Management of Key Cotton Arthropod Pests with Insecticides and Acaricides

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INTRODUCTION

The silverleaf whitefly (SLWF) and cotton aphid are not new insects to the SJV, but only in recent years have late-season populations of both of these pests become widespread. The silverleaf whitefly was first found in the SJV in 1992. The SLWF has continued to adapt to SJV conditions and cropping patterns and starting in 2001 SLWF populations expanded greatly both in severity and particularly in range. Populations in significant numbers occurred farther northward and westward into the SJV. This has pushed the whitefly into the primary cotton production area. The cotton aphid occurred sporadically in cotton throughout the 1970's and 1980's but damaging populations were rare. Early-season populations in the late 1980's and early 1990's were researched by Rosenheim and co-workers. Populations developed into a significant mid-season pest of SJV cotton and reduced lint yields in the mid-1990's with 1995 and 1997 being the most severe years. Late-season populations occurred occasionally during this period although impacts on lint quality were rare. However, in 2001, late-season populations occurred in many areas and contributed to the sticky cotton phenomena.

The specific studies summarized in this report, management of late-season infestations of SLWF and cotton aphids and mitigation of sticky cotton, were started at the Shafter REC in 2002. Work continued in 2003 and studies are in progress now in 2004. Specifically studies have included insecticide efficacy on late-season aphid/SLWF populations and threshold levels for cotton aphids and sticky cotton.

SUMMARY

Efficacy Studies: The first test was applied on 10 Aug. 2003 at the onset of boll opening (~10% open bolls). The second test was applied on 25 Sept. when about 90% of the bolls were open and this was about 7-10 days before defoliation. This is a critical period in the SJV for protecting lint quality. Aphid populations were quantified for 14-17 days after treatment (DAT). Ten fifth main stem node leaves (counting from the terminal) were collected from each plot on each sample date and aphid numbers were determined in the laboratory.

In the August test, the pretreatment population in this test was 25.8 aphids per leaf. The Astandard@ aphid products, Lorsban, Vydate, Centric, Furadan, Thiodan, Curacron, Leverage, Provado, and Assail were evaluated. Calypso and F1785 were the primary experimental materials evaluated. At 1 DAT, the best control, numerically, was provided by Furadan with Assail (0.025 and 0.05 lbs. AI/A) and Thiodan also providing at least 75% control. The population had declined substantially by the 3 day evaluation but Furadan, Assail (0.025 and 0.05 lbs. AI/A), and Thiodan were still highly effective. Lorsban, Vydate, and F1785 (0.054 lbs. AI/A) increased in effectiveness and provided similar percentage control as the best treatments.

A second aphid control study was conducted in Sept and was applied on 25 Sept. when about 90% of the bolls were open. This was about 7-10 days before defoliation. Both cotton

aphids and silverleaf whiteflies infested the plot area. Pretreatment levels were 12.9 aphids/leaf and 9.7 SLWF nymphs/leaf in this test. At 4 DAT, cotton aphid control was provided by the Curacron and Assail treatments but SLWF nymphal populations were unaffected by the treatments.. Populations at 7 DAT had increased slightly especially for SLWF levels (doubled). Assail (96%) and F1785 (~89%) provided very good aphid control. SLWF nymph levels were greatest in the untreated plots. The best control was seen in the Diamond, Danitol + Orthene, and V-10112 treatments but this was in the 40-50% range. Populations continued to increase at the 14 DAT sampling. The untreated plots averaged 18.1 aphids/leaf and 24.9 SLWF nymphs/leaf. Assail and F1785 clearly provided the best aphid control (98%). SLWF nymphal populations were reduced by all treatments except Centric. However, V-10112, Oberon, Diamond, and Danitol + Orthene were clearly more effective than the other treatments.

In summary, some new, useful materials are in development for aphids and whiteflies. F1785 appears to be very active on aphids. V-10112, Diamond, and Oberon reduced populations of late-season whiteflies at a time when activity is needed and difficult.

Optimal Timing for Late-season Aphid Applications: Studies were conducted to investigate the relationship between the number of cotton aphids and lint stickiness and therefore the optimal time to treat for cotton aphids. After the development of a low cotton aphid population near the time of initial boll opening, sets of plots were treated at weekly intervals with either Assail 70WP (1.1 oz./A) or Warrior (3.84 fl. oz./A) to control and to flare aphid populations, respectively. Application dates (and corresponding percentage open bolls) were Sept. 4 (50% open bolls), Sept. 11 (75% open bolls), Sept. 18 (90% open bolls), Sept. 25 (95% open bolls), and 1 Oct. (at defoliation). Untreated plots and one additional treatment in which Assail was applied on 4 and 18 Sept. were also included. Aphid populations were quantified from samples of the 5th MSN leaves at weekly intervals. Cotton lint was hand-harvested, ginned, and stickiness determined at the International Textile Center.

Aphid populations increased in untreated plots from an average of 1.1 per leaf on 4 Sept. to 36.8 per leaf in mid-Oct. Aphid-day accumulation over the 6 weeks of this test showed values from 96.7 (Assail applied on 4 and 18 Sept.) to 925.8 (Warrior applied on 4 Sept.). Untreated plots totaled 514.8 aphid-days. Therefore, the treatments worked well for altering the aphid populations as desired. Thermodetector ratings of lint exposed to these aphid levels ranged from 24 to 49.8 sticky spots. Using the criteria of Perkins and Brushwood, these would all be classified as sticky lint. The treatment with two applications of Assail had the fewest sticky spots. A second harvest of selected treatments was done on 4 Nov. following 0.26@ rainfall on 1 Nov. Sticky spots were reduced by 49% by this precipitation.

These results differ from the study done in 2002 when about 250 aphid-days was the threshold value that resulted in 10 sticky spots (using that as the criteria for stickiness). With a 6 week lint exposure period, aphid numbers of ~6 per leaf would be the threshold. However, in 2003, aphid-day numbers as low as ~100 still resulted in sticky spot values considerably higher (more than double) the 2002 values. Previous work by Rosenheim suggested aphid populations of 10-15 per leaf as causing sticky cotton in California. One difference between the 2002 and 2003 studies was that the plots also had a light SLWF infestation in 2003. SLWF nymphs per leaf averaged 1.1 at the start of the study (4 Sept.) and increased to 20-30 nymphs per leaf on 15 Oct. However, Naranjo and co-workers showed no relationship between SLWF populations and cotton lint stickiness with nymphal populations up to 100-fold that seen in our study. Ongoing studies in 2004 are designed to examine aphid and SLWF populations and stickiness.