Cooperative Extension, University of California

# San Joaquin Valley Entomology Newsletter

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## Provisional Guidelines for Managing Spotted Wing Drosophila in Cherries and Blueberries in California

Spotted wing drosophila is a newly established pest of small fruit in California. This pest has now spread to all major regions in California where small fruit are grown. Contained within this newsletter are two documents that are our current best estimates as to how to approach managing this new pest during the 2010 harvest season.

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# Provisional Guidelines for Managing Spotted Wing Drosophila in San Joaquin Valley Blueberries, 2010.

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Blueberry growers in California should be aggressively preparing to manage a new exotic pest called the spotted wing drosophila. This highly invasive pest was first found in California in 2008 and has now spread to all blueberry growing regions of the state. Background information on pest biology, coupled with experiences of Oregon blueberry growers in 2009, all suggest that California blueberry growers need to have contingency plans in place for how they plan to monitor and manage this new pest during the 2010 harvest season.

Spotted wing drosophila is not a true fruit fly like Mediterranean or olive fruit fly. Instead, it is a vinegar fly similar to the flies commonly found on overripe fruit on a kitchen counter. The difference, however, is that spotted wing drosophila has the capacity to attack unblemished fruit in the field before it is harvested. Since it was first identified in California, spotted wing drosophila has now spread to over 23 counties in California, 13 counties in Oregon, and into Washington, British Colombia and Florida.

Thus far the most preferred hosts have been blackberries, raspberries, cherries, blueberries, strawberries and certain other stone fruits. In the case of cherries, data and translations of Japanese literature (courtesy of Jana Lee, USDA, Corvallis, OR) suggest that cherries become susceptible once fruit reach a red color. If the same holds true for blueberries, oviposition into blueberry fruit could occur a few weeks prior to the initiation of harvest when the first few berries begin to change from a red to a bluish purple color.

Weather and damage potential

There is currently a lot of uncertainty as to how big of an issue spotted wing drosophila will be in California blueberries. Speculation with regards to this topic lies with interpretations of the influence of weather. Spotted wing drosophila thrives in mild humid environments. Therefore, the question that arises is, will it get hot enough fast enough to minimize damage to San Joaquin Valley blueberries?

The development of one generation of spotted wing drosophila requires 338 DD with a lower threshold limit of 48˚ F. Under San Joaquin Valley conditions this can result in generation times ranging from 6 to 2 weeks during the period from March until the end of harvest (Table 1). If you consider that most San Joaquin Valley fruit is picked during May and June, this is the equivalent of 3 to 4 generations of flies during the harvest season, with at least one additional generation occurring before harvest begins.

Table 1: Approximate generation time for SWD by date infestation and location

| | Number of days until adult emergence and (average high temperature) | | |
|---|---|---|---|
| Infestation date (egg laying) | Kern Co. Arvin | Fresno Co. Kingsburg | San Joaquin Co. Lodi |
| March 1 | 41 days (66ºF) | 48 days (65ºF) | 55 days (63ºF) |
| April 1 | 33 days (70ºF) | 32 days (71ºF) | 40 days (68ºF) |
| May 1 | 17 days (81ºF) | 21 days (79ºF) | 23 days (78ºF) |
| June 1 | 13 days (89ºF) | 14 days (88ºF) | 17 days (84ºF) |
| July 1 | 10 days (96ºF) | 12 days ( 94ºF) | 14 days (90ºF) |

However, spotted wing drosophila does not like the hot and dry weather typical of summers in the Valley. Adults are most active at about 68ºF, show less activity at 86ºF, and stop laying eggs when it is around 91ºF. Based on this information it is likely that overwintering adults will begin to lay eggs on non-blueberry hosts throughout March and will complete one generation in about 5 to 7 weeks. This means that the second generation, as well as the tail end of the first generation, could all be present around the time the first blueberries begin to change color in April. At that point additional generations could occur in blueberries until fly development becomes inhibited by high temperatures. However, since we do not know exactly when this will happen, all growers should actively monitor for spotted wing drosophila during the 2010 harvest season.

