ID#105 2002 Final VA

**NATIONAL PEANUT BOARD**
**PROJECT REPORT**
**MARCH 2003**

**PROJECT NAME:** Biology and Improved Management of Spider Mite in Peanut

**TERM OF PROJECT:** 1 year, Jan. 1 – Dec. 31, 2002

**PROJECT LEADERS and CO-INVESTIGATOR:** Dr. D. A. Herbert, Jr. (Entomologist, TAREC); Dr. C. Brewster (Entomologist, Blacksburg); Dr. E. E. Lewis (Entomologist, Blacksburg); Ms. J. L. Ashley (Co-Invest., Graduate Student, TAREC)

**LOCATION(S):** Tidewater Agricultural Research and Extension Center, Suffolk, VA; Department of Entomology, Blacksburg, VA; Cooperating grower's fields

**OBJECTIVES:**

***Ovicidal Trials (Egg killing capacity)***

**Methods** – Twenty 90-mm Petri dishes were lined with peanut leaflets. Ten adult, female TSSM (twospotted spider mite) were transferred to each dish and the dish was sealed with Parafilm. The mites were allowed to oviposit (lay eggs) for 48 hours. The actives stages (adults and nymphs) of mites were then removed from the leaflets. The number of eggs on each leaflet was counted. Ten leaflets were used per treatment. The eggs were then subjected to a dip test, using each of the treatments listed in Table 1. To complete the dip test, the leaflet was dipped into the treatment for approximately five seconds. The leaflet was allowed to dry under the fume hood for two hours. The leaflet was placed into a modified huffaker cell. For 10 days after treatment, the number of hatched eggs was counted. Any mites that hatched were removed.

**Results** – Two trials (Trials 1 & 2) have been completed and the data analyzed with ANOVA and Tukey's Multiple Range Comparison test. The two rates of Danitol were not significantly different from the controls, that is, Danitol did not reduce (kill) egg numbers. The two rates of V-1283 and Comite provided almost complete kill of eggs with resulting numbers that were significantly different compared with the controls (Figures 1 & 2).

***Pesticide Efficacy (Adult, nymph, and egg killing capacity)***

**Methods** – Peanut cuttings were taken that contained at least two leaves. Ten adult female TSSM were placed onto each cutting. The mites were left on the cuttings for one week to develop a mixed population of adults, nymphs and eggs. After one week, pretreatment counts were taken and the cuttings were sprayed with the treatments listed in Table 1. Post treatment counts were taken at one, three, and seven days after

treatment. The number of eggs, nymphs, and adults was counted. The trial was done two times (Trial 3 & Trial 4).

**Results** – These data were analyzed with ANOVA and Tukey's multiple comparison test. The results of total mites alive (adults + nymphs + eggs) after seven days provides what may be the most accurate comparison of the products tested. At seven days after treatment in Trial 3, cuttings treated with either rate of V-1283 had significantly less total mites alive than the low and high rates of Danitol, and those treated with the high rate of Danitol had significantly less total mites alive than the untreated control (Table 2). At seven days after treatment in Trial 4, there were no significant differences in treatments, all of which had fewer surviving mites than the untreated control (Table 3).

***Residual Activity (Length of killing activity)***

**Methods** – Lima bean plants were sprayed with the treatments listed in Table 1. Twenty cuttings were taken per treatment at one and three days after treatment. The cuttings were then placed into modified Huffaker cells. One adult TSSM was then placed onto the cuttings. After 24 hours, the adult was scored as dead or alive. Originally, cuttings were also to be taken at seven and 14 days after treatment. However, at three days after treatment, there was little or no residual toxicity, so the trials were concluded at three days after treatment. Data were subjected to chi-squared analysis.

**Results** – Two trials (Trials 5 & 6) have been completed for this experiment. Percent mortality at one and three days after treatment is presented in Tables 4 and 5. There were no significant differences in percent mortality of adults between any of the treatments and the untreated controls (Tables 4 & 5).

***Developing an understanding of the spatiotemporal distribution of twospotted spider mite populations in commercial peanut fields in southeastern Virginia.***

**Methods** – An understanding of the changes in the spatial distribution of TSSM is essential for developing methods for detecting and mapping the distribution of this pest and for timely implementation of precision management strategies within peanut fields. The study was conducted during the summer months of 2001 and 2002 in commercial peanut fields located in Dinwiddie County and Isle of Wight County in southeastern Virginia. Two peanut fields were sampled intensively each summer. The fields varied in size from ≈ 1.9 to 9.6 ha. Field 1 was sampled weekly for five weeks (July 19–August 16), Field 2 for four weeks (July 24–August 14), Field 3 for four weeks (July 10–July 31), and Field 4 for four weeks (July 8–July 29). For each of the four peanut fields, we used a handheld GPS to superimpose a sampling grid over the entire field with a resolution that varied from 10 × 10 m to 20 × 20 m depending on the size of the field. We used a 10X hand held lens to count the number of immature and adult TSSM on a quadrofoliate leaf that was arbitrarily selected from a peanut plant at each sampling point on the grid. For statistical analysis, we used a two-sample Cramér-von Mises test to test

the null hypothesis of no difference between any two spatial distributions of TSSM populations within each of the fields. The alternate hypothesis was that there was some unspecified difference between pair-wise distributions of spider mite populations within a field. We also determined whether the spatial distribution of TSSM within each of the fields changed from week to week and whether the distributions were aggregated, random, or uniform.

**Results** – The density of twospotted spider mites in the four fields ranged from a mean (± SE) of 0.06 ± 0.02 to 16.9 ±1.99 mites/leaf. The mean densities of TSSM in three of the fields increased initially, but decreased by end of the sampling periods (e.g., Figure 3). The mean density of TSSM in the fourth field decreased steadily during the study. The spatial distribution of TSSM within peanut fields in southeastern Virginia remained relatively constant from week to week in each of the fields that were studied despite the fact that the population density changed weekly. For example, the mean density of TSSM in the fourth week of sampling in Field 1 was more than twice the mean density in week 1, yet, there was no statistically significant difference in the spatial distribution patterns between week 1 and week 4 (Figures 3 & 4). In those cases where significant differences in the spatial distributions of TSSM were observed between sampling weeks, the growers reported that they had applied a pesticide to their fields. In Field 1, for example, the grower applied an acaricide to the field between the third and fourth weeks of sampling and again a week later (Figure 3).

Two requirements for precision pest management are that there exists some level of spatial variability in the density of the pest population within the field (i.e., the pest population has an aggregated spatial distribution) and that the spatial distribution changes very slowly over time. This study showed that TSSM populations in peanut fields tended to have 1) an aggregated spatial distribution, and 2) that the distribution changed very slowly over time. It may be possible, therefore, to use these two pieces of information to develop precision management tactics for TSSM in peanut.

Virginia Cooperative Extension

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March 20, 2003

Mr. Russell Schools
Virginia Peanut Growers Association
23020 Main Street
Capron, VA 23829-0356

Dear Russell,

Enclosed are the required copies of final reports for the two projects funded in 2001-2002 by the National Peanut Board.

1) *Biology and improved management of spider mite in peanut.*

2) *Management of tomato spotted wilt virus in Virginia peanut.*

According to the guidelines, a single copy is due 90 days after the ending date (December 31, 2002). Please do not hesitate to contact us if more information is needed.

Thank you for your support of the peanut research/extension program here at the Tidewater AREC.

Sincerely,

Ames Herbert
Professor, Entomologist
Virginia Tech