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Spray Table Evaluation of Miticides for Two-Spotted Spider Mites on Cotton

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Abstract. *Two-spotted spider mites, Tetranychus urticae Koch, are important pests on numerous field and horticultural crops in the U.S. and worldwide. Although this mite species has always been a pest on cotton especially in drier areas and more recently in the mid-South areas of the Cotton Belt, limited information is available on efficacy of aerially-applied miticides. Bioassay research initiated last year was continued and expanded to include the use of a hand-held optical sensor to assess treatment differences when miticides at different rates were applied to mite-infested cotton using the spray table. Treatment rates evaluated for the miticide, abamectin (Temprano™) were ⅛, ¼, ½, and the lowest recommended rate on the label. Damage assessments were made at 1, 8, 9, and 12 days after treatment. Results showed that product rates as low as ¼ lowest labeled rate were able to effectively control spider mites on cotton. In addition, the product maintained good control for up to 9 days after treatment*

Keywords. *Two-spotted spider mite, Tetranychus urticae, cotton, remote sensing, application rates, damage assessment, miticide efficacy, spray table.*

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Research Objective:

Compare damage caused by two-spotted spider mites on cotton plants after spray table applications of ⅛, ¼, ½ and the lowest label recommended rate of Temprano™ (abamectin) over a 12 day period.

Research Background and Methods:

Data presented at the 2009 NAAA/ASABE session showed that abamectin, a contact miticide, was highly toxic to adult two-spotted spider mites (TSSM) when evaluated in a glass vial bioassay. Additionally, it was shown that an optical remote sensor, GreenSeeker™, was effective in assessing damage caused by TSSM infesting cotton and pinto beans. Based on these findings, additional research was undertaken to evaluate efficacy of abamectin relative to deposition characteristics (droplet size and density) when applied on a spray table to TSSM-infested cotton. An important component of this research was to determine the efficacy of lower rates than those recommended on the label to better identify coverage effects because these become apparent when control is marginal. Coverage is especially important on the underside of leaves, as this is where TSSM predominantly feed (Figure 1). As such, the objective was to evaluate the efficacy of ⅛, ¼, ½, and the lowest label recommended rate of abamectin applied via spray table for control of TSSM on cotton.

Figure 1. Spider mites feeding on the underside of a plant leaf, showing typical damage (chlorophyll loss from individual cells).

TSSM used for testing were reared in a greenhouse on pinto beans as reported previously. NonBt and RoundUp Ready™ cotton variety (DeltaPine 494R) was planted in flats and the plants were infested with TSSM by placing bean leaves containing massing mites over the cotton plants when these were at the 4-5 true leaf stage. The treatments were applied using a computer-controlled spray table after TSSM populations were established on the plants. Treatment differences were assessed with a stationary GreenSeeker™ Model 505 active optical sensor suspended from the greenhouse support frame (Figure 2) by slowly passing the cotton plant flat under the sensor 3 times for each reading. The maximum normalized difference vegetative index (NDVI) readings were averaged for each treatment for each day of assessment. Statistical analyses were then conducted for data collected 1, 8, 9 and 12 days after treatment.

Figure 2. Use of the GreenSeeker™ active optical sensor for assessing spider mite damage on infested plants.

Results and Discussion: A total of 4 different miticide rates of Temprano were evaluated for their ability to control two-spotted spider mites on greenhouse-grown cotton. Damage assessments were made from the time of treatment up to 12 days after treatment (DAT). At 1 DAT, there were no differences between damage seen on the uninfested control and the infested treatments (Figure 3). By 8 and 9 DAT, the 1/8 rate treatment had sustained significantly more spider mite damage than the other treatments. At 12 DAT, all infested cotton plants treated with miticide at any rate sustained equivalent and substantial damage (Figure 4). The data show that Temprano, as applied, was moderately effective at controlling two-spotted spider mites at the ¼,

½, and lowest label rate for up to 9 DAT. After that, significant damage ensued. A more effective miticide application would have virtually eliminated the TSSMs, preventing reproduction and reinfestation. Although applicators would never intentionally apply anything less than the lowest labeled rate of product, environmental conditions at the time of application may reduce the actual amount of product that reaches the target. These results show that Temprano can still be effective, even when less than optimal deposition occurs. In addition, spider mites are known to reside and feed on the underside of leaves. The miticide applications for this study were all made from the top, similar to a conventional aerial application. Increased efficacy of the miticide would be expected with increased deposition on the underside of the leaves.

