EFFECTS OF TRANSPLANT TYPE AND SOIL TREATMENT ON STRAWBERRY RHIZOSPHERE FUNGI

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Use of strawberry transplant plugs produced in soil-less growth media has potential to reduce problems associated with bare root propagation certain to become more pronounced following phase-out of methyl bromide. Field establishment of bare root transplants requires extensive use of overhead irrigation which aggravates problems with pathogens, and leaches preplant herbicides from soil. Also, many strawberry root pathogens found in production fields originate on planting material grown in soil (Butler *et al.*, 2002). Propagation using plug plants eliminates the need for methyl bromide fumigation of soil in strawberry nurseries, where it has been difficult to identify alternative fumigants that do not negatively impact runner plant production (Larson and Shaw, 2000). Additional advantages of plug transplants include improved stand establishment and vigor, and earlier flowering and fruit set (Sances, 2000). It has also been demonstrated that under stress, plug transplants produce higher yields than bare root transplants (Waldo and Duval, 2001).

Use of plug transplants also allows for the introduction of biological agents in many crops. Soil-less transplant media amended with plant growth-promoting rhizobacteria (PGPR) designated LS213 (Gustafson LLC, Plano TX) improved plant vigor, reduced disease severity and increased yield of tomato and pepper (Kokalis-Burelle *et al*., 2002a). LS213 contains the PGPR isolates *Bacillus subtilis* strain GBO3 and *Bacillus amyloliquefaciens* strain GB99 in a formulation that includes chitin, a material shown to elicit low levels of resistance responses in tomato (Benhamou *et al*. 1998). The objective of these studies was to evaluate the effects of bare root, plug, or plug + PGPR transplants and several chemical soil treatments on isolation of rhizosphere fungi from 'Camarosa' and 'Sweet Charlie' roots during the growing season.

Methods

Two field trials using strawberry cultivars 'Camarosa' and 'Sweet Charlie' were conducted in fall 2000 at the Uniroyal Chemical Company, Inc., Florida Research Station, Sanford, FL. Treatments were arranged in split-plots with subplots comprised of three transplant types; bare root, plug, and plug + LS213. Main plot soil treatments were 1) untreated, 2) MeBr:chloropicrin (67:33 shank injected at 425 kg/ha 10 days prior to planting, 3) 1, 3-D (Telone II, Dow AgroSciences LLC, Indianapolis, IN) broadcast shank injected at 94.6 L/ha, and 4) Plantpro 45 (Ajay North America LLC, Powder Springs, GA) via two drip irrigation lines at 890 L/ha. Plantpro 45 is an unregistered, water-soluble, iodine-based compound being investigated as a methyl bromide alternative. Experiments were arranged in a RCB design with four replications. All main plot soil treatments were applied under 30-µm-thick low-density polyethylene mulch in a typical annual hill

plasticulture system. Strawberries were planted in double rows spaced at 30 cm. Bare root transplants were purchased from Parksdale Farms (Plant City, FL). Both types of plug transplant were purchased from S & G Growers (Limestone, MN).

Three plants/subplot were destructively sampled at mid- and end-of-season for the evaluation of rhizosphere fungal populations. Root tissue was ground in phosphate buffer, serially diluted and plated on agar media selective for oomycetes (PARP medium), *Fusarium* spp. (Komada's medium), *Rhizoctonia* spp. (Richard's medium), and total culture-able fungi (Ohio State medium).

Results

At mid-season, 'Camarosa' bare root plants had the greatest numbers of *Rhizoctonia* spp. and total fungi, while the plug and plug + LS213 plants had the least numbers of these organisms (Fig 1). There was no effect of transplant type on isolation of oomycetes or *Fusarium* spp. Both effects were sustained through end-of-season evaluations (Fig. 2). End-of season root weight, root condition and yield of 'Camarosa' plugs + LS213 were significantly higher than bare root plants (Kokalis-Burelle, 2002b). At mid-season, 'Camarosa' plants in MeBr treated soil had the fewest oomycetes and *Fusarium* spp. isolated from their roots (Fig. 3). Plants in Telone II treated soil had similar numbers of oomycetes, *Fusarium* spp., and *Rhizoctonia* as those in untreated soil, but the least total fungi of all the soil treatments. PP45 was not different from the untreated control in the numbers of fungi isolated from roots. At mid-season, 'Sweet Charlie' bare root plants had more total fungi than either type of plug plant, while there were no differences in oomycetes, *Fusarium* spp., or *Rhizoctonia* spp. (Fig. 4). At the end of the season, bare root plants had the greatest number of oomycetes, *Fusarium* spp., *Rhizoctonia* spp., and total fungi, while the plug + LS213 plants had the least numbers of these fungi (Fig. 5). End-of season root weight and root condition of 'Sweet Charlie' plugs were significantly higher than bare root plants (Kokalis-Burelle, 2002b). At mid-season, 'Sweet Charlie' plants in MeBr treated soil had the fewest *Fusarium* spp, *Rhizoctonia* spp., and total fungi isolated from their roots (Fig. 6). Isolations from Telone II treatments were similar to MeBr treated soil except for the occurrence of more *Rhizoctonia* spp. in the Telone plots. Roots from PP45 treated soil were not different from the untreated control.

Conclusions

Transplant Type: Bare root plants consistently had greater numbers of fungi than either the plug or plug + LS213 plants at mid- and end-of- season isolations. Plug + LS213 plants had numerically lower levels of fungi than the plug plants, although they were not statistically different. LS213 appeared to have a greater effect on 'Sweet Charlie' fungal populations than on 'Camarosa' at the end of season. *Soil Treatments:* Plants in MeBr treated soil had the lowest numbers of fungi isolated from their roots at mid-season. Telone II treated soil resulted in plants with fungal populations statistically similar to MeBr. Fungi isolated from roots in PP45 treated soil did not differ from those in untreated soil. Telone II more effectively reduced fungi on roots of 'Sweet Charlie' than 'Camarosa'.

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