

Management of Key Cotton Arthropod Pests with Insecticides and Acaricides

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Abstract. The late-season sucking insect complex (cotton aphids and sweetpotato whiteflies) has hindered cotton production in the San Joaquin Valley (SJV) during the 2000's. The effects on cotton quality have been most problematic. Insecticides are a primary management tool for late-season insect infestations and Lorsban® 4E is a commonly used treatment. Recent concerns over volatile organic compounds in the SJV have pinpointed emulsifiable concentrate pesticide formulations, particularly Lorsban 4E, as contributing factors. The activity and mode of action of this formulation make it ideal for controlling aphids on the leaf undersides within the large canopy. This research examined the efficacy of alternative chlorpyrifos formulations and other aphid-active materials against mid-season and late-season infestations of cotton aphids and as a second objective pinpointed and refined the threshold level for treatment of populations. Members of the neonicotinoid class of chemistry, organophosphates, and carbamates and single representatives from the pyridinecarboxamide and pyridine azomethines classes were compared. Aphid populations in 2007 were fairly low and well below threshold values. For mid-season populations, 12 of the 19 treatments provided at least 80% control. Assail® 70WP and Carbine® exhibited the best combination of speed-of-kill, efficacy, and residual control. Aphid control during the late-season period was more effective than that seen in past years with six of the eight treatments providing good to excellent control.

INTRODUCTION

VOC issues are still in the forefront of pesticide regulatory activities especially in the SJV. Lorsban 4E and EC formulations in general continue 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. As a first attempt at mitigating this problem, fumigant use is being addressed; however, that certainly does not preclude actions on the EC insecticides in the near future. The demand for high quality cotton has intensified, so this along with the increase in Pima cotton acreage, has placed an added burden on effective management of sucking insects. 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.

PROCEDURES

Two field studies were conducted specifically for this objective during the summer of 2007. Overall, aphid populations in 2007 were low in cotton, especially upland cotton, which hindered our success. Therefore, a mid-season (applied on 30 Aug.) and a late-season test (applied on 1

Oct.) were conducted. In both studies, field plots were treated with ground equipment at 20 GPA. Aphid populations were quantified prior to treatment and four times and three times during the 2 weeks 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 (whitefly nymphs were also counted) in the laboratory under magnification. For the mid-season test, products evaluated included 1.) organophosphates – Lorsban 4E, Dibrom 8, 2.) neonicotinoids – Assail 70WP, Assail 70DF, Assail 30SG, Centric 40WG, Trimax Pro, 3.) carbamates – Vydate C-LV, and 4.) cyclodiene organochlorine – endosulfan. Alternative formulations of chlorpyrifos were evaluated – Lock-On, Lorsban 75WDG, and GF-1253 (experimental low VOC formulation that has been developed by the manufacturer). Materials from two additional classes of chemistry were included, 1.) Carbine® (flonicamid) from a new class of chemistry (the pyridinecarboxamide class) was registered for the 2007 season primarily for lygus bug control but also has excellent activity on cotton aphids and 2.) Fulfill (pymetrozine) from the pyridine azomethines class. For the late-season test, the list of applicable products was considerably smaller including Curacron 8EC and Lorsban 4E (organophosphates), Assail 70WP, Assail 70DF, and Assail 30SG (neonicotinoids), and Carbine (pyridinecarboxamid). Alternative formulations of chlorpyrifos, Lock-On and GF-1253, were evaluated. Overall, 20 treatments were compared in the mid-season test and 9 in the late-season test.

RESULTS

Aphid populations in 2007 were low and very clumped in distribution. For the mid-season test, populations started at ~4 aphids per leaf (the threshold before boll opening [which this was] is 50-100 aphids per leaf and after boll opening it is 5-10 per leaf) and increased slightly over the next 14 days. Populations during the late-season were also in the 3-5 aphids per leaf range. On aphid populations occurring during the mid-season, several products were very effective (using 80% control as an arbitrary value), including neonicotinoids (Provado, Trimax Pro, Centric, Assail [all three formulations]), organophosphates (Lorsban 75WDG, GF-1253, and Dibrom), carbamate (Vydate), Carbine, and Fulfill (Fig. 1). The other two formulations of chlorpyrifos, Lorsban 4E and Lock-on, provided control slightly under 80%. Assail 70WP and Carbine exhibited the best combination of speed-of-kill, efficacy, and residual control. Aphid control during the late-season period was more effective than that seen in past years (Fig. 2). Carbine 50DF, Assail 30SG, GF-1253, Assail 70DF, Lock-on, and Curacron 8E were unusually effective with Assail 70WP and Lorsban 4E showing a lower level of control.

