Chemical Control/New Products

Evaluation of Confirm for Codling Moth and Leafroller Control in Pears

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A. Full Season Evaluation of Confirm for Coding Moth Control

Methods and Materials

A study was conducted in a commercial 'Bartlett' pear orchard in Hood, CA. Three unreplicated treatments of ca. five acres each were applied using an air-blast speed sprayer operating at 1.75 mph and applying 100 gal of finished spray per acre. The three treatments were: Confirm 2F applied four times, Confirm 2F applied five times and Guthion 50WP applied three times during the season. Applications were scheduled based on degree days (DD). DD were calculated with a biofix of 31 March for the first generation and 11 June biofix for the second generation using a single sine horizontal cutoff model with a lower threshold of 50°F and an upper threshold of 88°F. Maximum and minimum air temperatures were obtained from the IMPACT weather station at Lodi, CA. Flight activity of male codling moth (CM) was monitored with a pheromone trap placed in the experimental area. Target application timings were: Confirm at 200 DD or beginning of egg hatch of the A peak of the first flight (5/3), two weeks after the first application (5 application treatment only—5/18), 700 DD or beginning of egg hatch of the B peak of the first generation (6/3), 200 DD or beginning of egg hatch of the A peak of the second generation (6/14) and a final application at the "stop drop" timing (7/2). The grower standard (Guthion) target application timing was: 250 DD or egg hatch of the A peak of the first (5/9) and second (6/14) generations and at the "stop drop" timing (7/3). Control of the CM infestation and leafroller damage was evaluated on 11 June and 15 July (beginning of commercial harvest) by inspecting 250 fruit from the bottom of the tree canopy from four widely separated areas within each unreplicated treatment (a total of 1,000 fruit per treatment per evaluation).

Results and Discussion

First generation evaluation. The CM infestation was significantly higher in the Confirm four application treatment than in the Confirm five application treatment which was in turn significantly higher than the grower standard (Table 1). At the time of this evaluation, the Confirm four application treatment had only two applications (3 May and 3 June) while the Confirm five application treatment had three applications (3 May, 18 May and 3 June). The 18 May application of Confirm was responsible for the significantly lower infestation in the five Confirm application treatment. In comparison, only one application of Guthion (grower standard) on 9 May resulted in 0.1% infested fruit. No leafroller damage was observed in any of the treatments.

Harvest evaluation. The CM infestation after the completion of all applications showed a similar pattern of infestation to the first generation evaluation. However, the CM infestation in the Confirm treatments was extremely high and required bin sorting before the fruit could be delivered to the shed. Again, no leafroller damage was observed in any of the treatments.

Conclusions

Although this study was conducted against a moderate CM population, it appears that Confirm cannot be used in a stand-alone program for CM control (Table 1). The five Confirm application treatment had over 6% damage despite Confirm applications at approximately two week intervals. Confirm will have to be augmented with conventional insecticide or CM pheromonal control to achieve grower acceptable infestation levels.

B. Evaluation of Spray Volume of Confirm for CM Control

Methods and Materials

A study was conducted in a commercial 'Bartlett' pear orchard in Grand Island, CA. Four unreplicated treatments of ca. five acres each were applied using an air-blast speed sprayer. The four treatments were: Confirm 2F applied at 400 gal of finished spray per acre, Confirm 2F applied at 250 gal of finished spray per acre, a grower standard applied at 250 gal of finished spray per acre and a grower standard plus pheromone disruption. Applications were scheduled based on DD. DD were calculated with a biofix of 22 April for the first generation and 22 June for the second generation. Flight activity of male CM was monitored with two pheromone traps placed in the experimental area. Target application timings were: the grower standard of Imidan at 250 DD or egg hatch of the A peak of the first flight (5/4), Guthion at two weeks after the first application of Imidan (5/18), Penncap-M at 700 DD or egg hatch of the B peak of the first generation (6/2) and a final application of Guthion at the "stop drop" timing (6/26). Confirm treatments of 250 and 400 gal of finished spray per acre were targeted to precede each of the grower standard applications by 50 to 100 DD (3 or 4 days). A fourth treatment consisted of the aforementioned grower standard treatment program combined with three applications of Checkmate CM pheromone applied on 28 March, 8 May and 22 June. Control of the CM infestation and leafroller damage was evaluated on 13 June and 15 July by inspecting 250 fruit from the bottom of the tree canopy from four widely separated areas within each unreplicated treatment (a total of 1,000 fruit per treatment per evaluation).

