

Vegetable Transplants as a Delivery System for Biocontrol Agents

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Introduction:

Ohio vegetable growers often use transplants ('plugs') to permit earlier harvest of several important Solanaceous crops (tomatoes, peppers, eggplants) that require longer growing seasons. Use of transplants vs. direct seeding can also (1) reduce seed costs, (2) overcome adverse weather conditions in the spring, and (3) reduce weed control costs. In recent years, several microbial products (beneficial bacteria, fungi, etc.) have been marketed for crop production and disease management. Research and demonstration studies at a grower location and university facility tested biocontrol performance under Ohio's environmental conditions and range of cultural practices. Biocontrol compounds included Companion™ (*Bacillus subtilis* GB03), and PlantShield® HC (*Trichoderma harzianum*). Biocontrol compounds were evaluated alone, and in combination. Research/demo plots were featured at various summer meetings and tours in 2003, with summary presentations and reports available at winter 2004 grower meetings and on the OSU VegNet.

Objectives:

- (1) Evaluate effects of commercial biocontrol agents on seedling quality (plant height, stem diameter) of greenhouse-produced tomato, pepper and eggplant transplants,
- (2) Determine if biocontrol agents (alone, or in combination) are effective in controlling key early season root diseases of the Solanaceous crops listed above, and
- (3) Compare effects of biocontrol treatments on fruit characteristics (average fruit size, culled fruit) and marketable yields.

Methods and Materials:

Tomato ('OX150'), pepper ('Merlin') and eggplant ('Santana') were seeded into 288-cell plug trays on April 4, 2003. Transplants were grown in the OARDC Veg Crop Branch (VCB) greenhouse until field establishment on May 29, 2003. Plots were established on raised beds with black plastic mulch spaced 5 feet apart. Tomatoes were spaced 12 inches apart with peppers and eggplants spaced 24 inches apart in the rows. Plots were placed in ground where solanaceous crops (processing tomatoes) were grown the previous year to help establish disease pressure. No disease inoculants were applied to

the field. Biocontrol agents were applied to tomato, pepper and eggplant transplants prior to field establishment at the recommended greenhouse application rates (Companion 16 oz /100 gallons H₂O; PlantShield HC 4 oz/100 gallons H₂O). Plant heights and stem diameter were measured one month after transplant/initial biocontrol application. A second application of Companion and PlantShield HC were applied after plant measurements were recorded. Applications were made based on the recommended field rates of 4 oz/1,000 sq ft (Companion) and 2 oz/100 gallon/800 sq ft (PlantShield HC).

A small demonstration plot of tomatoes, peppers, and eggplant were also established at a grower site, near Fremont, Ohio. Biological controls were applied in the same manner as mentioned above. Plots were used for demonstration and field day presentations. Peppers and eggplants were harvested once at this location. Cultural practices used were according to standard practices used by the grower.

Results and Discussion:

Tomatoes were once-over hand harvested and graded at the Veg Crops Branch (VCB) on September 3, 2003. There were no differences in plant height or stem diameter one month after transplant and no differences in marketable red, green and cull fruit, or average fruit weight at harvest (Table 1).

Peppers were harvested three times at the VCB (Aug 14, Sept 3, 25) and once at the grower site on Aug. 14. Plant heights and stem diameter measured one month after field transplanting at the VCB showed a slight increase for the untreated check vs. Companion alone or the combination treatment with PlantShield (Table 2). No differences in plant height were noted in plots at the grower site (Table 3). There were no yield differences for the three harvests or season totals at the VCB, and no differences due to treatment for the one-time harvest at the grower site.

Eggplant was harvested three times at the VCB (Aug 14, Sept 3, 25) and once at the grower site on Aug. 14. No differences in stem diameter or plant height were noted at either location when measured one month after transplant (Tables 4,5). No differences in yield were observed at the VCB, but there was a difference in marketable T/A at the grower site with the untreated check plots having a higher yield of marketable fruit.

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