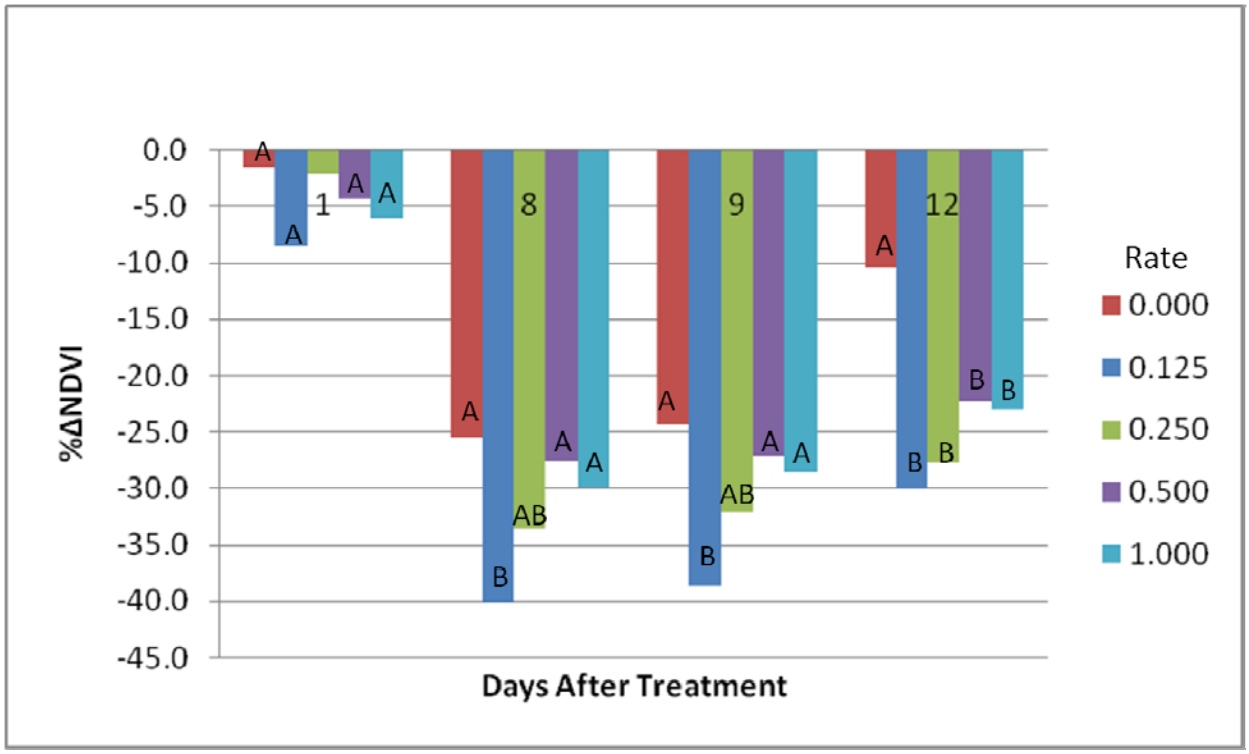

Figure 3. Effect of abamectin for control of two-spotted spider mites on cotton. A greater negative percent change in the Normalized Difference Vegetative Index (NDVI) for each treatment indicates greater damage to the cotton. The zero rate (0.000) represents the uninfested control. All other rates are fractions of the lowest labeled rate. For each day after treatment, common letters indicate no difference between treatments.

Figure 4. Two-spotted spider mite damage on greenhouse-grown cotton, 12 days after infestation.

Conclusions: Based on the results of these studies, abamectin applied at as low as ¼ the lowest labeled rate can effectively control two-spotted spider mites on cotton for up to 9 days. Increased coverage on the underside of the leaves, where spider mites feed, should greatly improve the efficacy of the application.