

Prophylactic Use of Microbial Control Agents to Prevent Colonization of Nursery Plant Containers by Red Imported Fire Ants, *Solenopsis invicta*

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BACKGROUND:

Fire ants, *Solenopsis* spp., colonize soil and potting media in plant containers in nurseries. This creates safety concerns for nursery personnel and provides a means of disseminating fire ants to areas outside of the quarantine program. Recent infestations of the red imported fire ant, *S. invicta*, in 3 southern California counties have been attributed to introductions via nursery stock originating in quarantined areas. Safe, reliable, and cost-effective methods of controlling fire ants in containerized plants must be developed to assure compliance with the quarantine program and insure the economic viability of nursery agribusinesses. The objectives of this study were to determine the feasibility of using biological agents to prevent colonization of containerized plants by fire ants and to compare their effectiveness with a standard insecticide used by the nursery industry.

PROCEDURES:

Ilex glabra (L.) Gray 'Compacta' liners were potted in 80, 7-gallon containers with a standard soil mix. In 16 of those 80 containers, a granular formulation of the insecticide Talstar™ (bifenthrin, FMC Corporation, Philadelphia, PA) was mixed with the soil medium at a rate of 2 lbs per cubic yard. All containers were transported to the University of Georgia Research and Education Garden on the College of Agricultural and Environmental Sciences Griffin Campus.

Containers were arranged in an open area in the Garden in a randomized complete block design with 4 blocks (replicates), 5 treatments, and 4 containerized plants (experimental units) per treatment per block. The 5 treatments were: (1) an untreated control, (2) the Talstar soil treatment, (3) a soil drench with the entomogenous fungus, *Beauveria bassiana*, formulated as BotaniGard ES™ (Mycotech Corporation, Butte, MT), at a rate of about 4.9×10^9 viable colony-forming units (CFUs) per container, (4) a soil drench with the entomogenous nematode, *Steinernema carpocapsae*, formulated as Ecomask™ (BioLogic Company, Willow Hill, PA), at a rate of 673,750 viable dauers per container, and (5) a soil drench with a combination of BotaniGard ES and Ecomask at the same rates. The soil drench treatments were applied in a total volume of 0.96 liters of water on 01 June 1999.

One-half of the experimental units in each treatment were infested with red imported fire ants, *Solenopsis invicta*, on 02 June 1999. Each container that was infested with ants received one queen with a small (20 to 40) number of workers. These ants had been collected from field colonies in the Griffin area and maintained in laboratory conditions until used in the test.

Containers were visually inspected for ants and evidence of tunneling activity every day for one week following treatment and then once every three days for the remainder of the month. On 01 July 1999, all containers were retreated and ants were added to the containers that had not received ants in the June treatment. Again, all containers were visually inspected for ants and tunneling activity in a manner similar to the June test. The number of sampling dates on which ants or active tunneling were observed in the treatments was statistically compared using the Mann-Whitney test.

RESULTS AND DISCUSSION:

The process we used in infesting the containers with ants for this study appeared satisfactory for short-term studies of this type. Ants and/or active tunneling activities were detected in 7 of the 8 untreated containers that were infested with ants in each test. We found active infestations in these untreated containers for 7.1 ± 1.4 days in the first test and 4.8 ± 0.7 days in the second test. The shorter period of active infestation in the second test was due to higher ambient temperatures in July than in June in the test area.

Within 2 days of infestation, the Talstar treatment had eliminated all ants in those containers in both tests. Dead workers were observed on the soil surface in 5 of the 8 containers in the June test and in all containers in the July test. Ant activity was detected in infested containers for 9.3 ± 1.4 days in Ecomask treatments, 8.4 ± 1.1 days in BotaniGard ES treatments, and 8.4 ± 1.3 days in Ecomask + BotaniGard ES treatments in the June test. These did not differ significantly ($P > 0.05$) from that of the untreated controls. In the July test, ant activity was detected in infested containers for 3.6 ± 0.7 days in Ecomask treatments, 5.0 ± 0.8 days in BotaniGard ES treatments, and 4.8 ± 0.5 days in the Ecomask + BotaniGard ES treatments. Again, these did not differ significantly ($P > 0.05$) from that of the untreated controls.

SIGNIFICANCE TO INDUSTRY:

In summary, mixing Talstar with potting media effectively eliminated invading fire ant colonies from containerized plants. The commercially-formulated biological control agents were not effective in eliminating and preventing these infestations. We did observe dead workers and queens on the soil surfaces of containers treated with the biological agents; however, the impact was not sufficient to efficaciously eliminate or prevent infestations. Biological agents are at least as sensitive to environmental extremes (i.e., temperature) as fire ants. Thus, different formulations or improved methods of application are needed before these biological agents can be recommended for fire ant control in nursery plant containers.