

**USDA RAMP Tart Cherry Integrated Orchard Management Project**  
**“Reduced Risk Pest Management Systems for U.S. Tart Cherry Production”**  
**Year 2 (2005) Report – Utah**  
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**Objective:**

Develop alternative insect management options for on-farm use (reduce dependency on organophosphate insecticides).

**Western Cherry Fruit Fly**

Efficacy of WCFF control with Provado and GF-120 was compared to conventional OP insecticides in nine study sites in 2004 and 2005. Seven of these trials were conducted in commercial orchards (two sweet cherry and five tart cherry) and two trials were in university research orchards. Growers applied all the treatments in on-farm trials and university staff applied treatments in research orchards. GF-120 was applied with a 4-wheeler-mounted sprayer at 4-7 day intervals for a total of 5-7 applications per season. Provado was applied with an orchard air blast sprayer approximately every 14 days for 2-3 applications per season.

**Research orchard trials:**

- 6 or 8 replicates per treatment
- Plot size: ~0.2 acre
- Fruit sample size: 3,000 or 4,000 fruits per treatment × 3 sample dates
- Adult trapping: 12 or 16 yellow sticky traps per treatment

**On-farm orchard trials:**

- 5 replicates per treatment
- Plot size: ~0.4 to 1.2 acres
- Fruit sample size: 2,500 fruits per treatment × 3 sample dates
- Adult trapping: 16 yellow sticky traps per treatment (8 traps on perimeter and 8 traps on interior trees)

**GF-120 On-Farm Trials, 2005**

Sweet 1			Sweet 2		
Trt.	Mean Cum. # Adults per Trap	Mean Cum. # Larvae per 100 Fruit	Trt.	Mean Cum. # Adults per Trap	Mean Cum. # Larvae per 100 Fruit
Guthion	3.4	0	Guthion	1.1	0
Provado	3.6	2.4	GF-120	1.4	0
GF-120	4.2	0.8			

*Very low crop load*

Tart 1			Tart 2		
Trt.	Mean Cum. # Adults per Trap	Mean Cum. # Larvae per 100 Fruit	Trt.	Mean Cum. # Adults per Trap	Mean Cum. # Larvae per 100 Fruit
Guthion	0.4	0	Guthion	0	0
GF-120	0.6	0	GF-120	0.2	0

5 reps.; 0.4 to 1.2 acre plots; 16 traps; 2,500 fruits x 3 dates

**Provado On-Farm Trials, 2004**

Tart 1			Tart 2		
Trt.	Mean Cum. # Adults per Trap	Mean Cum. # Larvae per 100 Fruit	Trt.	Mean Cum. # Adults per Trap	Mean Cum. # Larvae per 100 Fruit
Guthion	0.5	0	Dimethoate	4.6	0
Provado	0.8	0	Provado	4.5	0

Tart 3		
Trt.	Mean Cum. # Adults per Trap	Mean Cum. # Larvae per 100 Fruit
Guthion	0	0
Imidan	0	0
Provado	0	0

5 reps.; 0.4 to 2.4 acre plots; 16 traps; 2,500 fruits x 3 dates

**Results:**

**GF-120**

- Fruit injury in GF-120 plots in 3 out of 6 trials, but it was low (0.1-0.8 cumulative larvae per 100 fruit)
- Detectable injury occurred with:
  - High WCFF adult population (48 and 187 mean cumulative adults per trap)
  - Low crop load and moderate adult population (4.2 mean cumulative adults per trap)
- Sites with ≤1.4 cumulative adults per trap had no detectable injury
- Large enough sources of mature adults caused “small failures” in fruit protection

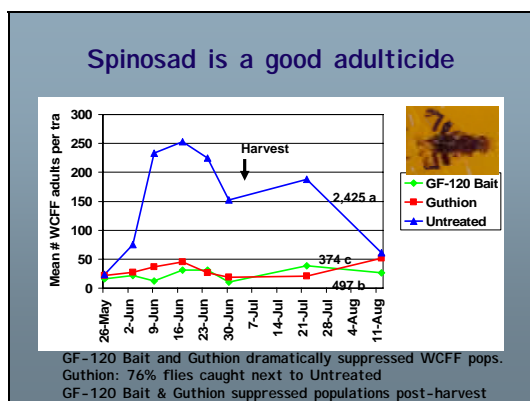
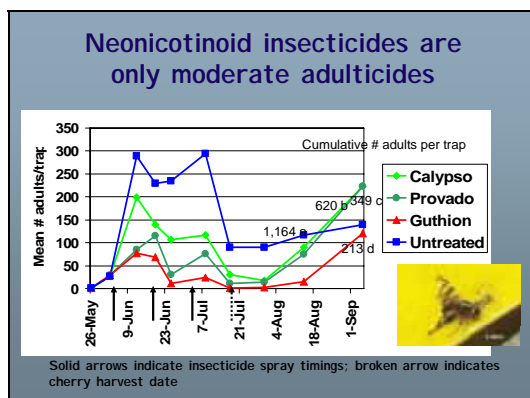
**GF-120 Research Trials, Kaysville (Tart Cherry)**

