

## Evaluation of Miticides and Factors Associated with Chemical Performance When Products are Applied for Control of the Banks Grass Mite and Twospotted Spider Mite – 2009 - 2010

Ed Bynum<sup>1</sup>, Pat Porter<sup>1</sup>, Monti Vandiver<sup>1</sup>, G. J. Michels, Jr.<sup>2</sup>, Rick Auckerman<sup>1</sup> and J. B. Bible<sup>2</sup>  
<sup>1</sup> Texas AgriLife Extension Service, <sup>2</sup> Texas AgriLife Research

### Relavance:

The Banks grass mite (BGM), *Oligonychus pratensis*, and Twospotted spider mite (TSSM), *Tetranychus urtica*, are serious corn pests in the Texas High Plains. The BGM is the predominate mite species infesting corn, but severe infestations of TSSM often occur each year in the Texas High Plains. Damage is caused by mites removing chlorophyll from host tissue resulting in decreased photosynthesis and transpiration. Heavy infestations can cause severe leaf death resulting in significant yield reduction. Mite suppression is, in many cases, dependent on miticides because control by predators and diseases alone may be delayed thus allowing unacceptable amounts of damage before suppression is achieved. Both spider mite species on the Texas High Plains have a history of developing resistance to miticides and there is the potential for mites to develop resistance to currently available miticides quickly. Since the removal of Azodrin<sup>®</sup> by EPA in the early 1980's, bifenthrin and dimethoate have been the primary miticides used to control mite infestations on tasseled corn. Within the past eight to ten years, BGM control failures with bifenthrin and dimethoate became common and widespread across the area. Products such as Comite<sup>®</sup> can be effective in controlling mites, but only when applied to pre-tassel corn while mite populations are just becoming established. The more recently registered Oberon<sup>®</sup> (2005) and Onager<sup>®</sup> (2007) miticides are products that corn producers in the Texas High Plains have begun using to control mites. Oberon has been used for both pre-tassel and post-tassel mite control but there have been reports of control failures when applied to post-tasseled corn. Onager<sup>®</sup> is primarily used to control mites on pre-tassel corn, but it shows promise as a post-tassel application product and will be investigated further in 2011. The early pre-tassel miticide applications are not always the best management practice because populations often never reach damaging levels due to environmental conditions and natural predation. Producers have very few options for controlling mite infestations after populations reach damaging levels on tasseled corn. It is imperative that producers have information about the most current practices and strategies for managing spider mite infestations.

### Response:

Individuals from Texas AgriLife Extension Service and the Texas AgriLife Research have developed a collaborative project to address issues related to control and management of spider mites in corn. Special emphasis is directed at evaluating new unregistered miticides for possible support in future registrations on corn, determining best control methods for currently registered products, and developing base-line susceptible levels for detecting possible changes in miticide resistance.

### Target Audience

The target audience includes producers, crop consultants, chemical representatives, and extension agents in the corn production areas for the Texas High Plains and the Texas Panhandle.

### *Resource Acquisition*

Several resources were required for this project. Human resources were needed to conduct field and laboratory trials. Producer fields and Texas AgriLife Research facilities were used when conducting field and laboratory trials. Extension Entomology Specialists and IPM extension agents are needed as presenters at educational events. Financial resources from 2009 and 2010 were provided from the Texas Corn Producers Board, Gowan Inc., FMC Inc., Valent Inc., Nichino, and Chemtura AgroSciences for the trials and educational events. A total of \$35,000 was secured for this program in 2010 and \$15,000 for 2009. Additionally, New Mexico State University participated in this project in 2009 by providing an additional experimental location on the NMSU Research Center at Clovis.

