Project Title: **Cherry Fruit Fly Control Options**

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Objectives

1: Identify new conventional and organic cherry fruit fly control products and methods.

2: Assess new insecticides and control methods for cherry fruit fly.

3: Work with industry toward the registration of new CFF control products.

Note Carefully: Some of the pesticides discussed on this poster were tested under an experimental use permit granted by WSDA. Application of a pesticide to a crop or site that is not on the label is a violation of pesticide law and may subject the applicator to civil penalties up to $7,500. In addition, such an application may also result in illegal residues that could subject the crop to seizure or embargo action by WSDA and/or the U.S. Food and Drug Administration. It is your responsibility to check the label before using the product to ensure lawful use and obtain all necessary permits in advance.

Significant 2007 Results Summary:

- ❏ Chloronicotinyl (neonicotinoid) class insecticides continued to control larvae of all instars inside of infested fruit. Imidacloprid (Provado Pro 192) provided post infestation control to a degree similar to that of full dimethoate rates. This kick-back effect may demonstrate advantages chloronicotinyl class insecticides offer as part of a pre-harvest control program.

- ❏ Entrust was 100% effective at full rates, but showed signs of inconsistency at 1/2 the recommended rate at 10 day intervals.

- ❏ Provado and Assail provide excellent CFF control when applied at 10 day intervals even at relatively modest rates.

- ❏ This project first recognized and demonstrated the potential of GF-120 Bait as a Cherry Fruit Fly control. In 2007, this control method saved the Pacific Northwest cherry growers about $1.5 million in labor, application and material costs, bringing the total since 2004 to $4.17 million. Judging by the number of acres treated per season, this bait is now the most-used product for cherry fruit fly control in Washington State. The

number of larvae detected during WSDA Washington cherry inspections has dropped from an average of 12 per season in 1997 2003, the seven seasons prior to bait use, to five larvae in 2006 and two in 2007.

- ❑ Reducing GF-120 rate to 10 fl. oz. of product per acre, 1/2 the recommended rate, resulted in a consistent failure of control in lightly infested test trees.

- ❑ Full GF-120 rates greatly reduced, but did not completely control CFF infestation on sites with very high numbers of adults emerging during the first season of treatment. A second season of treatment has been required to achieve 100% control on some sites.

- ❑ Full GF-120 rates greatly reduced, but did not completely control CFF infestation on sites near a tree supporting an unmanaged population of cherry fruit fly, demonstration the importance of scouting and controlling near-by pest sources as part of your IPM program.

- ❑ Assail and Delegate are expected to be registered for use in stone fruits by spring 2008. There are two or three new candidates within two new classes of insecticide that companies have proposed for testing in this project in 2008.

Methods

Pre-harvest efficacy trials: ***Sprayed products:*** In past trials, most products were effective when applied at rates well below those recommended for control of other insects. Companies are not comfortable adjusting rates lower for a pest that requires 100% control, but looking at lower rates gives an indication as to the margin of control. Is the product just on the edge of failure, or do the recommended rates provide for some degree of error? This year, three products, Provado, Assail, and Entrust, all very effective at full recommended rates on 7 10 day spray intervals in past trials, were applied at lower than recommended rates at 10 day intervals.

GF-120 Bait: During the past five years, GF-120 bait has been consistently effective, but there are indications that baits have limitations separate from those experienced with sprayed products. Baits have no effect on a population of adult cff at the time of application, as do all other effective registered products. There is a lag period during which the adults must find and feed upon the bait droplets. This does not seem to be a problem when the young target adult emerges from under the bait treated tree, as they must forage for five or more days before laying their first egg. This appears to be sufficient time for orchard-resident adults to find and consume lethal quantities of the bait. This year, we intentionally set up situations to demonstrate possible control problems, so as to lessen the chance of failure under field use. On three sites that have been monitored and treated with GF-120 Bait for at least two previous seasons, and seemed in relatively clean neighborhoods, we cut the rate of bait in half. Two sites that we had documented as very highly infested in 2006 were treated weekly with the 20 fl.oz. / Acre recommended rate. In one site, we treated one tree, and did not treat another that was about 100 feet away. We succeeded in setting up failure.

