

BIOLOGY AND ECOLOGY OF INSECTS, MITES, AND SPIDERS  
ON COTTON AND CONTROL.

Report of Progress  
University of California, Agricultural Experiment Station  
Project Number: CA-D\*-Ent-3003-H

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Report Period: 1/1/90 - 12/31/90

**OBJECTIVES:** Ascertain the efficacy of predatory mites as managed biological control agents against spider mites on cotton and strategies for their utilization.

Evaluate the relationship of alfalfa management systems to lygus bug infestation development and to utilization of alfalfa as a biological control agent preserve.

Assess cotton cultivar relationship (plant resistance) to cotton pest infestation development and pest impact on plant development and fruiting.

Evaluate cotton cultivar relationship to pesticide resistance in greenhouse whitefly

**PROCEDURES: Predacious Mite Studies.** Predatory mites obtained from a commercial insectary were distributed by hand onto cotton or onto alfalfa strips interplanted in cotton. Treatments compared two predatory mite species (western predatory mite (*Metaseiulus occidentalis*) and *Amblyseius californicus*), three release dates and three release rates. The alfalfa interplant experiment utilized the western predatory mite. Numbers of spider mites and predacious mites and thrips and their distribution within cotton plots were determined periodically throughout the late spring and summer period by a leaf wash technique. Distribution of generalist predators across the cotton sample areas was monitored by net sweeping.

**Alfalfa Management for Lygus bug Entrapment and Predator Preservation.** Alfalfa plantings within alfalfa fields were managed under three strategies; No harvest after a may cutting for weed control, alternate halves cut on a 28 day cycle (one half cut each 14 days), and complete harvest on a 28 day cycle. Lygus bugs and predators were collected approximately biweekly with a vacuum sampler and separated from trash through a berlese funnel. These were identified to developmental stage and counted.

**Cotton Cultivar Resistance to Insect Pests.** Four commercial cotton cultivars ('Acala SJ-2', 'Pima S-6', 'Prema' and 'C4226') were evaluated for susceptibility to spider mites and aphids in field tests. Development of spider mite infestations was monitored under three pesticide regimens: no treatment, predator elimination with acephate, and predator elimination with acephate but inclusion of an acaricide (abamectin). Spider mite and aphid numbers were determined by leaf wash.

**Pesticide Resistance in Greenhouse Whitefly.** The cotton cultivars Acala SJ-2, Pima S-6 and 'Gumbo 500' were colonized with organophosphate insecticide susceptible and resistant greenhouse whitefly. Colonization success and life table data were recorded.

**RESULTS: Predatory mite research** indicated that western predatory mite (Metaseiulus occidentalis) and Amblyseius californicus, effectively colonized cotton and provided control of spider mite (Tetranychus spp.) infestations. Most effective suppression of spider mite infestations was achieved with early season (June) inoculative predator releases. Spider mite infestation level at which control was achieved with the predators was negatively correlated with numbers released and delay in date of release. A preliminary evaluation of western predatory mite for control of spider mites on corn indicated efficacy.

Experiments with interplanted alfalfa in cotton fields indicate that crop can be colonized with both tetranychid mites and with the western predatory mite. Inoculative releases of western predatory mite, made onto the interplanted alfalfa in early May, increased through early July, declined briefly following alfalfa harvest and peaked again in September. The western predatory mite populations appeared to be responsive to spider mite numbers. The western predatory mite colonized cotton within the 15-20 meter sample area downwind from the alfalfa strips, but did not disperse across the entire area.

In all experiments, throughout the sampling period, species purity of the predatory mite population remained virtually pure, with only a rare non M. occidentalis or A. californicus predatory mite collected.

Sweepnet evaluation of other predator types (big eyed bugs, Geocoris spp.; pirate bugs, Orius tristicolor (White); and thrips, Frankliniella occidentalis Pergande) revealed uniform distribution across the cotton sample areas with no apparent relationship to proximity of alfalfa.

**Alfalfa harvest management** comparisons resulted in major magnitude lygus bug infestations in alfalfa that was not cut after mid May, with as much as 10 fold greater numbers as in strip cut plots and 100 fold greater than commercial cut plots. Very low numbers were collected in the latter plots which were completely cut on a 28 day cycle. The predacious big eyed bugs and damsel bugs (Nabis americanoferus) were common to all three harvest practices with greatest numbers of damsel bugs in the no cut plots, intermediate numbers in the strip cut plots' and low numbers in the commercial harvest practice. Big eyed bug numbers were usually greatest in the strip cut plots. Pirate bug numbers were usually greatest in the no cut and commercial cut practices.

**Cotton Cultivar and Pest Interactions** indicated resistance in the cultivar Pima S-6 to spider mites. Severe infestations of the cotton aphid developed on all four cultivars,

but were significantly greater on Pima S-6 where they caused severe stunting of the plants. There did not appear to be significant variety x predator interaction with predator suppression or use of an acaricide for spider mite suppression having no impact.

**Whitefly and cultivar interactions** indicate that Gumbo 500 is very resistant to greenhouse whitefly as indicated by reduced colonization success on that cultivar and greatly suppressed oviposition after an initial three to five day period. By the same measures, whitefly were highly successful in colonizing Pima S-6 and were most fecund on that cultivar. Acala SJ-2 appeared to be a less suitable host than Pima S-6, but was not significant from it. Data concerning host effect on insecticide susceptibility has not been analyzed, but appears to indicate differences.

FUTURE PLANS: The predatory mite and alfalfa management aspects of this research program will continue, with inclusion of a full study of spider mite infestation development on silage cultivar corn. Methods for dispersal of predatory mites onto cotton and from alfalfa interplants to cotton will be developed.