Monitoring

According to studies by Janet Caprile (UCCE Contra Costa Co.) and Bill Coats (UCCE San Benito Co.), bucket-style traps with apple cider vinegar are the easiest method for monitoring for the presence of spotted wing drosophila. Commercial bucket traps can be purchased from monitoring supply companies for about fifteen to twenty dollars, or do-it-yourself models can be made for less than a dollar. To make your own trap, purchase a 1 quart plastic container and cover the top with 3/16 inch mesh hardware cloth. The screen is not necessary; but simplifies data collection by letting fruit flies in while excluding larger insects such as moths and bees. Creative trap-makers might also use binder clips or melt holes in the trap to allow it to be hung on a wire.

Once traps are ready they should be filled with 1 inch of apple cider vinegar and hung on a trellis wire within the blueberry canopy. Deploy traps prior to when the first berries begin to expand and color. Traps should be monitored twice weekly, with bait changed once a week. Be sure to remove old bait from the orchard. Blueberry growers that neighbor cherries (which become susceptible to attack earlier than blueberries) or citrus (that have rotting fruit on the ground throughout the spring) should work with their neighbors to also trap in those areas. When examining trap catches, look for drosophila vinegar flies with spots on their wings (=male spotted wing drosophila). If any spotted wing drosophila males are found in the traps just prior to or during harvest, consider making a treatment immediately.

Chemical Control

Insecticides are currently the only option for spotted wing drosophila control during the spring in blueberries. Data from Japanese literature on cherries, trials by Mark Bolda (UCCE Santa Cruz County) in coastal caneberries, and laboratory trials by Denny Bruck (USDA-ARS, Corvallis OR) all suggest that organophosphate (Malathion) and pyrethroid (Mustang) insecticides will be the most effective for blueberries. Both of these products are labeled for use in blueberries and have a one day pre-harvest interval. Other pyrethroids are also available but most have longer pre-harvest intervals.

The most practical method of applying Malathion and Mustang will be in rotation with each other by air every 7 to 14 days. Aerial applications will likely be preferred to ground applications to minimize the risk of spotting fruit and knocking fruit on the ground. Aerial applications will also allow large acreages to be sprayed very quickly such that the period of time pickers need to stay out of the field can be minimized. Malathion and Mustang applications should be alternated to reduce the risk of resistance to either chemistry.

Organic blueberry growers should contact their certifiers early in the year to make sure they will approve the use of spinosad (Entrust) if spotted wing drosophila begins to cause damage. Entrust is not as effective as the other products previously mentioned, but can suppress fly populations. Other organic products such as permethrin and a variety of oils are not effective. It is also important to remember that Entrust should not be overused in efforts to prevent resistance development in both spotted wing drosophila and citrus thrips to this chemistry. Entrust can be sprayed by ground or air and has a pre-harvest interval of three days.

# 2010 Spotted Wing Drosophila Recommendations for Sweet Cherry

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These recommendations are derived from translated Japanese research articles on spotted wing drosophila (SWD), preliminary trapping data from Janet Caprile (UCCE Farm Advisor – Contra Costa County) and Bill Coates (UCCE Farm Advisor- San Benito County), insecticide efficacy data from Mark Bolda (UCCE Farm Advisor - Santa Cruz) and fruit maturity susceptibility data from Jana Lee (USDA – Corvallis, OR). Control procedures are conservative due to the lack of insecticide efficacy data on California cherries and damage experience by cherry growers this past season. These are our best guesses with limited data and we expect the recommendations to change over time.

Monitoring: Place a commercial bucket style trap or a 1 qt. plastic container with screen (3/16 inch holes hardware cloth) on the top and bait the trap with 1 inch of apple cider vinegar. The 3/16 inch holes will limit the number of large moths, flies and bees captured in the traps. The plastic containers are about 50¢ each and apple cider vinegar is about $3.00/gal from Smart & Final. Replace the vinegar weekly (remove spent bait from the orchard – do not dump the spent bait on the ground in the orchard). Place trap about 3-5 ft. off the orchard floor and monitor twice weekly from first color change (light green to straw) until completion of harvest. Count only flies with spots on the tip of the wings (male SWD). OptiVISOR (optical glass binocular magnifier) will aid in the identification of flies. If any SWD are found in the traps, take control action immediately (see insecticide control below).