Results and Discussion

First generation evaluation. The CM infestation was significantly higher in the Confirm at 250 gal per acre treatment than in the Confirm at 400 gal per acre and grower standard treatments (Table 2). The increased spray volume caused a significant increase in CM control. It is speculated that the increased spray volume caused a more thorough coverage of the fruit with Confirm. No leafroller damage was observed in any of the treatments.

Harvest evaluation. The CM infestation showed a similar pattern to the first generation evaluation. However, the CM infestation in the Confirm treatments was high as compared to the grower standard treatment, particularly in the 250 gal per acre treatment which required bin sorting before the fruit could be delivered to the shed. Even the 400 gal per acre treatment had a CM infestation level that was unacceptable to the grower. Again, no leafroller damage was observed in any of the treatments.

Conclusions

This study was conducted against a moderate CM population. An increased spray volume caused a significant increase in CM control. Similar findings were reported by Pons and Riedl in 1995. The use of Confirm requires thorough coverage with a spray volume of approximately 400 gal per acre to be effective. However, this volume of finished spray may meet with grower resistance since typical spray volumes range between 100 to 250 gal per acre and 400 gal per acre would add additional costs to the application.

C. Evaluation of Supplemental CM and Leafroller Control with Confirm

Methods and Materials

A study was conducted in a commercial 'Bartlett' pear orchard in Courtland, CA, that was under pheromonal control for CM. Three unreplicated treatments of ca. five acres each were applied using an air-blast speed sprayer operating at 1.75 mph and applying 100 gal of finished spray per acre. The three treatments were: Confirm 2F applied at the B peak of the 1st CM flight and at the "stop drop" timing, Penncap-M applied at the "B" peak of the 1st CM flight and Guthion 50WP applied at the "stop drop" timing. Applications were scheduled based on the expected life of the Checkmate pheromone dispensers (45-60 days) and the anticipated beginning of the B peak of the first CM flight. Flight activity of male CM was monitored with a pheromone trap baited with 10 mg of codlemone placed in the experimental area. Target application timings for Confirm and Penncap-M were mid-May (5/11) (45 days after Checkmate pheromone dispensers were applied) and a second application of Confirm at the "stop drop" timing (7/2). The untreated control required an application of Guthion at the "stop drop" (7/2) timing because of damaging levels of leafroller. Control of the CM infestation and leafroller damage was evaluated on 11 June and 15 July by inspecting 250 fruit from the bottom of the tree canopy from four widely separated areas within each unreplicated treatment (a total of 1,000 fruit per treatment per evaluation).

Results and Discussion

First generation evaluation. There was no CM infestation in any of treatments and only 0.1% leafroller damage in the Guthion treatment (Tables 3 and 4). At the time of this evaluation, the Guthion treatment could be considered an untreated control since Guthion had not been applied while Confirm and Penncap-M had been applied about one month earlier. These results would indicate that the CM pheromonal control alone had suppressed the CM population and that Penncap-M and Confirm were of little additional benefit in CM control.

Harvest evaluation. There was no significant difference in CM infestation among the treatments. The lack of significant difference among the treatments was due to the very low CM infestation observed in the study. CM infestation ranged from 0.1% for Confirm and Guthion to 0.2% for Penncap-M. Again, these results would indicate that the CM pheromonal control had suppressed the CM population and that Guthion, Penncap-M and Confirm were of little additional benefit in CM control. However, the Confirm and Penncap-M treatments had significantly lower leafroller damage as compared to the Guthion treatment. The "stop drop" application of Guthion was not adequate in preventing damage from the increased leafroller population. However, the Guthion treatment may have prevented much greater leafroller damage. In the Guthion treatment, the combined CM infestation and leafroller damage was 0.5% which is an unacceptable damage level to pear growers.

