

Management of Key Cotton Arthropod Pests with Insecticides and Acaricides

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INTRODUCTION

Regulatory actions involving pesticides are ongoing and appear inevitable in California. Most recently, volatile organic compounds (VOCs) have become the “buzz word” and regulations to restrict these compounds threaten many emulsifiable concentrate pesticide formulations. The fuming action of many of these products enhances their activity on cotton given the large canopy and aerial application; however, that same fuming action is their downfall in terms of VOCs. CA-DPR is discussing registration/use changes with these products and it appears certain that some actions will be taken. These actions potentially impact product registrations and, along with resistance build-up in pests (which is constantly evolving), remove materials from the “tool box”. Fortunately, new materials are developed to facilitate IPM programs and these new products must be evaluated under California conditions. Insecticides have remained an important component of efficient IPM of California cotton pests. However, insecticides must be integrated with cultural controls such as planting date restrictions, plow-down dates, etc., biological controls (predators and parasitoids), vigorous cotton varieties that help withstand pest populations, effective production practices such as proper irrigation and fertilization, and other appropriate practices to form a pest management package. This multi-faceted management approach has not happened by “accident” but rather through careful, well-designed research.

The specific studies summarized in this report on the management of whiteflies and cotton aphids were conducted at the Shafter REC in 2006. Research is ongoing for 2007.

SUMMARY

Cotton aphids remain a concern in the SJV. Mid-season populations above threshold levels have been rare in recent years so yield losses have been curtailed. Late-season populations are problematic but the last 2 years have been overall low. Whitefly populations, another culprit for sticky cotton, have also generally been low the last two growing seasons. This is likely due to the cool, wet spring conditions which have inhibited early-season build-up. An additional concern is that use of some of the most effective insecticides for controlling late-season populations may be restricted due to VOC issues in the SJV. Two field studies were conducted at the Shafter REC specifically for this objective during the summer of 2006. Lorsban 4E continues to be an important product for management of sucking insects in cotton. Efficacy, price, pest spectrum, and alternative chemical class to aid in resistance management are all

attributes of this product for use in cotton. With the possible restriction of Lorsban 4E use because of volatile organic compound issues, alternative products as well as alternative chlorpyrifos formulations were evaluated. Product efficacy may vary with cotton development; during the late-season period, when aphid and whitefly control is critical in order to protect lint quality, the hardened-off leaf tissue may restrict uptake of some products. That is thought to be the strength of Lorsban 4E in that it fumes which aids in penetration of the large canopy. Therefore, a mid-season (applied on 18 August) and a late-season test (applied on 18 September) were conducted. In both studies, field plots were treated with ground equipment at 20 GPA. Aphid populations were quantified prior to treatment and six times during the 4 weeks following application and four times during the 2-week period following application for the mid- and late-season tests, respectively. Populations were assessed by collecting 10 leaves per plot (5th main stem node leaf from the plant terminal) and counting the aphids and whitefly nymphs in the laboratory under magnification. Products evaluated included registered standards 1.) organophosphates – Lorsban 4E, Curacron 8EC, dimethoate, 2.) neonicotinoids – Assail 70WP, Assail 30SG, Centric 40WG, Venom, 3.) carbamates – Vydate C-LV, and 4.) cyclodiene organochlorine - endosulfan. Alternative formulations of chlorpyrifos were evaluated – Lock-On and Lorsban 75WDG (an experimental chlorpyrifos formulation was also included in the late-season test). Materials from two additional classes of chemistry were included, 1.) Carbine® (flonicamid) from a new class of chemistry (the pyridinecarboxamid class) and 2.) Fulfill® (pymetrozine) from the pyridine azomethines class. Inclusion of these classes in cotton IPM would help with resistance management. Three organic alternatives were evaluated, 1.) Prev-Am, a surfactant/pesticide that includes citrus oil and other additives, 2.) Ecotrol, a blend of plant essential oils, and 3.) pyrethrum + rosemary oil. Overall, 24 treatments were compared in the mid-season test and 14 in the late-season tests.

