting). Several isolates were identified that either significantly increased or decreased shoot and root growth. Preliminary field trials were conducted last season to identify isolates that might have either a beneficial or detrimental effect on plant establishment, early season growth, and yield. More extensive replicated field evaluations with these isolates are currently in progress this season, the results of which will be discussed.