2004			2005		
Trt.	Mean Cum. # Adults per Trap	Mean Cum. # Larvae per 100 Fruit	Trt.	Mean Cum. # Adults per Trap	Mean Cum. # Larvae per 100 Fruit
Control	1211 a	44.7 a	Control	474 a	9.3 a
Guthion	249 b	1.1 b	Guthion	69 b	1.3 b
GF-120	187 b	0.3 b	GF-120	48 b	0.1 b

6 or 8 reps.; 0.2 acre plots  
 12 or 16 traps; 3,000 or 4,000 fruits x 3 dates  
 High WCFF population!

## Provado

- Fruit injury in Provado plots in 1 out of 4 trials (2005 sweet cherry orchard, low crop load, 2.4 cumulative larvae per 100 fruit, 3.6 cumulative adults per trap)
- No fruit injury in tart cherry orchards (0-4.6 cumulative adults per trap)



## GF-120 mode of action:

- Bait in GF-120 is a weak attractant, but a strong arrestant
- Adult fruit flies that feed on GF-120 are quickly killed
- 0.02% a.i. spinosad is highly toxic to adults when ingested
- It is critical to keep enough GF-120 available in relation to adult population size
- Not rain-fast
- Reapply every 5-7 days and after a rain event

## Provado mode of action:

- Systemic uptake by fruit kills eggs and small larvae
- Contact activity, weak to moderate adulticide
- In earlier studies (2001-2003), Provado held up under high populations of WCFF with 14 d reapplication intervals

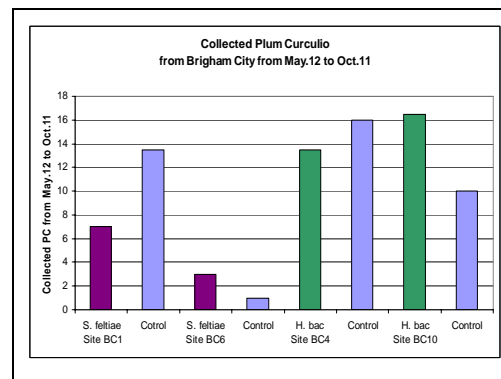
## Summary points:

- GF-120 and Provado offer greater flexibility in REIs and PHIs than Ops
- GF-120 offers an alternative application method
- Differ in target stage efficacy
  - Provado – ovicide and larvicide
  - Success and GF-120 – adulticide
- Cannot protect fruit against migrating, mature adults
- Rotate neonicotinoid insecticide applications due to spider mite stimulation (observed in several orchards)

## Plum Curculio

Efficacy of two species of entomopathogenic nematodes [*Heterorhabditis bacteriophora* (Hb) and *Steinernema feltiae* (Sf)] for suppression of plum curculio were evaluated in field, micro-plot, and laboratory experiments in 2005. Hong-Geun Kim, MS graduate student, is the lead researcher of these studies. Field trials were conducted in four home orchard sites in Brigham City, UT. Nematodes were reared in *Galleria* insect larvae in the lab and applied to field and micro-plots with a backpack sprayer four times at a concentration of 100,000-200,000 infective juveniles (IJs) per m<sup>2</sup> soil corresponding to when plum curculio larvae were present in soil under trees. Plot size was 2-3 trees for each nematode species and untreated control. Reduction of mean adult capture in tree trunk screen traps in nematode-treated plots was variable across the four trial sites. Plum curculio populations were low and plot size was too small to prevent adult migration between plots.

Mortality of plum curculio larvae in micro-plots where field-collected infested fruit were placed on soil sprayed with nematodes (Type I micro-plots) was 17 and 47% for Sf and Hb, respectively. When plum curculio larvae were collected from field fruit (Type II micro-plots), mean mortality was 29 and 28% (Sf and Hb, respectively).



Laboratory studies are on-going and evaluating susceptibility of plum curculio life stages (larva, pupa, adult) to the two species of nematodes and determining

effects of temperature on nematode infection, reproduction, and insect mortality.