After-harvest efficacy trials: Portions of an unharvested, extremely CFF infested cherry tree were treated with the various test products at a fruit development stage that would have been after-harvest, under normal conditions. The test products were applied in a volume of water that resulted in full wetting, but light run-off, which we judged to be equivalent to about 200 gallons per acre. At the treatment date, some of the larvae in the fruit were late in their third (final) instar, and were soon to emerge, as they had cut the breathing and emergence holes in a low percentage of the fruit. The larva emergence data indicated that there were all stages of larvae and a few eggs in the fruit on the treatment day. Judging by the days to emergence, the treated fruit contained larvae and eggs in the following proportion: egg: 1.8%, 1st instar: 41%, 2nd instar: 28.4%, 3rd instar: 28.8%. One day after treatment, 250 fruit were harvested from each treatment and suspended over sand. The fruit was maintained at room temperature, and emergence of the larvae from the untreated sample was complete at 19 days after the treatment day.

Results & Discussion

Pre-harvest efficacy trials: ***Sprayed products***: Provado 1.6F (imidacloprid), Assail 70 WP (acetamiprid), and Entrust (80% spinosad) all provided 100% fruit protection when applied at 10 day intervals. The only exception was a single larva found in 1000 fruit sampled on a tree treated with Entrust applied at 1.0 oz. / acre, which is almost one-half the recommended rate (see table 1). The equivalent rate of Success 2L was effective when applied on 7 day intervals in past trials. It appears that the apparent residual effect of spinosad products may not be present at lower rates. Provado at full or moderate rates and full rates of Entrust (or Success) have been the most consistently effective treatments of the currently registered products over several years of these efficacy trials.

GF-120 Bait: The treatment of very highly infested trees, while very suppressive of fruit infestation, does not always lead to 100% control in the first year of treatment. We have had reports of this, and have some evidence in our past trials, and documented this once again this year. In every documented instance in past trials, treatment in the second season resulted in 100% control of larvae. It is possible that high numbers of adult flies rapidly find and consume the bait applied to the tree, and there is not enough left to completely control the entire population.

As bait has a lag period required for control, having a near-by untreated infested tree led to the essential failure of control with bait. The treated tree had 0.5% of fruit with larvae. This degree of infestation is far lower than would have been expected on the tree if it had not been treated. However, this demonstrates the importance of sanitation in the region around cherry orchards as a part of the IPM program, especially if you are depending entirely on bait for CFF control.

Product	Rate / A - Days Interval	Number of Trees/Sites	2007 Adult Trap Catch	Total Fruit Inspected	Number of Larvae Found
Untreated	na	3/3	340 827	500 500	790 915
Provado Pro 192 SC	6 fl. oz. – 10 day	4/4	11 30 6 20	1000 1000 1000 1000	0 0 0 0
Provado Pro 192 SC	4 fl. oz. – 10 day		21 14 16	1000 1000 1000	0 0 0
Provado Pro 192 SC	3 fl. oz. – 10 day		18 8 21	1000 1000 1000	0 0 0
Assail 70 WP	2.3 oz. – 10 day		72 13 12	1000 1000 1000	0 0 0
Assail 70 WP	1.7 oz. – 10 day		17 14 17	1000 1000 1000	0 0 0
Entrust	1.9 oz. – 10 day	6/3	17 7 17 10	1000 1000 1000 1000	0 0 0 0
Entrust	1.0 oz – 10 day.	4/4	12 10 20 57	1000 1000 1000 1000	0 0 1 0
GF-120 Bait Normal Site 1st or Re-treatment	20 fl. oz. – 7 day	7/6	0 0 26 32 18	1000 1000 1000 1000 1000	0 0 0 0 0
GF-120 Bait Very High 2006 Adult Population	20 fl. oz. – 7 day	2/1 12/1	98 24	1000 1000	12 0
GF-120 Bait Near an Untreated Tree	20 fl. oz. – 7 day	1/1	25	1000	5
GF-120 Bait Half Rate on Light Infestation	10 fl. oz. – 7 day	3/3	18 16 41	1000 1000 1000	3 10 14

Table 1. Results of 2007 Cherry Fruit Fly rate and bait/site situation trials.