Similar studies were done in 2008 but data summaries, analyses, and interpretation are ongoing.

Table 1. Treatments evaluated in aphid management studies, 2007.

<u>Treatment</u>	<u>Rate (form./A)</u>	<u>Rate (lbs. AI/A)</u>
<u>Mid-Season Test</u>		
1. Provado 1.6F	3.75 fl. oz.	0.047
2. Lorsban 4E	32 fl. oz.	1.0
3. Centric 40WG	2 oz.	0.047
4. Carbine 50DF	2.8 oz.	0.088
5. Carbine 50DF	2.28 oz.	0.071
6. Assail 70WP	0.6 oz.	0.025
7. Assail 70WP	1.1 oz.	0.05
8. Assail 30SG	2.5 oz.	0.047
9. Trimax Pro	1.8 fl. oz.	0.063
10. Thiodan 3EC	24 fl. oz.	0.56
11. Untreated	---	---
12. GF-1253	24 fl. oz.	0.75
13. Fulfill 50WDG	2.75 oz.	0.086
14. Dibrom 8	1 pts.	1.0
15. Assail 70DF	1.1 oz.	0.05
16. GF-1253	32 fl. oz.	1.0
17. Vydate C-LV	25.5 fl. oz.	0.75
18. Lorsban 75WDG	1.0 lb.	0.75
19. Lock-on	64 fl. oz.	1.0
20. Carbine 50DF + Dibrom 8	2.28 oz. + 16 fl. oz.	
<u>Late-Season</u>		
1. Carbine 50DF	2.8 oz.	0.09
2. Assail 30SG	3.7 oz.	0.07
3. GF-1253	32 fl. oz.	1.0
4. Assail 70DF	1.7 oz.	0.07
5. Lock-on	64 fl. oz.	1.0
6. Curacron 8E	8 fl. oz.	0.5
7. Assail 70WP	2.3 oz.	0.094
8. Lorsban 4E	32 fl. oz.	1.0
9. Untreated	---	---