Conclusions

This study was conducted against a low CM population which had been under CM pheromonal control for the past three years. It would appear that the application of Penncap-M at the B peak of the first CM flight timing or applications of Confirm at the B peak of the first CM flight and "stop drop" timings had little benefit in CM control. However, both Penncap-M and Confirm were successful in suppressing the leafroller damage. In orchards where CM has been suppressed by pheromonal control and leafrollers have become a problem, Confirm, with its desirable mammalian toxicity and environmental effects, would be the material of choice.

General Conclusions of Confirm Studies

These three large plot studies indicate that Confirm cannot be used in a stand-alone program for CM control and the effectiveness of Confirm will be enhanced by increased coverage through either increased spray volume or reduced sprayer speed. The most promising use of Confirm is as a supplemental insecticide to be used in conjunction with CM pheromonal control. Confirm used in conjunction with CM pheromonal control provides leafroller control and some additional CM control.

Table 1. Mean percent codling moth infested fruit from the full season evaluation of Confirm at Hood, CA, 1996.

		Mean** percent codling moth infested fruit	
Treatment*	No. applications	1st Gen. (6/11)	Harvest (7/15)
Confirm 2F	4	2.0a	13.9a
Confirm 2F	5	0.8b	6.8b
Guthion 50WP	3	0.1c	0.0c

*Confirm was applied at 0.28 lb (AI)/acre. All Confirm applications contained 0.5 pt Latron-1956 per 100 gal. Guthion was applied at 1.0 lb (AI)/acre for the first two applications and 1.5 lb (AI)/acre for the last application.
**Means followed by the same letter within a column are not significantly different (Fisher's Protected LSD, $P<0.05$). Data analyzed using an arcsine transformation.

Table 2. Mean percent codling moth infested fruit from spray volume evaluation of Confirm at Grand Island, CA, 1996.

	Mean** percent codling moth infested fruit	
Treatment*	1st Gen. (6/13)	Harvest (7/15)
Confirm 2F at 250 gal	0.8a	6.9a
Confirm 2F at 400 gal	0.3 b	1.1b
Standard at 250 gal	0.1b	0.0b
Standard at 250 gal + pheromone disruption	0.0b	0.0b

*Confirm was applied at 0.28 lb (AI)/acre. All Confirm applications contained 0.5 pt. Latron-1956 per 100 gal. Grower standard was Imidan 50WP at 2.0 lb (Al)/acre, Guthion 50WP at 1.5 lb (Al)/acre and Penncap-M 2EC at 2.0 lb (Al)/acre.
**Means followed by the same letter within a column are not significantly different (Fisher's Protected LSD, $P<0.05$). Data analyzed using an arcsine transformation.

Table 3. Mean percent codling moth infested fruit from CM pheromonal control and Confirm at Courtland, CA, 1996.

Treatment	Rate lb (AI)/acre	Mean** percent codling moth infested fruit	
		1st Gen. (6/11)	Harvest (7/15)
Confirm 2F*	0.28	0.0a	0.1a
Penncap-M 2EC	2.0	0.0a	0.2a
Guthion 50WP	0.5	0.0a	0.1a

*All Confirm applications contained 0.5 pt Latron-1956 per 100 gal.
**Means followed by the same letter within a column are not significantly different (Fisher's Protected LSD, *P*<0.05). Data analyzed using an arcsine transformation.

Table 4. Mean percent leafroller damaged fruit from CM pheromonal control and Confirm at Courtland, CA, 1996.

Treatment	Rate lb (AI)/acre	Mean** percent leafroller damaged fruit	
		1st Gen. (6/11)	Harvest (7/15)
Confirm 2F*	0.28	0.0a	0.0a
Penncap-M 2EC	2.0	0.0a	0.0a
Guthion 50WP	0.5	0.1a	0.4b

*All Confirm applications contained 0.5 pt Latron-1956 per 100 gal.
**Means followed by the same letter within a column are not significantly different (Fisher's Protected LSD, *P*<0.05). Data analyzed using an arcsine transformation.