Control of aphids and mites on Celebrity tomato plants using organic controls

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Every year gardeners face many insect pests feasting on fruits and vegetables (Jackman 1998). A commonly planted and harvested fruit are tomatoes. Tomatoes have many pests, such as aphids and mites. Aphids remove sap using their piercing-sucking mouthparts. Some aphids feed on foliage, while others feed on the twigs, limbs, branches, fruits, flowers or roots of plants. If aphid populations are left untreated, they can stunt plant growth, deform and discolor leaves and fruit. Tomato russet mites can also damage stems, leaves and fruit of tomatoes and related plants by inserting their mouthparts into plants and removing the plant cell contents. Their damage causes the appearance of small clusters of empty cells that appear from a distance like stipples. These stipples turn brown or bronze, with most of the damage occurring around major leaf veins. Plant injury starts at the base of the plant and spreads from the stems to the leaves and fruit. In Texas, there is a growing interest in using naturally derived insecticides for controlling all insects. These products are termed "organic" (Drees and Lennon 1998). Current organic recommendations for control of other landscape insects include neem oil and insecticidal soaps, for such pests as scales, aphids, leafhoppers, and thrips.

In this study, we examined several organic control options compared to a synthetic insecticide option to determine efficacy of aphid and mite populations. One product tested was neem oil, since it is effective in killing insect eggs, immature insects, and small soft-bodied pests such as whiteflies and aphids. Once ingested, neem disrupts the molting and reproductive cycles of many insects. Another product tested was a combination of rosemary, sesame, peppermint, thyme and cinnamon oils that interrupts neurotransmission within the insects, which leads to immobilization and death. In addition, sesame oil was tested which coats and suffocates insects after contact. The synthetic treatment tested contained permethrin, which blocks the movement of sodium ions into the nerve cells. Permethrin is commonly used to kill pest insects in agriculture, home pest control, forestry, and in public health programs.

This trial was initiated to determine if the organic control options of neem oil, a combination of rosemary, sesame, peppermint, thyme and cinnamon oils, and sesame oil were are able to control aphid and mite populations compared to the synthetic treatment containing permethrin.

Materials and Methods

Twenty tomato plants of the Celebrity variety were planted within one bed in the Community Gardens at the Urban Solutions Center in Dallas on April 13, 2009 from 9:30am to 12:00pm. The plants were allowed to grow for three weeks in order to establish roots and insect populations for the trial. Treatments were assigned randomly to each plant within each bed.

Treatments include:

Treatments	Company	Rate
Control (water)		**1 gal**
Rosemary, Sesame, Peppermint, Thyme and Cinnamon Oil	**Monterray®**	**Ready-to-use: Spray until covered**
Permethrin	**Green Light®**	**2 Tablespoons/gallon**
Sesame Oil	**Organocide®**	**¼ Cup/gallon**
Neem Oil	**Green Light®**	**2 Tablespoons/gallon**

The foliar treatments were applied every week for a total of 5 weeks. Pretreatment populations of aphids and mites were observed beginning on May 4, 2009. Evaluations were made by examining four randomly selected leaves on each plant. Aphids were counted using a MV-5, 5X Head Magnifying Visor (http://srproduct.com/id21.htm) and numbers were recorded on data sheets. Since the mites were so small, a rating system was used to document the damage to the four randomly selected leaves. The rating system for mites was on a 0-5 scale: 0= no spots; 1= <20% of leaf is spotted, 2=25% of leaf is spotted, 3= 50% of leaf is spotted, 4= 75% of leaf is spotted, 5=100% of leaf is spotted. Evaluations were made at 1, 2, 3, 4 and 5 weeks post treatment. Data were analyzed using SPSS Analysis of Variance (ANOVA) test with means separated using Duncan's Multiple Range Test at $P \leq 0.05$ (SPSS for Windows, Lead Technologies, Version 13.0).

Results and Discussion

For the aphid population, no significant differences were found at pre treatment, 1, 2, and 3 weeks post treatment between the treatments and the water control (Table 1). At 4 weeks, the combination of rosemary, sesame, peppermint, thyme and cinnamon oils had a significantly higher aphid population compared to the other treatments and the water control. At 5 weeks, no significant differences were found between the treatments and the water control. For the mite population, there were no significant differences found for the pre treatment count (Table 2). At 1 week, the permethrin treated plants had significantly higher mite rating compared to the other treatments and the water control. At 2, 3, 4, and 5 weeks, no significant differences in the mite rating were found between the treatments and the water control.

