

College of Tropical Agriculture and Human Resources University of Hawai'i at Mānoa Insect Pests December 2020 IP-49

Olive Fruit Fly Management

Rosemary Gutierrez-Coarite¹, Robin Shimabuku², Kylie Tavares¹, Randall T. Hamasaki², Steven Souder³ and Nicholas Manoukis³ ¹Deparment of Tropical Plant and Soil Science, ²Department of Plant and Environmental Protection Sciences, ³Tropical Crop and Commodity Protection Research Unit Daniel K. Inouye US Pacific Basin Agricultural Research Center United States Department of Agriculture-Agricultural Research Service Hilo, Hawaii 96720

Introduction

The olive fruit fly, Bactrocera oleae (Diptera, Tephritidae), is the most important insect pest of olives worldwide. It is thought to have originated in sub-Saharan Africa, but is found today in northern and central Africa, the Mediterranean basin, southern Asia, Mexico, (Economopoulus, 2002) and was detected in California in 1998 (Rice, 2000). The olive fruit fly larvae (maggots) are specialized, only eating fruit in the olive genus Olea. The olive fruit fly was first detected in Hawai'i in August 2019 on the islands of Maui and Hawai'i, and is widespread in olive groves on both islands (Matsunaga, et. al., 2019).



Figure 1. Adult olive fruit fly. Photo source: https://bugguide.net/node/ view/602540

Larvae are yellowish-white and legless, with pointed heads. Larvae exit the olive and pupate in the ground, but may also stay in the olive until emerging as an adult fly (Zalom et. al., 2009).

Adult flies can fly distances of up to six miles in search of host olives. Adult flies may live for as long as six months, depending on food availability and temperature. The reproductive potential for this pest is extremely high, thus extensive fruit damage can occur relatively quickly. Research has shown that a female can lay 500 or more eggs during its lifetime. Usually, only one egg is laid per fruit, but multiple eggs may be laid in large olive fruit varieties (Rice, 2000).

Identification

Adult olive fruit flies collected from Hawai'i are orangebrown, with faint black lines running the length of their thorax. They are slightly smaller than those recorded in other parts of the world, measuring approximately 5mm (3/16"). They have two black dots on the front of their faces, as well as a black spot on the tips of their wings (Matsunaga, et. al. 2019). The wings are positioned horizontally and are held away from the body.

Damage

Adult females deposit eggs under the skin of olive fruit as small as 1 cm3. The resulting larvae feed on the fruit, causing brownish feeding tracks and tunnels. Damage from this pest also allows for the entry of secondary bacteria and fungi that rot the olive fruit (Zalom et al. 2009).

They typically prefer larger table olive varieties (e.g., Mission, Taggiasca, Frantoio) but will also target smaller

Published by the College of Tropical Agriculture and Human Resources (CTAHR) and issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, under the Director/Dean, Cooperative Extension Service/CTAHR, University of Hawai'i at Mānoa, Honolulu, Hawai'i 96822. Copyright 2018, University of Hawai'i. For reproduction and use permission, contact the CTAHR Office of Communication Services, cos@ctahr.hawaii.edu, 808-956-7036. The university is an equal opportunity/affirmative action institution providing programs and services to the people of Hawai'i without regard to race, sex, gender identity and expression, age, religion, color, national origin, ancestry, disability, marital status, arrest and court record, sexual orientation, or status as a covered veteran. Find CTAHR publications at www.ctahr.hawaii.edu/freepubs. oil cultivars when available (e.g. Arbosana, Koroneiki, Arbequina). Adults may feed on a variety of organic materials apart from olives, including pollen, honeydew, and plant nectar. Feeding damage by larvae can cause premature fruit drop and reduce fruit quality for both table and oil production. This pest can cause crop losses of 100% of some table cultivars and up to 80% of oil value. There are differences in olive fruit fly preference between olive cultivars.



Figure 2. Olive fruits damaged by the olive fruit fly.

Monitoring

Several traps can be used to monitor olive fruit fly populations. One of the most widely available and easy to use is a McPhail-type trap baited with torula yeast to attract the flies. Each trap should be set up with 3 torula yeast bait tablets in 300 ml of water or a 10% propylene glycol (anti-freeze) mixture for each trap (Figure 3).

Traps should be set in olive trees about 4 to 6 feet off the ground (Figure 4); two traps per acre will be sufficient to monitor olive fruit flies. Traps using torula yeast with water mixtures should be checked weekly to ensure that the water has not evaporated to maintain maximum attraction. Using 10% propylene glycol reduces evaporation and traps can be checked less frequently.

Several companies currently sell McPhail-type traps. Contact your local Extension office for a source.

