

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

Kimberly Schofield, Program Specialist-IPM
Texas AgriLife Extension Service, Dallas, TX

Vicki Burk, Amy Dessert, Joyce Flachmeier- Collin County Master Gardeners
Laura Britton, Kathryn Garner – Dallas County Master Gardeners

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 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	6.25b	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

^aMeans 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.

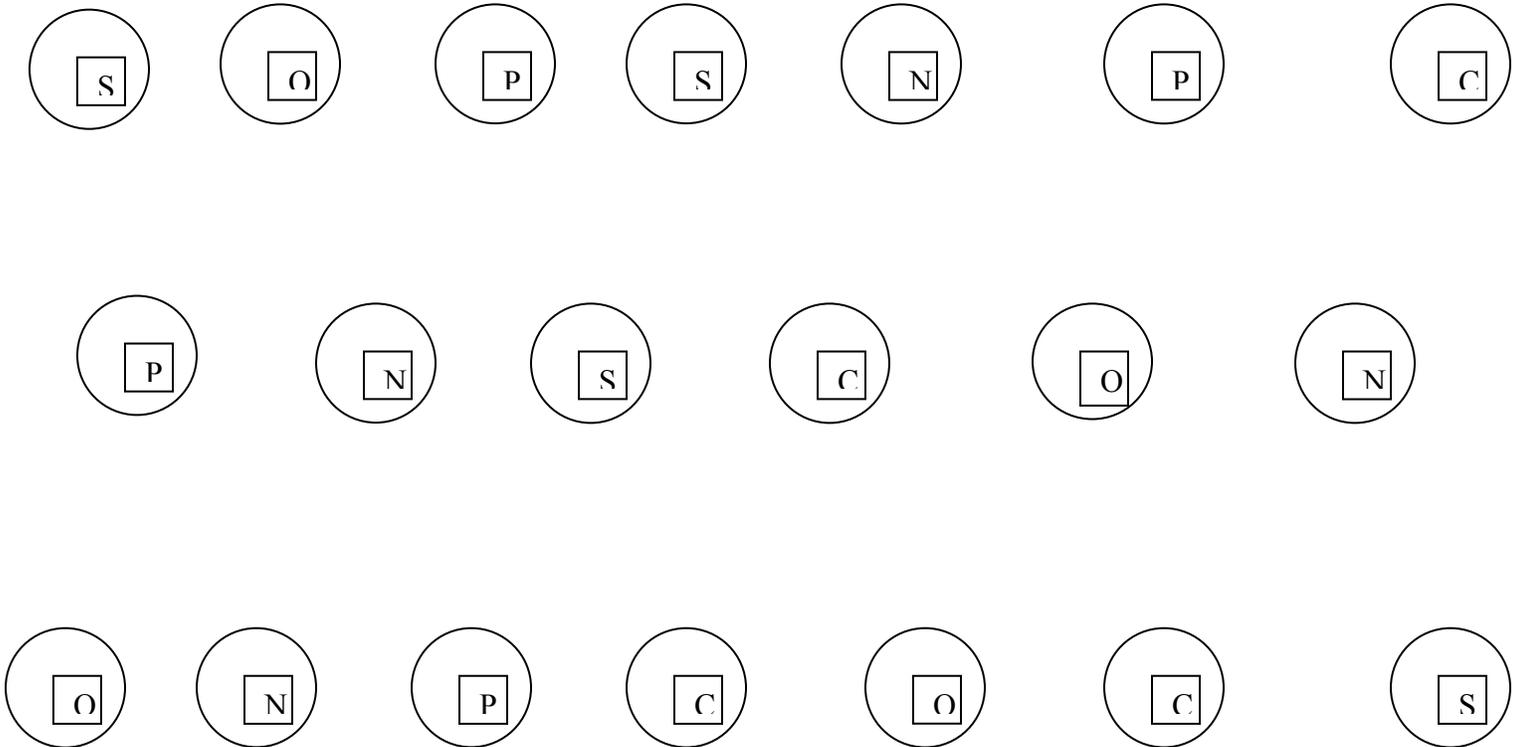
Treatment	Pre-count	1 Week	2 Weeks	3 Weeks	4 Weeks	5 Weeks
Neem Oil	0.00a	0.00a	0.00a	0.00a	0.00a	0.50a
Permethrin	0.25a	0.50b	0.25a	0.25a	0.00a	0.25a
Rosemary, Sesame, Peppermint, Thyme and Cinnamon Oils	0.00a	0.00a	0.25a	0.00a	0.50a	0.50a
Sesame Oil	0.00a	0.00a	0.00a	0.00a	0.00a	0.00a
Control	0.00a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

^aMeans 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.

Jackman, John. 1998. Managing insect and mite pests in vegetable gardens. Texas AgriLife Extension Service Publication Number B-1300. Texas AgriLife Extension, Texas A&M University System, College Station, TX. 55 pp.