Generation time: One generation requires 338 DD with a lower threshold limit of 48˚ F. The table below shows the approximate generation times throughout the spring and summer in the northern San Joaquin Valley (Linden) and the central coast (Hollister). These generation times are based on 30-year average temperatures from the UC IPM weather network and will vary depending on current temperatures.

Approximate generation time for SWD by date infestation and location

| | Number of days until adult emergence | |
|---|---|---|
| Infestation date (egg laying) | San Joaquin Valley (Linden) | Central Coast (Hollister) |
| April 1 | 28 days | 34 days |
| May 1 | 20 days | 29 days |
| June 1 | 15 days | 22 days |
| July 1 | 13 days | 18 days |

Cultural Control: If conventional insecticide treatments are not an option (organic growers), and if fruit from pollinizer varieties matures earlier than the main variety and the pollinizer fruit will not to be picked and sold, then pick and remove pollinizer fruit at least one week before harvest of the main variety. This will prevent the SWD from emerging from the pollinizer fruit during the main variety

harvest. Fruit removal is a critical control step for organic growers because of the lack of known effective organic insecticides. Conventional growers can suppress SWD on pollinizer fruit by insecticide applications (below).

Chemical Control: Begin applications when the pollinizer or the earliest variety in the orchard, changes color from pink to red. Repeat applications at 7 to 10 day intervals until harvest with one of the materials listed below. From Jana Lee and from Japanese literature it appears that the SWD will infest ripe cherries of red to mahogany color. Also, from the Japanese literature it appears that 3 or 4 applications are required to control the pest and that the organophosphate and pyrethroid insecticides are effective for one to possibly two weeks. Observe all pre-harvest intervals (PHI) and re-entry interval (REI) periods and rotate between materials of different chemical classes between applications to slow the development of resistance. At this point in time, we are recommending adding Nu-Lure bait at 3 pt/100 gal with a final spray volume of 50 gal/ac. Do not include surfactant with Nu-Lure. Nu-Lure should be removed during post-harvest washing.

| Trade Name | Common Name | Chemical Class[a] | PHI | REI | Rating[b] |
|---|---|---|---|---|---|
| GF-120[C] | Spinosad | SPIN | 0 days | 0 hr | 4 |
| Sevin 80S | Carbaryl | CAR | 1 days | 12 hr | 3 |
| Malathion | Malathion | OP | 3 days | 12 hr | 1 |
| Ambush/Pounce | Permethrin | PYR | 3 days | 12 hr | 2 |
| Renounce/Tombstone | Cyfluthrin | PYR | 7 days | 12 hr | 1 |
| Baythroid | Beta-Cyfluthrin | PYR | 7 days | 12 hr | 1 |
| Assail | Acetamiprid | NEONIC | 7 days | 12 hr | 3 |
| Provado | Imidacloprid | NEONIC | 7 days | 12 hr | 3 |
| Leverage (Baythroid+Provado) | Beta-Cyfluthrin + Imidacloprid | PYR + NEONIC | 7 days | 12 hr | 1 |
| Entrust/Success | Spinosad | SPIN | 7 days | 4 hr | 3 |
| Delegate[d] | Spinetoram | SPIN | 7 days | 4 hr | 1 |
| Actara | Thiamethoxam | NEONIC | 14 days | 12 hr | 3 |
| Asana | Esfenvalerate | PYR | 14 days | 12 hr | 2 |
| Warrior II | Lambda-Cyhalothrin | PYR | 14 days | 12 hr | 2 |
| Diazinon 50WSB | Diazinon | OP | 21 days | 4 days | 1 |

[a] The chemical classes are: SPIN is spinosyns, CAR is carbamate, OP is organophosphates, PYR is pyrethroids, NEONIC is neonicotinoids.

[b] The rating scale is: 1= control for 7 to 14 days, 2 = control for 3 to 7 days, 3 = control for 1 to 3 days, and 4 = control for only 1 day.

[c] GF-120 is slow acting and does not have knock-down activity but will suppress population over time.

[d] There is no MRL established for Delegate in Japan, Korea or Taiwan. Please consult your packer/shipper for export implications.