Aphid populations in 2006 were fairly persistent, evenly distributed in the plots, and amenable to testing. For the mid-season test, populations started at ~150 per leaf (~3X the threshold) and ranged from 107 to 17 per leaf during the evaluation period. Populations during the late-season were lower (1 to 5 aphids per leaf in the untreated) but this higher number is near the threshold value. On aphid populations occurring during the mid-season, several products were very effective (using 80% control as an arbitrary value), including Assail (both formulations), Lorsban 4E, Carbine, Centric, Vydate, and Lock-On (48 oz.) (Fig. 1). However, the first three products were clearly the most effective. Alternative chlorpyrifos formulations, Lock-On and Lorsban 75WDG, were somewhat less effective than the 4E formulation. On an equal AI basis (0.75 lbs.) during the first 13 days of the test, Lorsban 4EC, Lock-on, and Lorsban 75WDG averaged 65.3, 53.2, and 33.6% control, respectively. The experimental material Carbine (registered for the 2007 use-season) was very effective and Fulfill, which has an anti-feedant mode of action, was moderately effective. Ecotrol and the pyrethrum+rosemary oil product were much less effective. Aphid control during the late-season period was more challenging. The low populations and clumped distribution presented research challenges. Several products provided moderate control at 3 DAT (Fig. 2). Knock-down (1 DAT) and longer-term control, i.e., 8 and 11 DAT, control was non-existent with many treatments. Assail 70WP, Carbine, and the experimental chlorpyrifos showed the most potential.

In summary, aphid control (and whitefly control [data not presented]), during the late-season period is still problematic. Even with the slate of registered materials, the pests are difficult to

control. Loss of Lorsban 4E would further exacerbate the situation. The neonicotinoid products show the most promise but resistance management is an issue with this chemistry. Carbine, recently registered, is very effective on aphids but its mode of action may inhibit activity during the late-season. This warrants additional research. It is important to note that all this research was done with ground application, whereas growers would use exclusively aerial application on late-season cotton. The poorer coverage with aerial application could hinder control efficacy.

