

Chemical Control/New Products

CONTROL OF WESTERN CHERRY FRUIT FLY IN TART CHERRY WITH NEONICOTINOID INSECTICIDES

Diane G. Alston

Department of Biology, Utah State University, Logan, UT

Keywords: tart cherry, western cherry fruit fly, *Rhagoletis indifferens*, Calypso, thiacloprid, Provado, imidacloprid, Guthion, azinphosmethyl, Sevin, carbaryl, chemical control, neonicotinoid insecticide

Abstract: The efficacy of two neonicotinoid insecticides, thiacloprid (Calypso) and imidacloprid (Provado), was tested for control of western cherry fruit fly (*Rhagoletis indifferens*) in tart cherry as compared to an industry standard program (azinphosmethyl [Guthion] and carbaryl [Sevin]) and an untreated control. Insecticides were applied with an airblast sprayer (70-80 gpa) to 3-row-wide by 5-tree-long (60 ft x 60 ft) plots. In fruit harvest samples collected on 16 July, there was no fruit injury in Provado and Guthion/Sevin treatments, 0.08% injury in the Calypso treatment, and 2.75% injury in the untreated plots. Adult fly densities monitored with yellow sticky traps were high in all treatments (ranged from 195-272 cumulative flies per trap per treatment from 1 June to 26 July) with no differences among treatments.

Introduction

Calypso and Provado are neonicotinoid insecticides that act upon nicotinic acetylcholine receptors (nAChR) of insect nerve cells. Provado is registered on pome fruits for control of aphids, leafhoppers, leafminer, psylla, scale and mealybugs. Provado is not registered on stone fruits. Calypso is a new product, related to Provado, but not yet registered.

Materials and Methods

The trial was conducted in a 2.2 acre 'Montmorency' tart cherry orchard at the Utah State University research farm in Kaysville, UT. Other pesticides applied to trees besides the insecticides evaluated were oil on 11 April and fungicides for powdery mildew control: Elite (tebuconazole) on 24 April and Rally (myclobutanol) on 10 May, 29 June, 6 and 17 July, and 1 August. The experimental design was a randomized complete block with four treatments and four replications (16 plots). Each plot was 3 rows wide and 5 trees long (12 ft x 20 ft row spacing). An untreated buffer row was left between plots to reduce the likelihood of insecticide drift and increase western cherry fruit fly populations in the orchard.

The first activity of adult fruit flies (i.e., biofix) was determined by placing three yellow AM sticky traps with additional ammonium carbonate bait in the study orchard. The first fly captures were on 26 May 2001. On 1 June (6 days after first adult capture), trial insecticide treatments were initiated and one yellow AM sticky trap plus bait was placed in each of the 16 plots to follow seasonal adult densities. Traps were checked and flies counted at approximately weekly intervals (8, 14, 19, 22 and 26 June, and 5, 16 and 26 July). Adult

captures were plotted over time by treatment and mean cumulative fly capture for the season was compared among treatments with analysis of variance (GLM; SAS).

Insecticides were applied with an airblast sprayer at a rate of 70-80 gal of dilute spray per acre. Treatments were applied every 14 days for a total of three times each. Application dates were 1, 15, and 29 June.

Insecticide Treatments:

1. ***Calypso 4 F*** (thiacloprid; 40.4% AI; Bayer) @ **4 fl oz/acre**
2. ***Provado 1.6 F*** (imidacloprid; 17.4% AI; Bayer) @ **8 fl oz/acre**
3. ***Guthion 50 WP*** (azinphosmethyl; 50% AI; Bayer) @ **1.5 lb/acre (applied twice: 1 and 15 June)** and ***Sevin XLR Plus*** (carbaryl; 44.1% AI; Rhone- Poulenc) @ **2 qt/acre (applied once: 29 June)**
4. ***Untreated Check***

Tart cherry fruits were randomly sampled from the three center trees per plot to determine percentage infestation by western cherry fruit fly larvae midway to harvest on 26 June (100 fruit per plot=400 fruit per treatment) and at harvest on 16 July (300 fruit per plot=1200 fruit per treatment). The surface of each fruit was inspected for fly emergence holes and then cut open to determine the presence of larvae or injury. The number and size of larvae (1st instar: <2 mm length; 2nd instar: 2-4.5 mm length; 3rd instar: >4.5 mm length) found in fruit from each plot were recorded. The percentage of infested fruit was compared among treatments with analysis of variance (GLM; SAS) and treatment means were separated with Tukey's studentized range test. Proportion data were transformed with arcsine square root before analysis.

Results

Fruit Injury

Table 1. Percentage of fruit with western cherry fruit fly larvae (instars 1-3), exit holes and total injury (larvae + exit holes) on 26 June (100 fruit sampled per plot) and 16 July (1200 fruit sampled per plot).

Treatment	Early Harvest – June 26 (100 fruit sample)			Final Harvest – July 16 (1200 fruit sample)		
	Larvae	Exit holes	Total	Larvae	Exit holes	Total
Calypso 4 F	0 B	0	0 B	0.08 B	0 B	0.08 B
Provado 1.6 F	0 B	0	0 B	0 C	0 B	0 C
Guthion 50WP/Sevin XLR	0 B	0	0 B	0 C	0 B	0 C
Untreated	1.25 A	0	1.25 A	1.00 A	1.75 A	2.75 A
<i>P>F</i>	0.0001	-	0.0001	<0.0001	0.0003	<0.0001

Data were transformed as arcsine square root of proportions before analysis. Means were separated with Tukey's studentized range test.

