**2007 Update**: Organic Cherry Fruit Fly Control with Spinosad (Enrust, GF-120 bait), Compared to a Conventional Provado Standard and an Untreated Check.

**PI**: Timothy J. Smith
**Organization**: Washington State University Extension, North Central Washington
**Address, phone, e-mail:** 300 Palouse, Wenatchee, WA 98801
(509) 667-6540; smithtj@wsu.edu
**Research Assistant**: Esteban Gutierrez, WSU Extension.

**Introduction and Justification**

Cherry fruit fly has been identified as the top priority in the Washington State Tree Fruit Research Commission Cherry Research Committee yearly priority setting sessions. Until the recent availability of organically acceptable formulations of spinosad, cherry fruit fly control was becoming ever-more difficult in Washington State organic cherry orchards, and failure to control was an increasing problem.

**Significant Results Summary**:

- Entrust, applied at seven or ten day intervals resulted in 100% cherry fruit fly control. Seven day spray intervals were recommended for this product, further testing has shown control at 10 day spray intervals, if full, or near-full rates are applied. Spinosad (the active ingredient in Entrust) has proven to be disruptive to some important beneficial insects, which sometimes causes a significant increase in black cherry aphid populations. Black cherry aphid is a serious pest to be avoided, and there is nothing other than natural control for management.

- GF - 120 bait application has continued to be effective in our trials, and is now used widely by Washington organic and conventional cherry growers. Since 2006, this method of CFF control has become the most widely used product/method to control this pest in Washington sweet cherry orchards.

- In 2007, cutting rate of GF - 120 NF Bait per acre to half (10 oz. /A) led to control failure.

- In 2007, having an untreated tree nearby led to control failure on a cherry tree treated with the full rate of bait, demonstrating the importance of area sanitation as a part of IPM.

- Untreated cherry trees in this project have had 30 to187 percent fruit infestation. Percent infection is calculated by the number of larvae extracted from each 100 fruit sampled from the infested tree. Usually, CFF deposit only one egg per fruit, but when unoccupied fruit become hard to find, fruit may support more than one larva.

Spinosad was proven as an effective CFF control active ingredient during earlier work by the PI (1997) and others. Entrust, an organically acceptable formula of sprayable spinosad was shown effective during this project. Early work by the PI indicated that 1/2 of recommended rates of spinosad (Success) would control CFF if applied every 7 days. This project has demonstrated three seasons of successful control of CFF when infested trees were sprayed every 10 days with a full rate of 1.9 ounces / acre of Enrust (the ai equivalent of 6.0 ounces of Success). This year, a 1.0 ounce / A rate of Entrust was tested against the recommended 1.9 oz./A. In three of four sites, control with 1.0 oz./A was 100%, with 0 larvae in 3000 fruit. However, in the fourth replicate, one larva was detected in the 1000 fruit sample. No larvae were detected in the 1.9 oz./A treatments.

The GF-120 NF bait was first shown to be an option as a cherry fruit fly control material and method through this project. In it's first four seasons of use, total savings from reduced product and application costs total over $4.2 million, and increase by about $1.5 million yearly.

As application of an insecticidal bait is a new practice to Pacific Northwest tree fruit producers, research and educational efforts are closely linked. Some growers, both conventional and organic have decided to depend 100% on GF-120 for their cherry fruit fly control program. This appears to have been successful so far, judging by the low number of reported CFF larva detections by WSDA inspectors over the past four seasons (see chart 1). However, despite testing this product for six seasons on many highly infested sites, we do not know if the product is always going to be highly effective under all circumstances, or if it might fail under special, identifiable circumstances. In 2007, we made an effort to find difficult control situations that could put the degree of efficacy of GF-120 to a test. If we can find a way to make it fail, we can continue to improve it's efficacy.

In one test, we treated very highly infested sites, where the cherries had been 100% infested the previous season. In past trials, the weekly bait treatments had worked very well to suppress these infestations to less than 1%, sometimes 0. Results in 2007 were similar, but infestation was reduced from 100% down to 1.2 % of fruit. It appears that CFF populations on very infested trees are greatly reduced the first season of treatment, but application must continue for a second season for apparent complete control. Some sites in cities become fly-free after the first two years of treatment, others have low numbers of adults captured on their traps every year. We are uncertain where these low numbers come from, but believe they come from the neighborhood, as isolated cherry trees become and remain fly-free after the first year or two of bait application.