### *Education Events and Media Efforts*

Since field trials were conducted during the 2009 and 2010 growing season and the laboratory studies were conducted from October through November of 2009, there have been eight educational events conducted to date. Two of the educational events were in November 2009 and November 2010 at the Entomology Science Conference in College Station, TX for entomologists with the Texas A&M University Entomology Department, Texas AgriLife Extension Service, and Texas AgriLife Research. Four educational events were conducted in January 2010 in District 1 covering the Texas Panhandle. These educational events were a part of the 2010 Texas and Oklahoma Panhandle Crop Production Clinics as presented by Pioneer Hi-Bred International, DuPont Agricultural Products, and the Texas AgriLife Extension Service. The meetings in Texas were held at Dalhart, Dumas, Panhandle, and Spearman, TX on Jan. 11, 12, 13, and 14, respectively. Also, information was provided to extension agents from the Texas High Plains at a corn training workshop on June 29, 2010 and to State Entomology Extension specialists and seed company representatives from Alabama, Arkansas, Arizona, California, Florida, Georgia, Louisiana, Mississippi, Missouri, New Mexico, North Carolina, South Carolina, Tennessee, and Texas on October 12, 2010 at the Bayer CropSciences/Monsanto 2010 Southern Cotton, Corn, and Soybean Management Seminar in Savannah, GA.

Information from the field and laboratory studies were used in the Panhandle Pest Update, Focus on High Plains Agriculture, and county IPM newsletters to help producers and crop consultants manage mite infestations during the 2009 and 2010 growing seasons.

## **Results:**

### *Result Demonstrations or Research Studies*

There were a total of seven miticide field studies conducted across the Texas High Plains during the 2009 growing season. Two field trials were conducted at the Texas AgriLife Research Station at Etter, TX. These trials were conducted in an area that had been infested with mites collected from a producer's field located north of Sunray, TX and from a laboratory mite colony at the Texas AgriLife Research Station at Bushland, TX. Two trials were conducted on producer fields near Muleshoe, TX and Farwell, TX. These trials were treated with a hand-carried CO<sub>2</sub> spray boom held over the top of tasseled corn to simulated control by aerial applications. One trial near Clovis, NM

and another at the Texas AgriLife Research station at Lubbock, TX, were conducted using a hand-carried CO<sub>2</sub> spray boom held vertically within the corn canopy to provide good spray coverage. The last trial was conducted at the Texas AgriLife Research station at Halfway, TX, using a tractor-mounted spray boom designed to simulate chemigation with Low Energy Precision Application (LEPA) commercial drop nozzles. A complete summary of the results is available upon request.

Laboratory studies were conducted at the Texas AgriLife Research Station at Bushland, TX, in 2009 using mite colonies from mites collected from field populations at Etter, TX. The objectives of these trials were to 1) Determine baseline toxicity data of spider mites to Oberon® (spiromesifen) and 2) evaluate possible susceptibility changes by spider mites following an exposure to Oberon®.

There were six field studies on producer fields and at Texas AgriLife Research facilities in 2010. Four studies were conducted to evaluate the effectiveness of early pre-tassel applications of miticides for control and prevention of economic damage from spider mite infestations. These trials were conducted at Halfway, TX (2), Dimmitt, TX, and Tam Anne, TX. The other two trials (Hereford, TX and Muleshoe, TX) were conducted to evaluate new and existing miticides as rescue treatments for control of spider mites infesting tassel stage corn.

Additional research will be conducted in 2011 to continue evaluation of miticide products and application methods for effective spider mite control

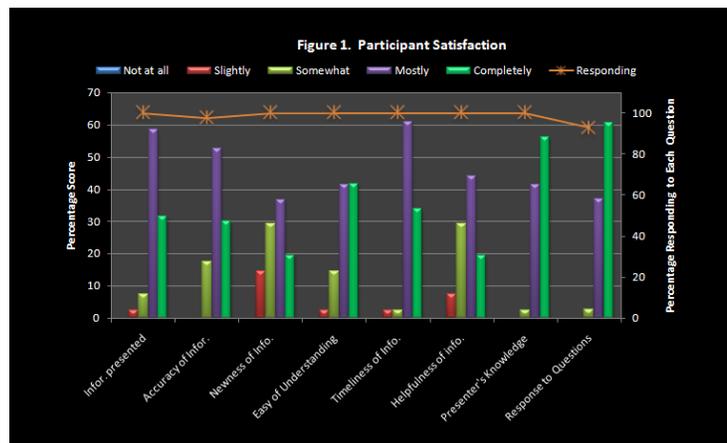
*Summary of Study Results* - Field control of spider mites on tasseled corn, late in the season when populations are increasing is influenced by environmental conditions, susceptibility of mites to a chemical, the complex of mite species present, the chemical mode of action, and application spray coverage. The comprehensive field trials these past two seasons showed that all registered and non-registered miticides evaluated (Comite®, Onager®, Oberon®, Hero®, Dimethoate®, Portal®, and Zeal®) were affected by some, if not all, of these factors. Poor coverage of over the top applications probably had the greatest influence on mite control. Coverage is critical because these miticides are not systemic within the plant and their activity is primarily against mite eggs and the immature stages. The incidence of TSSM spider mites in the field could have contributed to control failures, particularly if TSSM spider mites were less susceptible to the currently registered miticides. This can be important because field identification of mites are not easy and can be miss-identified.