Although the combination of rosemary, sesame, peppermint, thyme and cinnamon oils treatment was not significantly different than the other treatments in controlling the aphid and mite population, this treatment had a higher aphid population and mite rating compared to the other treatments and the water control at the final observation. Overall, the population of aphids and mites found on all of the tomato plants was very low. Many spring days of rain and cooler temperatures could have attributed to the overall low insect population. Since the populations of all pest insects were extremely low, the results from the trial might not be a true depiction of the effectiveness of the treatments tested. This trial needs to be repeated to determine effectiveness of these treatments.

Table 1. Mean number of aphids found at pretreatment, 1, 2, 3, 4 and 5 weeks post treatment.

Treatment	Pre-count	1 Week	2 Weeks	3 Weeks	4 Weeks	5 Weeks
Neem Oil	3.50a	5.50a	3.00a	0.00a	2.25a	2.25a
Permethrin	0.75a	0.75a	1.00a	2.00b	2.50a	1.00a
Rosemary, Sesame, Peppermint, Thyme and Cinnamon Oils	0.00a	0.00a	0.00a	0.00a	6.25**b**	4.00a
Sesame Oil	0.00a	0.25a	0.00a	0.00a	1.25a	1.75a
Control	0.00a	0.00a	0.50a	1.25ab	1.00a	1.75a

[a]Means followed by the same letter within the same column were not significantly different using Analysis of Variance (ANOVA) and means separated using Duncan's Multiple Range Test at $p \leq 0.05$ (SPSS, Windows 11.5).

Table 2. Mean rating of mite damage found at pretreatment, 1, 2, 3, 4 and 5 weeks post treatment.

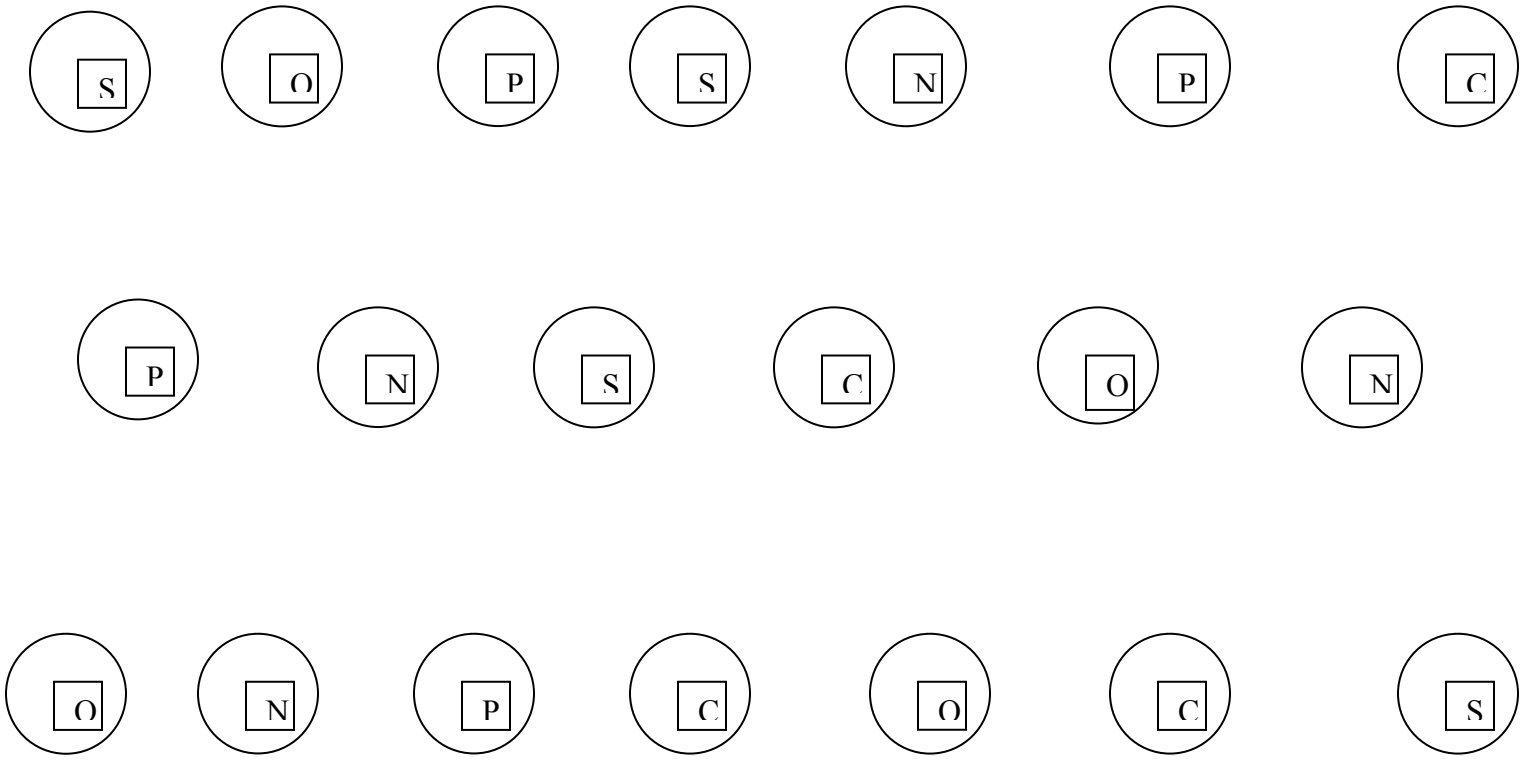
Treatment	Pre-count	1 Week	2 Weeks	3 Weeks	4 Weeks	5 Weeks
Neem Oil	0.00a	0.00a	0.00a	0.00a	0.00a	0.50a
Permethrin	0.25a	0.50**b**	0.25a	0.25a	0.00a	0.25a
Rosemary, Sesame, Peppermint, Thyme and Cinnamon Oils	0.00a	0.00a	0.25a	0.00a	0.50a	0.50a
Sesame Oil	0.00a	0.00a	0.00a	0.00a	0.00a	0.00a
Control	0.00a	0.00a	0.00a	0.00a	0.50a	0.75a