Management

GF-120 NF Naturalyte Fruit Fly Bait

GF-120 is an organic bait product containing the biologically produced insecticide Spinosad. It controls fruit fly populations by attracting adults to feed on the bait, causing mortality in adults due to the Spinosad insecticide. GF-120 applications should begin when olive fruit fly adults are captured in the monitoring traps, or at least 2 to 3 weeks before pit hardening. Repeat applications every 7 days while flies are captured on monitoring traps until harvest.



Set up of traps for monitoring olive fruit fly

Figure 3. How to set up a McPhail-type traps to monitor olive fruit fly



Figure 4. Torula yeast baited McPhail-type trap set in an olive tree.

GF-120 is a concentrated produce and needs to be diluted with water before application, at 1 part GF-120 to 4 parts water. Follow label instructions for personal protective equipment requirements and methods of dilution and application. GF-120 can be purchased from a local agricultural supplier.

GF-120 Bait Stations

Using bait stations with GF-120 is recommended to prolong the effectiveness of the product. Bait stations can be made using a few tools and materials. To make one trap you will need:

- (1) Plant pot saucer (14 in. outer diameter; 2 in. deep approximately)
- (1) Metal shelf bracket (8 in. x 10 in.)
- Screws
- Super glue
- Wire brush
- Power drill
- Yellow spray paint

Using the wire brush and power drill, score the inside of the saucer. This improves surface retention of the bait spray. Paint the plant pot saucer yellow to improve its visual attractiveness to the fruit flies and allow to dry. Using screws and super glue, attach the shelf bracket to the inverted saucers, as shown in Figure 5. About 8 to 12 bait stations per acre are needed, depending on the abundance of the olive fruit fly. GF -120 needs to be applied every 7 days. Spray 10 ml of diluted solution on each bait station. To apply the GF-120, place bait stations on the ground, with the L bracket pointing to the sky, and spray the interior evenly. Allow the spray to set for 15 minutes to dry, reducing unwanted runoff. Bait stations can be placed in trees using zip ties or flagging tape at 4 to 6 ft high.

Follow all the requirements on the pesticide product label.



Figure 5. Bait station sprayed with GF-120.

Kaolin Clay

Kaolin clay application is another strategy to control olive fruit flies. This is a fine white substance that is mixed with water and used as a physical repellent. When sprayed on the trees, it repels female flies and prevents her from laying eggs by forming a barrier on the fruit. This should be applied three times during the season. The first application should be just before pit hardening and repeated every 5-6 weeks. To apply this product and achieve thorough coverage, it needs to be mixed with water at a rate of 1/4 - 1/2 lb to 1 gal of water. Follow all requirements on the product label. The kaolin clay is washed off before processing (Vossen, 2016).

Sanitation

Pick up and destroy fallen fruit to reduce olive fruit fly populations. Remove fruit as soon as possible once it is ripe to prevent the maggots from leaving the fruit and entering the soil to pupate. After harvest, collect all olive fruit left on trees or on the ground and place them in a black garbage bag, sealing it air tight and leaving it in a sunny location for 21 days to kill any eggs, larvae or adult olive fruit fly.

Biological Control

In other regions of the world with long-standing establishments of olive fruit fly, braconid parasitoid wasps are often important to reduce the populations of the pest. Some have been introduced specifically to control the olive fly, such as the two Psyttalia species brought to California in the early 2000s.

In Hawai'i, a large number of braconid wasps were released during the 20th century to control other fruit flies. One of these wasps (*Diachasmimorpha longicaudata*) has already been observed emerging from olives in Waimea, Hawai'i island. This suggests that augmentative release of some wasps already established in Hawai'i could provide a degree of control for olive fruit fly as a component of a comprehensive IPM strategy. The introduction of new exotic parasitoids is a long-term project.

References

- 1. Economopoulos AP, Haniotakis GE, Michelakis S, et al. Population studies on the olive fruit fly, Dacus oleae (Gmel.) (Dipt., Tephritidae) in Western Crete. Z Ang Ent. 1982. 93:463-76.
- 2. Matsunaga J., Roerk L. and Hamasaki R. 2019. New Pest Advisory: olive fruit fly Bactrocera oleae (Rossi) (Diptera: Tephritidae). Hawaii Department of Agriculture.
- 3. Rice, R.E. 2000. Bionomics of the Olive Fruit Fly Bactrocera oleae. Plant Protection Quarterly, University of California Cooperative Extension, Volume 10 Number 3.
- 4. Vossen P. and Devarenne A. 2006. Controlling Olive Fruit Fly at Home. University of California Cooperative Extension.
- Zalom, F. G., R. A. Steenwyk, H. J, Burrack, and M. W. Johnson. 2009. Olive fruit fly. UC IPM, University of California. http://ipm.ucanr.edu/PMG/PESTNOTES/ pn74112.html.