Early season pre-tassel miticide trials showed the difficulty in knowing when to spray corn in the pre-tassel growth stages for mite management. Mite densities in the two trials conducted at the research facilities at Halfway, TX, never developed throughout the growing season. In the trial at Dimmitt where applications were made to mite populations migrating from CRP grasses to 1 to 2 ft. tall corn, mite populations were naturally controlled by predators. Mite densities never rebounded to damaging levels the rest of the growing season. Therefore for these trials, there was no need to spray miticides. The last pre-tassel miticide trial at Tam Anne, TX, showed promise for managing mites when corn is ca. 4 ft tall. Mite populations were establishing and the miticide applications were reducing mite densities. Unfortunately, the trial was heavily damaged by a hail storm which prevented further sampling for mite infestations and damage.

Laboratory studies in 2009 provided interesting insights into Oberon’s mechanism for control of spider mites infesting corn. The studies confirmed that Oberon® is not a good adulticide and control is associated with mortality of eggs and immature mites. The studies provided baseline data that can be used to evaluate possible changes in TSSM susceptibility as Oberon® continues to be used by producers. The studies showed that the susceptibility of the tested mite population did not change after being treated with Oberon®. This would indicate the population was not mixed with susceptible and resistant mites. Further studies are needed to determine if there are differences in susceptibility by BGM and TSSM.

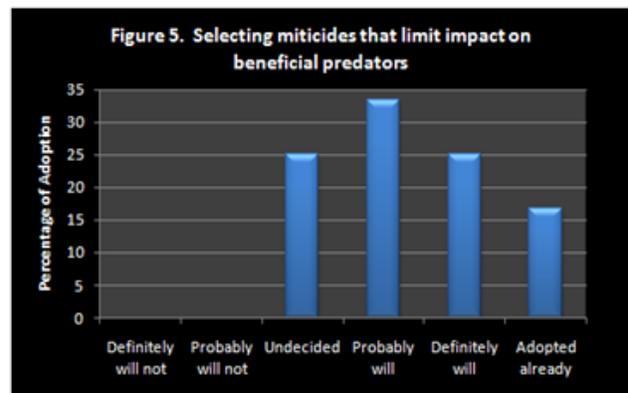
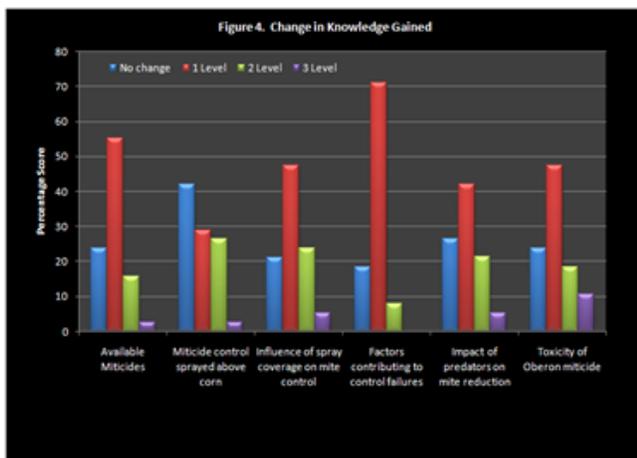
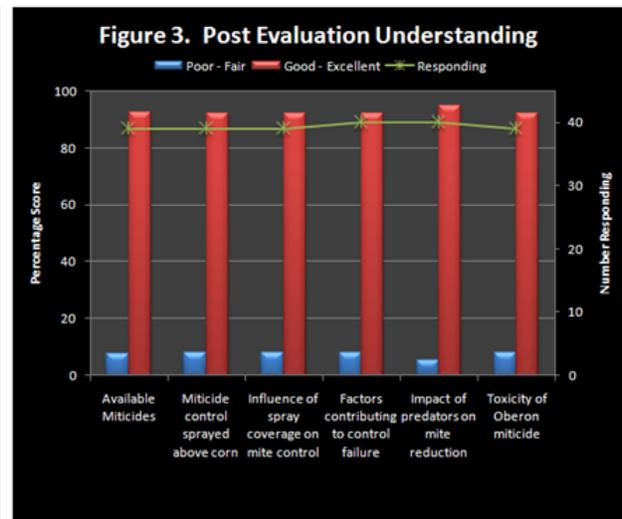
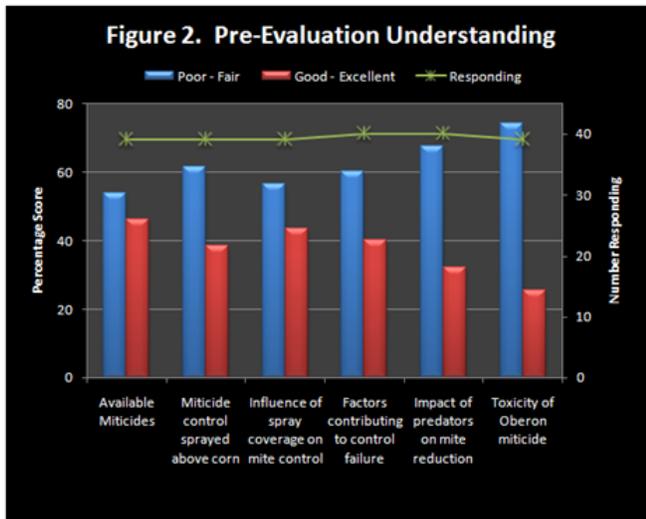
### Educational Results

