SPIDER MITES- PEST STATUS WESTERN REGION

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Abstract

Spider mites (*Tetranychus* spp.) are key pests of cotton in the San Joaquin Valley of California. The arid Mediterranean climate of the region creates ideal conditions for this pest. Without management, this pest can cause up to 50% cotton yield losses. Over the last 20 years, estimated lint losses from spider mites in the SJV have been as high as ~10% in spite of management actions with 1-3% being the more common value. Besides the obvious economic consequences of these yield losses, the other concerns of this pest to the cotton industry include the need for accurate pest monitoring to optimize IPM programs, the costs of control actions, consideration of the implications of using broad-spectrum insecticides (such as for Lygus bugs) in order to protect natural enemies (helping to reduce spider mite build-up), and the ability of spider mites to develop resistance to acaricides.

Introduction

Spider mites are key arthropod pests in San Joaquin Valley (SJV) cotton accounting for estimated lint losses as high as 7.2% in 1991 (Head 1991) to 1.9% in 2005 (Williams 2005) in spite of control actions. There are three species of spider mites in California cotton; strawberry spider mite (*Tetranychus turkestani*), twospotted spider mite (*T. urticae*), and Pacific spider mite (*T. pacificus*). Spider mites have been pests of SJV cotton since the time of earliest production but only outbreaks of strawberry mite were common prior to the use of synthetic insecticides (Moore et al. 1996). Spider mites damage cotton by feeding on the leaves, thereby reducing plant photosynthetic activity and eventually yield. The species present in a cotton field is influenced by the neighboring crops with *T. urticae* presently generally being the most important species. The three species differ somewhat in biology and damage severity to cotton, but for management purposes the species complex is considered as one. Differentiating the species is difficult based on external morphology.

The tenets of the California spider mite management scheme involve cultural, biological, and chemical controls. In terms of cultural practices that reduce the impacts of spider mites, maintaining a healthy, well-watered vigorous plant is of utmost importance. Reducing dust from field borders and dirt roads is also important as dusty plants/leaves tend to promote mite populations. Biological control is also important. During the early-season period (up to 4 to 5 nodes), western flower thrips help to keep mite populations in check by preying on spider mites (primarily the egg stage). Western flower thrips also feed on the emerging and developing cotton seedlings, so balancing the positive and negative effects of thrips is important. Generalist predators (Hemiptera, Coleoptera, and Neuroptera) play a role in managing spider mite populations. Specific predators of spider mites such as six-spotted thrips (*Scolothrips sexmaculatus*), spider mite destroyer beetle (*Stethorus picipes*), and western predatory mite *Galendromus (Metaseiulus) occidentalis* appear to be more effective and common in perennial cropping systems than in cotton. The flaring of spider mite populations following application of broad-spectrum insecticides results, in part, from the destruction of populations of natural enemies (Univ. of California, 1996). These insecticides such as many organophosphate and pyrethroid materials, which would target other important cotton insect pests such as *Lygus hesperus, Aphis gossypii*, or *Bemisia* spp., may also directly or indirectly cause the mites to reproduce more. The indirect effects "operate" by altering the nutritional value of the cotton plant.

Acaricides are an integral part of the mite IPM program in cotton in the SJV. For instance in 2007, approximately 75% of the SJV cotton acreage received a treatment of an acaricide (California Department of Pesticide Regulation, 2008). Usage has been as high as 95% in previous years. Selective miticides sulfur, Kelthane®, Comite®, Zephyr®, and Onager® have been utilized on SJV cotton for the last 20-30 years. Laboratory bioassays have demonstrated that Kelthane and Comite resistance can be detected in twospotted spider mite and Pacific mite populations (Bruce-Oliver and Grafton-Cardwell 1997, Grafton-Cardwell et al. 2000) but the resistance is not dominant in inheritance and mites can revert to susceptible at the beginning of the season. However, careful rotation of miticides has been a critical factor in maintaining control options in SJV cotton. In recent years, four new acaricides have been registered on cotton in California, 1.) Acramite® (bifenazate), 2.) Fujimite® (fenpyroximate), 3.) Oberon® (spiromesifen), and 4.) Zeal® (etoxazole). Baseline susceptibility values were established for these materials in 2007 (Pierce and Godfrey 2008). Optimizing the utilization of these newer products, i.e., the best window for use,

has been an ongoing project in cotton IPM in the SJV. Research on efficacy of acaricides in cotton is an ongoing program in California (Wynholds and Godfrey 1995, Keillor and Godfrey 2005).

Spider mites in SJV cotton are sampled using a binomial sampling plan which involves inspecting leaves for the presence of immature and adult spider mites. The treatment threshold is 30-50% of the 5th main stem node leaves infested with mites (Godfrey et al. 2008, Wilson et al., 1983, 1987, 1991). Spider mite populations begin in cotton from overwintering adult mites emerging from the soil or from mites dispersing from neighboring crops or weeds. These early-season populations are generally held in check by predators including thrips. In fields with low natural enemy populations, spider mite populations can increase quickly. Later season problems are often associated with the use of disruptive, broad-spectrum insecticides, which release spider mites from their natural enemies, thus allowing damaging populations to build up. Spider mite infestations can also result from mites blowing from neighboring, maturing crops such as corn, seed alfalfa, sugarbeets, or beans.

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