Hot Water Treatment for Arthropod Pests Management

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Introduction

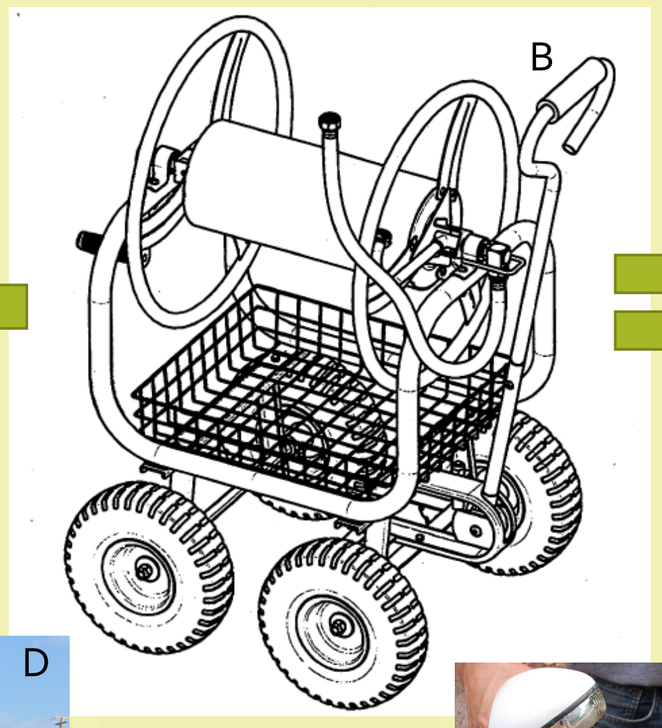
Hot water treatments have been shown effective to free various plant materials (including potted plants, plant suckers, tropical cut flowers) from arthropods and other invertebrate or vertebrate pests particularly for export materials against quarantine pests (Hara, 2011). The objective of this project is to examine the potential of hot water treatment as a non-chemical based approach to manage arthropod pests on field grown crops. Two cropping systems targeting on different key arthropod pests were examined: 1) tea (*Camellia sinensis*) infested with red, broad and 2-spotted spider mites (Acari: Tarsonemidae) and scale insects (Homoptera: Diaspididae); and 2) tomato (*Solanum lycopersicum*) infested with silverleaf whiteflies (*Bemisia argentifolii*).

Materials and Methods

Hot water treatment was generated by a portable propane tankless water heater (Eccotemp Systems, Summerville, SC) delivered through a shower spray nozzle (Fig. 1 A-C) calibrated for 227 gal/acre on the 3-year old tea plants in the **Tea Trial**, and 201 gal/acre on 2-month old tomato plants in the **Tomato Trial** (Fig. 1 D-E). Cold water treatment was served as the control. Targeted pests on recently matured leaves (n=10 and n=5 per plot in tea and tomato trials, respectively) from 4 replicated plots were counted weekly for the tea trial, and twice a week for the tomato trial.

Propane Tankless Water Heater

Hose reel cart



Connect to water tap or portable sprayer tank with pump

Infra red thermometer to monitor spray temperature between 115-120° F.

Hot water treatment on tea plants using weed mat as ground cover (**Tea Trial**).

Hot water treatment on tomato following winter cover cropping and intercropping between insectary plant borders (**Tomato Trial**).

Fig. 1. Diagram showing hot water spray equipment for the tea and tomato trials.

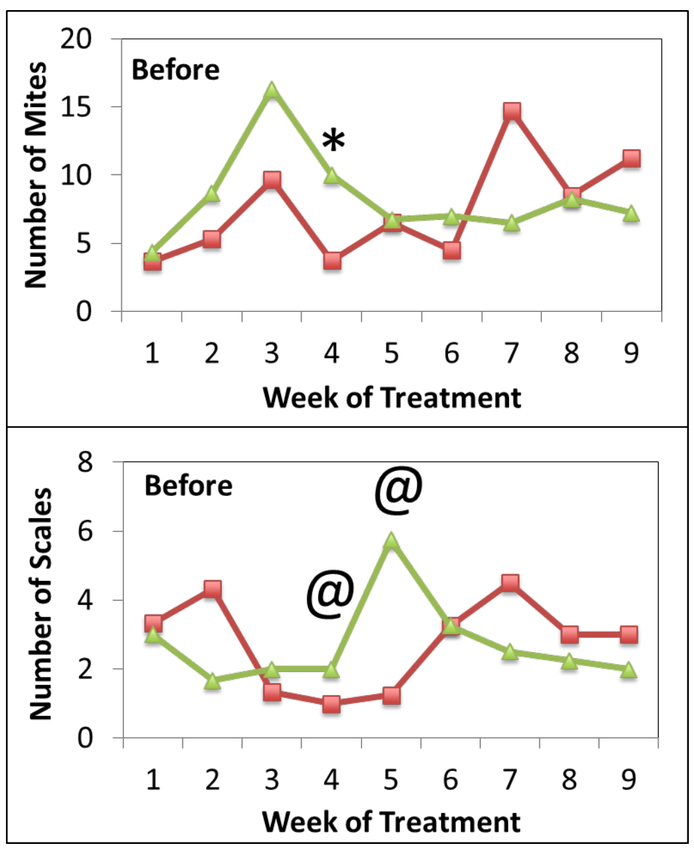


Fig. 2. Number of mites and scales before hot (red line) or cold (green line) water spray at each sampling date in the tea trial. Means (n = 4) on each date followed by * ($P < 0.05$) or @ ($P < 0.10$) indicated significant difference between treatments based on analysis of variance.

Results & Discussion

Tea Trial: Hot water treatment reduced mites or scales on several sampling dates but not consistently (Fig. 2). Hot water spray might offer one tactic to be integrated with other integrated pest management (IPM) tools for an ecosystem that is not particularly abundant in natural enemies partly due to the use of weed mat.

Tomato Trial: Hot water treatment did not show any trend of suppressing whiteflies. Hot water spray might interfere with the visitation of natural enemies such as parasitoids and spiders that are already abundant in agroecosystems with cover cropping and insectary plants.

Future work should look into the use of hot water treatment for arthropod pests management in less biologically diverse system such as in screenhouse or greenhouse crop production.

Mite damage on tea leaves.

Scale insects on tea leaves.

Whiteflies eggs and instars on a tomato leaf.

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