In 2010 a series of 4 meetings were conducted from January 11 to 14 in the Texas Panhandle. At each of these Texas and Oklahoma Panhandle Crop Production Clinics there were four concurrent sessions. One session was on management and control of spider mites infesting corn. A total of 491 individuals attended these 4 meetings. Of those attending 41 producers responded to questions on a post evaluation survey.



1. Customer Satisfaction – Participates were asked to rate the level of satisfaction as related to the program. The choices were not at all (NA), slightly (SL), somewhat (SW), mostly (M), and completely (C). The producers response were: Information presented (41 of 41 for 90.2% rating of M to C), Accuracy of information (40 of 41 for a 82.5% rating of M to C), New information (41 of 41 for a 56.1% ratio of M to C), Information easy to understand (41 of 41 for a 83% rating of M to C), Timeliness of information (41 of 41 for a 95% rating of M to C), Helpfulness of information (41 of 41 for a 63.4% rating of M to C), Knowledge level of presenter (41 of 41 for a 97.6% rating of M to C, and Presenter’s response to questions (38 of 41 for a 97.3% rating of M to C) (Figure 1).
2. Knowledge Gained – A retrospective post evaluation method was used to assess the amount of knowledge producers gained from this program. The amount of knowledge gained was based on producers response to 1=Poor, 2=Fair, 3=Good, and 4=Excellent as related to before the meeting and after the presentation. From the pre-evaluation response, 53.7% of the producers had no more than a fair knowledge of what miticides were available for spider mite control, 61.5% only had a poor to fair knowledge of how effective miticides were when sprayed over the top of corn, 56.4% had only a fair to poor understanding of the influence spray coverage on mite control, 60% did not have a good understand of the factors causing control failures, 67.4% did not understand the importance of predators for controlling mite populations, and 74.3% had only a fair to poor knowledge of Oberon miticide toxicity (Figure 2). After the program, ≥ 92% of the producers had a good to excellent understanding for any of the topics (Figure3). This indicates there was a substantial increase in knowledge gained by producers about controlling spider mites. The level of change from before the meeting to after the program is illustrated in Figure 4.

Depending on the topic there was at least a 28.9% to 71.1% in a one level change and a 7.9% to 26.3% in a two level change of understanding. From the knowledge gained 58.3% of producers probably will or definitely will adopt the practice of selecting miticides that limit the impact on beneficial predators (Figure 5). Considering only 16.7% of the producers have already adopted this practice, this is substantial increase in producers that are considering using miticides that are not detrimental to the natural predator population.



### Acknowledgements:

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