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BIOLOGICAL CONTROL OF PHYTOPHTHORA CINNAMOMI AND P. CITRICOLA ON AVOCADO BY THE USE OF ANTAGONISTIC MICROORGANISMS. A 4-MONTH PROGRESS REPORT

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This is a 4-month progress report of the project which was funded on November 1, 1989. Anticipating the possible funding, seeds of Persea indica and P. americana (Topa-Topa and G-6) were obtained and planted in flats on October 11 and 20, 1989 (and more planted later). At the time of preparation of this report on February 23, 1990, five greenhouse experiments have been conducted: two on pathogenicity of Phytophthora cinnamomi and P. citricola on avocado seedlings (E12-8-89 and E12-22-89), two on biological control of Phytophthora root rot with the antagonistic fungus, Penicillium funiculosum (E12-2-89 and E2-1-90). A fifth experiment has just begun.

Phytophthora cinnamomi (isolate T139) caused severe root rot on indica and Topa-Topa seedlings under our experimental conditions [peat-perlite (3:1) planting medium, inoculated with Phytophthora-infested millet seed (1 or 2 grams per 4-in or 6-in pot), receiving heavy watering once per week]. The majority of feeder roots were infected and discolored and both top and root growths were greatly reduced at 6 to 10 weeks. Some seedlings wilted due to complete loss of the roots. Phytophthora citricola (P1273) caused moderate root rot and growth reduction on indica seedlings and only slight root rot on Topa-Topa seedlings under our experimental conditions. The experiment on the pathogenicity of these two Phytophthora species on G-6 seedlings is presently still underway.

Penicillium funiculosum, the most promising antagonistic fungus in our previous work on biocontrol of Phytophthora root rot of azalea and citrus, was tested on indica seedlings as potential biocontrol agent against root rot caused by P. cinnamomi and P. citricola. The antagonist was grown in bran/peat mixture in flasks for 3 weeks and incorporated by mixing the inoculum into the peat/perlite planting medium. Seedlings were transplanted to the planting medium in 4-inch pots which received Phytophthora inoculum 5 to 7 days later. Heavy watering was given once per week. The first experiment (E12-2-89), which was terminated at 8 weeks, produced good data on suppression of Phytophthora root rot caused by P. cinnamomi. New linear shoot growth of the seedlings in the 4 treatments (nontreated, Phytophthora alone, antagonist alone, and Phytophthora plus antagonist) was 45, 12, 48, and 33 mm, respectively. The dry weight of the top was 1.13, 0.60, 1.16, and 1.07 grams, respectively; and that of the roots was 0.36, 0.16, 0.37, and 0.22 gram, respectively. P. citricola caused less disease than P. cinnamomi. Penicillium funiculosum was not as effective in suppressing P. citricola as compared to P. cinnamomi in this experiment.

The second biocontrol experiment in the greenhouse was set up on February 1, 1990, which

involved two subisolates of Penicillium funiculosum and two concentrations of the antagonist inoculum. The first reading was taken this week and the experiment will be terminated in mid March.

Four laboratory experiments have been conducted in the past four months, which deal with mechanism(s) of biocontrol of P. cinnamomi by Penicillium funiculosum. Briefly, P. funiculosum produced toxic metabolites which inhibited linear growth and lysed the mycelia of P. cinnamomi. Different subisolates of the antagonist exhibited these inhibitory effects in varying degrees. There was also evidence that the antagonist could colonize the outer layers of root tissues of avocado seedlings which might play a role in the suppression of Phytophthora root rot.