Field evaluation of reduced-risk insecticides for codling moth control in apples: Does adding virus help?

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Codling moth damage makes fruit unmarketable.

Codling moth (*Cydia pomonella*) is extremely difficult to control in California's Sierra foothill apple and pear orchards. Most growers have relied on repeated applications of azinphos-methyl (Guthion), an organophosphate insecticide, for codling moth control but increasing concerns about farm worker safety and environmental quality have sparked interest in alternatives to Guthion.

Assail, (acetamiprid, Cerexagri), is a newly registered "reduced-risk" chloronicotinyl insecticide. In apples grown in California, Assail has a "Caution" label with a worker re-entry interval of only 12 hours. This makes Assail an attractive choice for codling moth control, especially during apple thinning season.

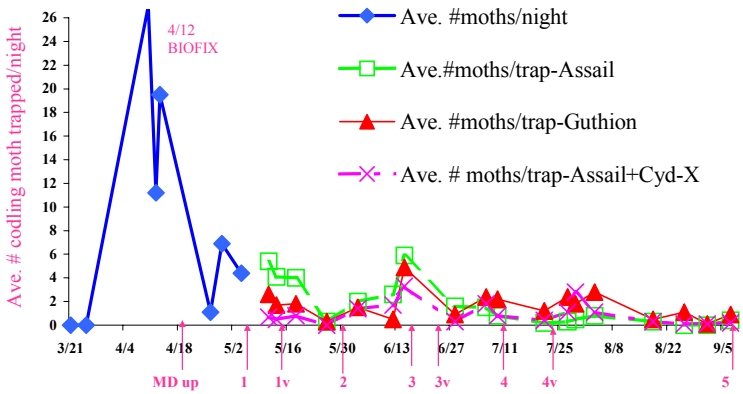
Cyd-X, (granulosis virus, Certis), is an organically-acceptable granulosis virus specific for codling moth. The submission for California registration has been made.

Project Goal: To evaluate two new reduced-risk insecticides, Assail (acetamiprid) and Cyd-X (granulosis virus), for season-long codling moth control compared to the grower standard, Guthion (azinphos-methyl), in a commercial apple orchard under mating disruption.

Table 1. Treatment dates and corresponding degree days for codling moth insecticide applications. Treatments were applied during the season by the grower using an air-blast sprayer and were in 300 gal./ac. Numbers above date correspond to treatment arrows on Figure 1 below.

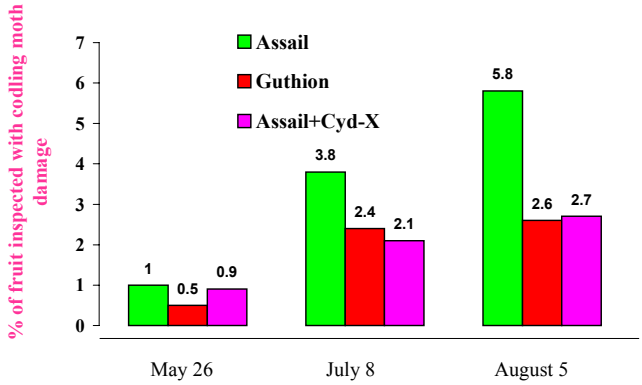
# Date	Degree days	Assail	Guthion	Assail+Cyd-X
April 19	19	Mating disruption put up across entire orchard: CTT at 200 ties/ac		
1 May 7	256	2.5 oz. Assail/ac + .5% oil	2.2 lbs. Guthion	2.2 oz. Cyd-X plus 2.5 oz. Assail plus .5% oil
1v May 15	331			2.2 oz./ac Cyd-X
2 May 31	492	11.8 oz Intrepid/ac. plus 1 gal oil/400 gal. across entire orchard		
3 June 16	787	2.5 oz. Assail + .5% oil Nu-film sticker	2.2 lbs. Guthion	2.2 oz. Cyd-X plus 2.5 oz. Assail plus .5% oil Nu-film sticker
3v June 23	929			2.2 oz. Cyd-X
4 July 11	1326	3.4 oz. Assail	2.2 lbs. Guthion	3 oz. Cyd-X plus 3.4 oz. Assail
4v July 20	1560			2.2 oz. Cyd-X
5 August 9	2053	Intrepid 16 oz./ac R-56 sticker	Imidan 2.96 lbs/ac	Intrepid 16 oz./ac R-56 sticker plus 3 oz. Cyd-X/ac

Fig 1. Average number of codling moth trapped/night with pheromone lures in each treatment. Arrows correspond to treatments listed in Table 1.



Fruit damage evaluation. On three dates during the season, May 26, July 8 and August 5, 1000 fruit per treatment were evaluated for codling moth damage (stings and entries). Ladders were used to observe fruit high and low in the canopy.

Figure 2. Percent of fruit inspected with codling moth damage (stings and entries) during the season, n=1000 fruit/treatment.

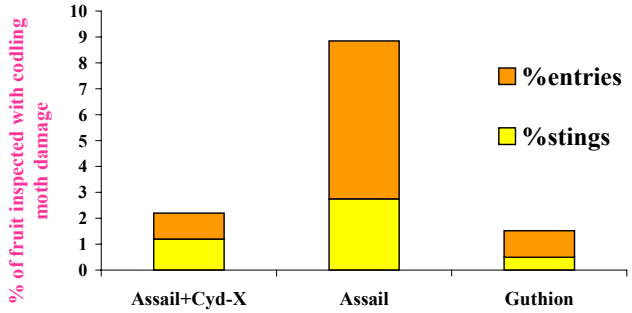


At harvest, 1500 fruit/treatment were inspected from "high" in the canopy (using ladder), and 1500 fruit/treatment were inspected from "low" in the canopy (no ladder). Damaged fruit was cut open and stings and entries were recorded separately.

Codling moth "sting"- no tunneling to seed.

Codling moth "entry"- with tunneling to seed.

Figure 3. Percent of fruit observed at harvest in each treatment with codling moth damage, "stings" and "entries". n= 3000 fruit/treatment.



Analysis was conducted using SAS Logistic Procedure. Position, "high" or "low" was not significant for total damage (stings and entries). The probability of damage using the Assail + Cyd-X treatment regime was less (Wald chi-square= 13.2279, p = .0003 at alpha = .05) than the probability of damage using the Guthion regime. The probability of damage using the Assail regime was greater than either the probability of damage using the Assail + Cyd-X (Wald chi-square= 96.0602, p < .0001) or the Guthion regime (Wald chi-square= 178.9636, p < .0001), alpha= .05.

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