A half rate of GF-120 was applied to trees that had been protected by full bait rates fort the prior two seasons, and appeared to be the most likely sites for a successful reduction of rate. All three sites treated with 10 fluid ounces / acre had a significant infestation in 2007, only somewhat lower than the degree of infestation we have seen in similar trees where treatment is suspended for one season

After-harvest efficacy trials: The emergence pattern indicated that CFF larvae were present with all three instars at the treatment date. In the most effective treatments, most of the few larvae that emerged came out during the first nine days after treatment, which indicates that very small percentage of the third and second instar larvae are were not controlled by the insecticide treatment. Judging by the number of larvae that emerged, about 100 percent of the fruit on the test tree was infested, most with more than one viable larva (table 2).

		Emergence Period – Larvae / Interval Day									Total Live Larvae	% of Untreated Control
Product	**Rate/A**	**7/1**	**7/3**	**7/5**	**7/6**	**7/9**	**7/11**	**7/13**	**7/16**	**7/18**		
Dimethoate	4 lb. ai	1.3	1	1	1	0.3	0.5	0	0	0	**11**	**2.4**
Dimethoate	3 lb. ai	1.7	1.5	1.5	1	0.7	0.5	0	0	0	**15**	**3.2**
Provado Pro 192 SC	8 fl.oz.	1.3	1	1.3	2	1	0.5	0	0	0	**15**	**3.2**
Provado Pro	6 fl. oz	2.7	2	2.5	3	0.8	1	0	0	0	**26**	**5.6**
Provado Pro	4 fl.oz.	2.3	1.3	3	4	2.7	1.3	0.5	0.3	0	**33**	**7.1**
Assail 70WP	3.4 oz.	4	4.5	5.5	6	2.7	2	1	0.7	0	**54**	**11.5**
Assail 70WP	2.3 oz.	3.7	6.5	4	7	4.7	2.5	1.5	0.7	0	**63**	**13.5**
Untreated	0	18	40	46	36	31	29	21	2.7	0	**468**	**100**

Table 2. After-Harvest Control of Larvae Inside of Fruit. Emergence of cherry fruit fly larvae from 250 fruit treated on separate parts of the same highly infested tree June 28, harvested June 29, 2007.

All products tested appear to be acceptable replacements for dimethoate, the only product currently recommended for controlling larvae in fruit remaining on harvested trees. There was no significant difference of control between dimethoate and the highest rate of Provado (imidacloprid). The post-infestation effect observed within the chloronicotinyl insecticide class may give them an advantage as a pre-harvest product, as application may control newly hatching eggs or young larvae that may have slipped through earlier control programs. There is no mention of this effect or spray timing on any label on any of these products at this time.

Dimethoate is not a popular pre- or post-harvest choice, as it sometimes causes leaf yellowing, necrosis and drop. Dimethoate recently passed through a regulatory evaluation by EPA, and data from this trial was used as evidence that dropping the allowed rate from 4 to 3 pounds active ingredient per acre could result in less control. The current 4 lb. after-harvest rate was maintained.

Other effects: Though earlier application timing is recommended, Provado and Assail controlled black cherry aphid (Myzus cerasi) when used at rates and timings intended for cherry fruit fly control.

Despite as many as five weekly applications at higher than necessary rates, no treatment in this project has resulted in leaf marking, yellowing or shedding, fruit marking, or excessive mite flare-ups leading to significant leaf damage. Some moderate leaf symptoms induced by mite feeding were observable by late summer on some of the trees treated with up to five weekly applications of Provado, Assail, and Calypso. Many of the candidate products have not yet been tested on all common sweet cherry varieties, so, while there are no indications of these potential problems to date, potential for leaf drop sensitivity in some varieties, or marking of light colored cherries is unknown.