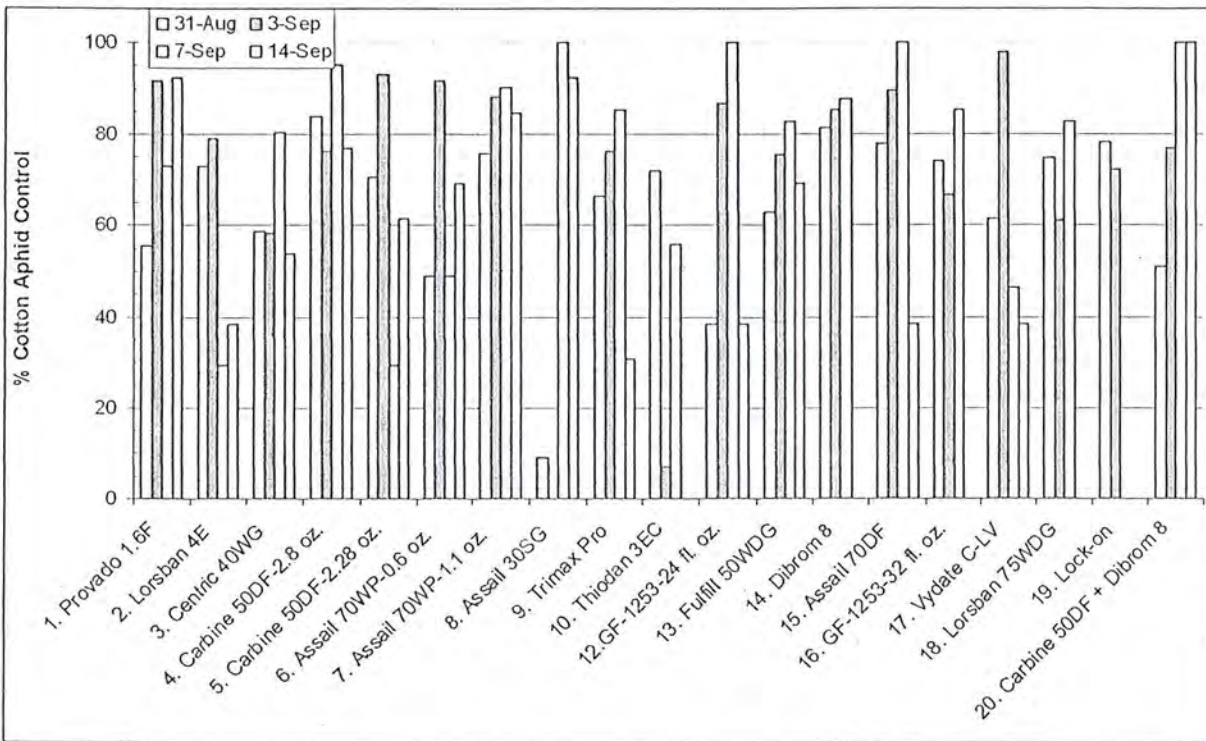


Figure 1. Mid-season cotton aphid control from selected insecticides in 2007.

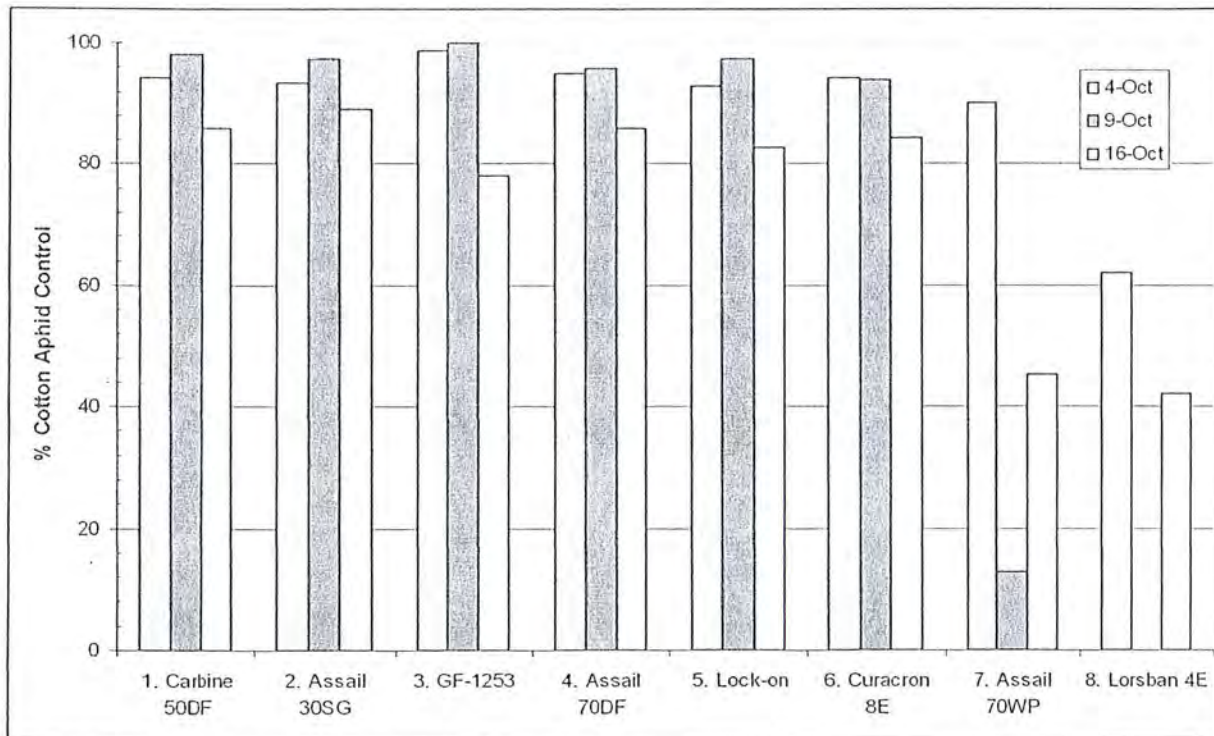


Figure 2. Cotton aphid in late-season test, 2007.