LANDSCAPE IMPLICATIONS FOR CONTROL OF SPIDER MITES

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Abstract

Spider mites (*Tetranychus* spp.) are key pests of many crops in the San Joaquin Valley (SJV) of California. Spider mites flourish under hot, dry conditions and the arid Mediterranean climate of the SJV, and many of the Western cropping areas, creates ideal conditions for this pest. Several factors associated with this pest contribute to its pest status including the high reproductive potential, the ability to feed on several crops/host plants (reported more than 200), the capacity to develop resistance to acaricides, potential to move long distance including dispersal with wind currents, and ability to overwinter therefore surviving poor conditions. The agroecosystem in the SJV also facilitates spider mite population build-up due to the variety of crops grown, the season-long cropping scenario used in many areas, and the intensive management of crops practiced in most areas. Spider mites are a pest on many of the crops grown in the SJV. The dominant species varies with crop and area in the SJV but management plans are in place for spider mites on most crops. Management plans for agricultural crops in California (Pest Management Guidelines) detail IPM of mites on individual crops including cotton (Godfrey et al. 2008, Univ. of California 1996, 2008). On cotton in the SJV, there are three species of pest spider mites; strawberry spider mite (*Tetranychus turkestani*), twospotted spider mite (*T. urticae*), and Pacific spider mite (*T. pacificus*). The carmine spider mite, *Tetranychus cinnabarinus*, tends to be more of a pest of cotton in the desert valleys of the West, southern California, Arizona, and New Mexico. 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).

Reports from the 1980's on spider mites in California used two descriptors for the pest, 1.) that the mites are omnipresent and 2.) that spider mite populations are held in balance by natural enemies, weather, and host quality. When considering the landscape effects on spider mite populations, it is important to consider factors occurring outside of the cotton field and factors within the cotton field. These are both going to influence the build-up of mite populations in cotton fields. Clearly, mite levels can build on neighboring crops (other than cotton) and "spill-over" into cotton fields. Crops such as almonds, stone fruits, field corn, sugarbeet, dry beans, grapes, and melons are excellent hosts for spider mites in the SJV as well as several weed species. Movement from other crops into cotton does happen in California but a couple of factors result in this not being the primary factor leading to mite problems in cotton. Spider mite management is practiced on all crops due to the high value of most of these commodities. IPM practices have to be used on mites in most situations to produce a viable crop since the mites are universally present. That keeps large outbreaks populations to a minimum. Build-up of mites at the end of the season; however, can create a population of overwintering spider mites that may impact the subsequent crops such as cotton. Factors within the cotton field often greatly influence populations of spider mites. Water-stressed crops are very susceptible to mite population build-up. Even under the irrigated conditions of the SJV, unique soil characteristics in one part of the field (such as a sand streak) can result in water-stressed plants and create ideal conditions for spider mites. Dust on cotton plants at the field edges, resulting from dirt farm roads between fields, facilitate mite population build-up. Application of broad-spectrum insecticides can cause a build-up of spider mite levels in cotton fields. Insecticides such as many organophosphate and pyrethroid materials are used for management of other key cotton insect pests (western tarnished plant bug, cotton aphid, whiteflies, etc.). These products can reduce populations of natural enemies (predators) that feed on spider mites and help to keep them in check. In addition to affecting natural enemies, some insecticides have been shown to directly impact spider mite reproduction, actually causing the mites to produce more eggs. This can be a direct effect or can be manifested through an effect on the host plant. Orthene® and methyl parathion were documented to cause this effect in the 1980's and 90's; however, other insecticides can also cause this. The development of more selective, reduced risk insecticides in recent years has lessened this effect. The final aspect of cotton system which can affect spider mite levels is the use of minimum or no till production. This cropping practice area is being studied in California and work is ongoing to optimize it for SJV conditions. In research plots, spider mite populations have been extremely severe under these conditions. In

summary, the complex cropping patterns and intensity of agriculture in the SJV make spider mite management very challenging. Spider mites are a long-time pest for the SJV and other parts of the West. Coupled with the optimum environmental conditions in the western cropping areas, landscape effects on spider mites must be considered.

References

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