Although fruit injury was fairly low in untreated plots (1.25-2.75%), injury was significantly greater in untreated plots than in any insecticide treatment on both 26 June and 16 July (Table 1). In the final harvest sample there was a very low level of injury in the Calypso

treatment (1 fruit with a larva out of 1200 fruit sampled). On 26 June, larvae were 1st-2nd instars, whereas on 16 July most larvae were 2nd-3rd instars and exit holes were present.

Adult Western Cherry Fruit Fly Densities

Adult densities were high (Figs. 1 & 2), but mean cumulative catches per trap from 1 June to 26 July were not different among treatments (Fig. 2). Mean numbers of adults per trap per sampling period (5-10 days) ranged from 0.75 to 65.5 from 1 June to 26 July (Fig. 1). Fly densities did decline following the first two insecticide applications in most treatments as compared to untreated plots (Fig. 1), however, densities did not seem to respond as much to the third set of insecticide applications on 29 June. Greatest fly densities occurred during the tart cherry harvest period for northern Utah, early to mid-July. Cumulative adult captures were slightly lower in the Guthion/Sevin treatment as compared to the others, but not significantly (Fig. 2).

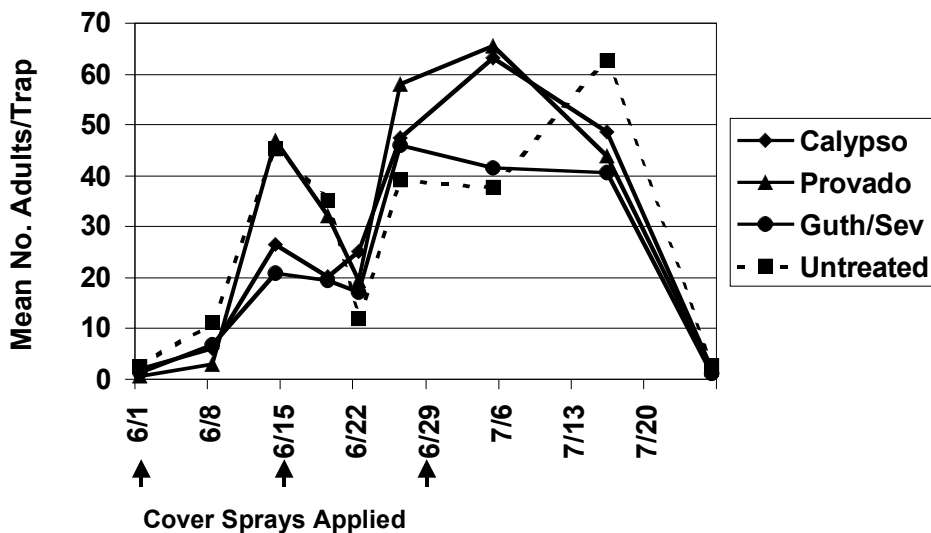


Figure 1. Mean adult fly capture per trap in the four treatments from 1 June to 26 July 2001.

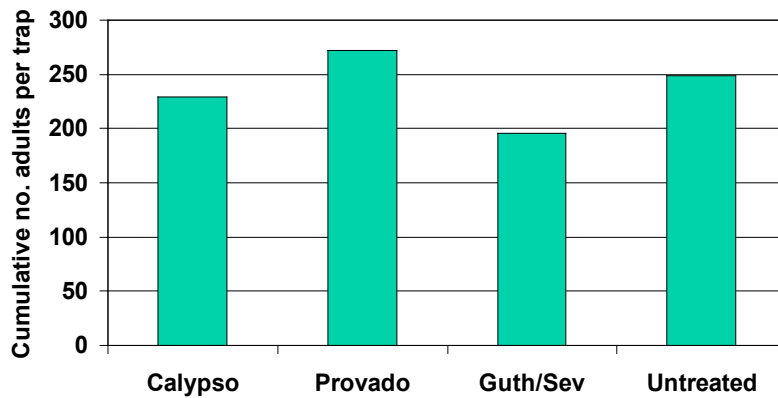


Figure 2. Mean cumulative adult fly capture per trap from 1 June to 26 July 2001. There were no significant differences in cumulative numbers among treatments ($P=0.6761$).

Conclusions

Both neonicotinoid insecticides, Calypso and Provado, effectively controlled western cherry fruit fly in this trial. Fruit injury in all insecticide treatments was significantly less than in the untreated control. The Guthion/Sevin and Provado treatments had no fruit injury at harvest, while the Calypso treatment had a very low level of 0.08% (1 infested fruit out of 1200 fruit sampled).

Adult fly densities were substantial in all treatments. Mean cumulative numbers of flies per trap ranged from 195 to 272 for 1 June to 26 July. Although cumulative fly captures in the Guthion/Sevin treatment were slightly lower than in the other treatments, there were no significant differences among treatments.

Fruit injury at harvest in the untreated plots was lower than expected (2.75%), especially given the high fly pressure. The small plot size and relatively small area of untreated trees in the orchard are likely explanations. Untreated buffer rows were left between plots in this study because of problems with low fruit infestation in untreated plots in 2000. The buffer rows were established in 2001 in the hopes of eliminating any insecticide drift between plots and to create a greater reservoir of untreated trees to harbor fruit flies. Perhaps a greater sample size of fruit would increase our detection of injury. However the labor required to check and dissect more than the 1200 fruit per treatment used in this study may be prohibitive.