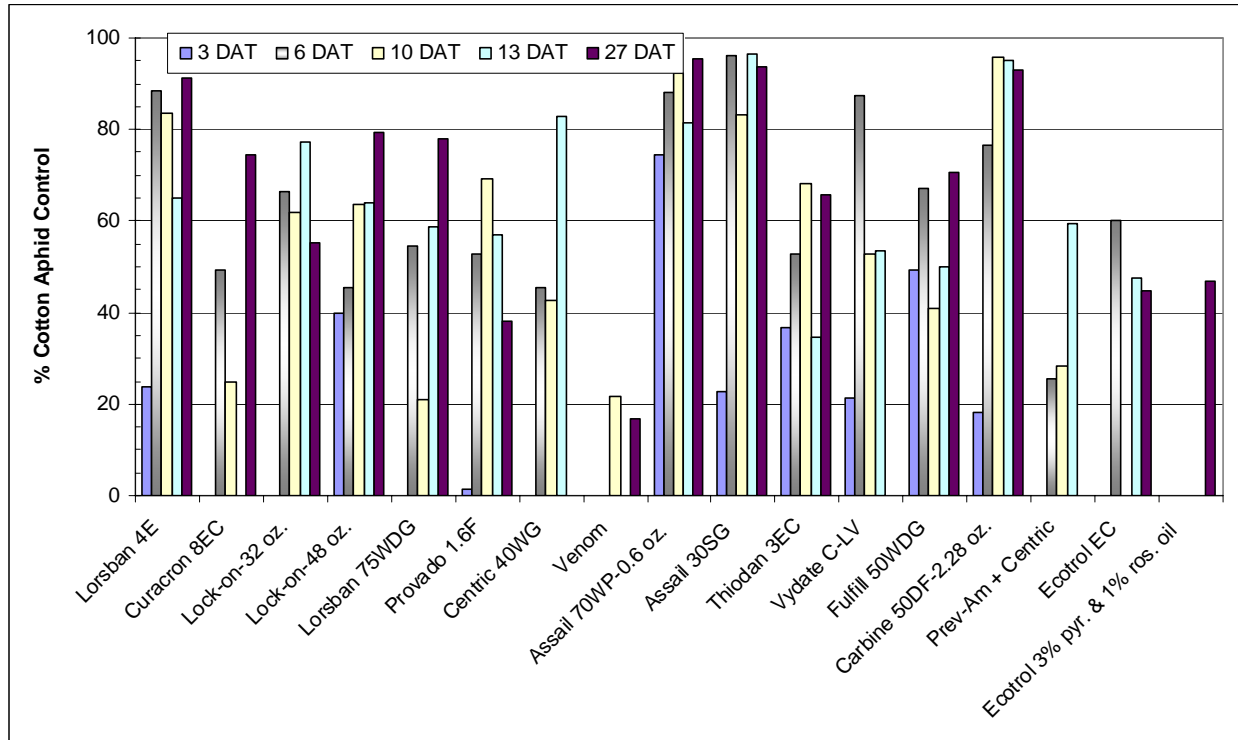


Figure 1. Percentage cotton aphid control in mid-season test from selected insecticides in 2006 (several treatments and sample dates excluded for simplicity).

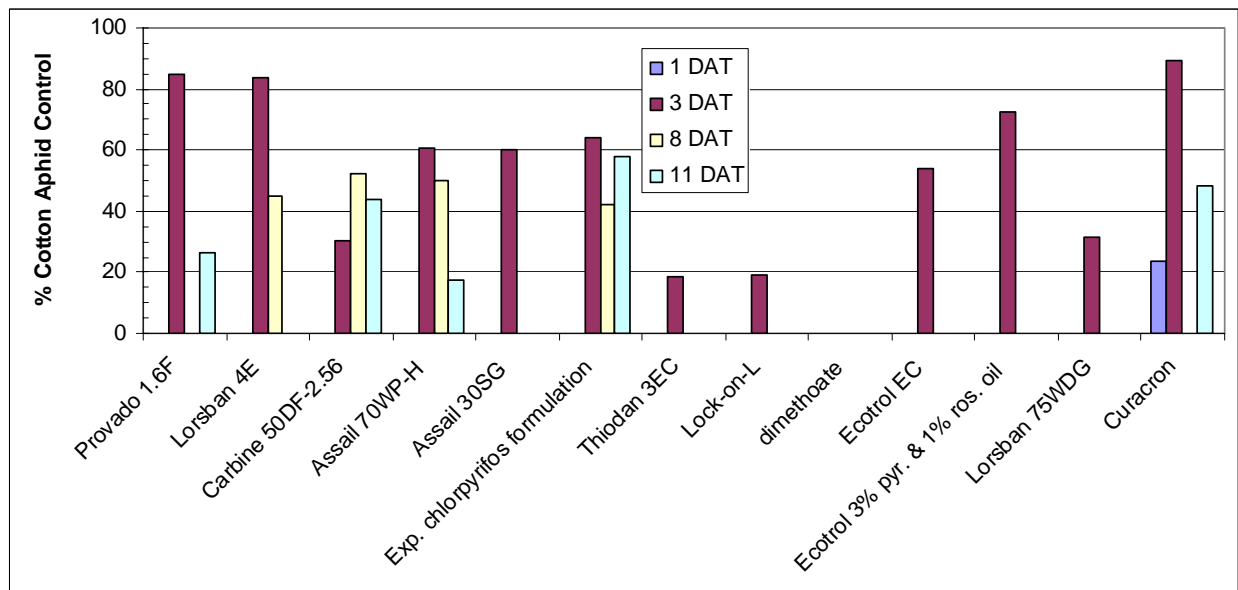


Figure 2. Percentage cotton aphid control in late-season test from selected insecticides in 2006 (several treatments and sample dates excluded for simplicity).