In another trial, we reduced the rate applied, contrasting a 1/2 rate of 10 fl.oz product/A with the usual 20 fl.oz. rate. The sites selected for the 10 oz. rate had been successfully cleaned up and protected with a 20 oz. rate for three season, but were in neighborhoods where traps on cherry test trees captured adults every season, indicating a constant threat of infestation. Under these circumstances, the lower rate failed to maintain the fruit larva free in all three sites. In fact, the increase of larva in the fruit went from 0/3000 in 2006 to 27/1000 in 2007. Based on past experience, this indicated that control with the half rate may have been no better than 25 - 50%.

In third test of bait efficacy, a site was treated with a full rate of 20 fl. oz. /A, but an infested tree 100 feet away was left untreated. In this case, the bait once again failed to completely control CFF, as 3/1000 fruit were infested. This is possibly due to in-flight of mature bred CFF females depositing eggs on treated trees prior to finding and consuming the bait. In this situation, an effective residual product that would quickly control the in-flying female would be more effective than the bait, which works best when newly emerged adults from inside the treated orchard feed on the tree for 5-7 days prior to egg maturity.

**Methods and materials:**

The test fruit was checked for larva with the Washington State Department of Agriculture standard brown sugar solution method for the detection of CFF larvae in large batches of fruit. In this extraction technique, cherries are crushed carefully, then place in a solution of seven pounds of brown sugar dissolved in five gallons of water. The specific gravity of CFF larvae is less than that of the solution, which causes them to float to the surface of the cherry/syrup mixture. The light colored larvae are relatively easy to observe floating on the dark surface, even when they are in their first instar. This method assured that large numbers of fruit could be sampled, assuring detection of even low numbers of small larvae. Larvae were easily detected in fruit taken from untreated check trees. Some samples of fruit were also suspended on a grate over sand to check for naturally emerging larvae. This larva detection method did not appear significantly more accurate than a carefully run brown sugar solution larval extraction technique.

***Application***: All materials except the bait were applied with a backpack air-blast/mist sprayer in about 100 gallons water per acre. All rates and carrier volumes wee adjusted relative to tree size. The "post-harvest" GF - 120 bait applications were treated with a 1:3 bait to water mix applied with hand-held "window washer" squirt bottles adjusted to apply a solid stream of mixture. Rate per acre was adjusted by varying the amount of mixture that was applied relative to the size of each test tree. Bait was re-applied after significant rainfalls. Heavy dew would likely dissolve the bait speckles, possibly leading to control failures, but heavy dew is rare in North Central Washington during June and July, so was not monitored. For a description of application methods in commercial orchards, go to the web site: http://www.ncw.wsu.edu/treefruit/BAITAPPLICATION.htm

**Results Summary:**

| Organic Product in Trials | Years in Trial | Total Trees / Total Sites | Total Fruit Inspected | Total Larvae Found |
|---|---|---|---|---|
| **Untreated Checks** | **2003-07** | **22 Trees<br>22 Sites** | **16,315** | **7,081<br>(43% Average)** |
| **Aza-Direct / Neem** (azadirachtin) | **2004** | **12 Trees<br>6 Sites** | **2000** | **102** |
| **GF-120NF Bait<br>*Full Rate* of 20 fl. oz/A** | **2002, 03, 04, 05, 06, 2007** | **123 Trees<br>51 sites** | **42,400** | **7** |
| **GF-120NF Bait<br>*Half Rate* of 10 fl. oz/A** | **2007** | **3 Trees<br>3 Sites** | **3000** | **27** |
| **GF-120NF Bait, 1st year**<br>*on Extreme Infestations*<br>**Full Rate of 20 fl.oz/A** | **2007** | **13 Trees<br>2 Sites** | **1000<br>1000** | **12<br>0** |
| **Entrust 1.9 oz @ 10 Days Interval** (spinosad) | **2003, 05, 06, 2007** | **25 Trees<br>16 Sites** | **15,400** | **0** |
| **Entrust 1.0 oz @ 10 Day Intervals (*half rate*)** | **2007** | **4 Trees<br>4 Sites** | **4,000** | **1** |
| **Stylet Oil**<br>1% Summer Oil- weekly<br>*(damaged trees & fruit)* | **1999** | **4/1** | **800** | **6** |
| **Pyganic 5**<br>(pyrethrum) | **2006** | **6 Trees<br>6 Sites** | **6,000** | **10**** |

**Table 2. Organic CFF Control Product Summary:** *Control failure in one first season replicated plot when mature females crossed over from heavily infested untreated "check" trees within 50 feet. All other plots in subsequent years have had no larvae in fruit.

**Five of six plots had larvae in fruit, indicating that the product is only suppressive.