[a]Means followed by the same letter within the same column were not significantly different using Analysis of Variance (ANOVA) and means separated using Duncan's Multiple Range Test at $p \leq 0.05$ (SPSS, Windows 11.5).

Figure 1. Plot plan of Urban Plant Detective tomato study at the Texas AgriLife Research and Extension Center, where a total of 20 Celebrity tomato plants were tested.

Plot Plan:
20 Celebrity Tomato Plants
5 Treatments Replicated 4 times

Bed 23:



O= Rosemary, Sesame, Peppermint, Thyme, Cinnamon Oils
N= Neem oil
S= Sesame Oil
P= Permethrin
C= Water

Literature Cited

Drees, B. M. And L. Lennon. 1998. A review of "organic" and other alternative methods for fire ant control. Fire Ant Plan Fact Sheet FAPFS012. Texas Imported Fire Ant Research & Management Project, Texas A&M University System, College Station, Texas. 8 pp.

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Current Status of the Invasive Rasberry Crazy Ant, *Paratrechina* (=*Nylanderia*) sp. nr. *Pubens*, in Texas

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In 2002 a new invasive ant was found in an industrial area in the Houston area (Pasadena). This ant has the potential to spread rapidly, as October 2009, high numbers of this species have been reported for 13 counties including Jim Hogg (South TX) and Bexar Co. as new counties are expected to be invaded. New county records, general information, identification forms and management options are posted on http://UrbanEntomology.tamu.edu.

The Rasberry crazy ant has become extremely locally abundant. Although they do not sting, they are becoming a serious pest in rural and urban areas by damaging electrical equipment and can irritate or disturb pets, livestock and wildlife, and have been reported invade bee colonies causing them to abscond (leave the hive). They also tend and protect sap-feeding insects (i.e. scales) where they collect honeydew from, some of economic importance. These associations are expected to fuel the spread of this species in the future.

Taxonomic studies indicates this species is similar to the Caribbean crazy ant, *Nylanderia* (=*Paratrechina pubens*), previously reported in Florida but differs from descriptions in the literature (both morphologically and genetically), some others places this species near to *N. fulva*, a serious pest in South America. Basic and applied research is being conducted at Texas A&M University primarily focusing on early detection (locating and surveying recently infested areas), impact on resident arthropod assemblages and evaluation of potential control techniques for developing management strategies for the Rasberry Crazy ant (RCA), *N.* nr. *pubens*.

Progress made to date:

1) A major development on *Paratrechina* taxonomy has occurred, a recent publication by LaPolla et al (LaPolla, J.S., Brady, S.G., Shattuck, S.O. 2010 (Phylogeny and taxonomy of the *Prenolepis* genus-group of ants (Hymenoptera: Formicidae), Systematic Entomology 35: 118-131). They have placed all species under the genus *Paratrechina* under the genus *Nylanderia* with the exception of *P. longicornis,*. As this moment RCA should be recognized as *Nylanderia* sp nr *pubens*.
2) We have contacted LaPolla group and we are making progress on addressing the taxonomical problems that RCA still presents. We have also contacted and visited the *P. fulva* group in Colombia (Drs. Ingeborg Zellner de Polania and Patricia Chacon), they have a long experience on the management of *P. fulva* (~20 years) and we are in the process of establishing collaborative