Easy as 1-2-3

Fruit Fly Suppression in Hawaii

Begin your own sustainable suppression program using an "area-wide" approach to managing fruit flies. Environmentally acceptable and cost-effective technologies increase economic benefits to growers, the community, and the state of Hawaii through expanded opportunities in diversified agriculture.

Use this simple guide to learn about fruit flies and help manage these pests in your farming community. Fruit fly suppression can be as easy as 1-2-3.

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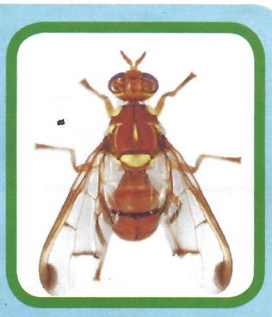
Fruit Fly Biology----------

Which Fruit Fly Do You Have?

Oriental Fruit Fly



Melon Fly

-Lower Elevation-

↑ Fruit Pest

↑ Vegetable Pest

Mediterranean Fruit Fly

-Upper Elevation-

↑ Fruit Pest

Malaysian Fruit Fly

Not a Major Concern

↑ Vegetable Pest

Fruit Fly Lifecycle

Adult Stage
4+ months

Flies emerge from pupae. Fruit flies become sexually mature within 1-5 weeks.

Female flies lay eggs into fruits & vegetables

Egg Stage
1-2 days

Female fruit flies can lay several hundred eggs over the course of their adult life.

Pupal Stage
8-11 days

In the soil, larvae form a puparium which protects the insect until it develops into an adult.

Larvae emerge from fruit to burrow in soil.

Larval Stage
5-15 days

Larvae hatch from eggs and tunnel through host fruits and vegetables.

Male or Female?

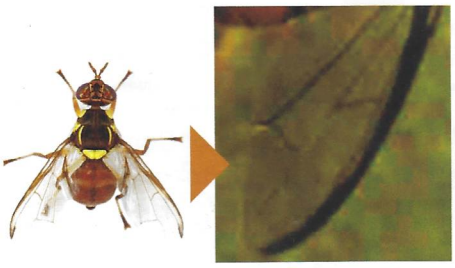
Female

Female flies have an ovipositor to lay eggs.

Male

Male flies do not have ovipositors.

Oriental Fruit Fly----------



Identifiable Trait:
Clear wings
Black T-shaped mark on abdomen

Major Hosts

Breadfruit, carambola (starfruit), cherimoya, citrus, guava, mango, papaya, peach

Other Hosts

Apricot, banana, calamondin, custard apple, fig, grapefruit, jackfruit, lemon, lime, loquat, kumquat, mountain apple, nectarine, passion fruit, persimmon, plum, poha, sapodilla, soursop, star

Oriental Fruit Fly Behavior

Oriental fruit fly adults remain within orchards and crop fields in elevations sea level to 4000 feet. Adult fly behavior is affected by temperature. On cooler mornings, flies warm-up on top of leaves. In warmer temperatures, flies tend to avoid the sun and stay inside foliage. Fruit flies are active from after sunrise to mid-day, up until mid-afternoon depending on the temperature. They usually mate late in the afternoon as the light intensity drops and sleep among the leaves in the evening.

Suppression Tactic #1

Field Sanitation

Sanitation is the disposal of infested fruit so fruit fly eggs and larvae do not survive. It is a very important suppression method for two reasons: 1) An infested fruit may hold hundreds of larvae and/or eggs; by getting rid of that one fruit, you are eliminating future fruit fly swarms, 2) Pesticides applied to fruit do not kill larvae and eggs.

Common Sanitation Techniques for Oriental Fruit Fly

Rid the farm area of wild hosts like strawberry guava, mango, etc.

Bag culls in thick plastic bags.

Feed infested fruit to animals, but do not leave leftovers around for over a day

Suppression Tactic #2

Protein Bait

Fruit flies need sugars for energy and proteinaceous food to mature and reproduce. Protein baits attract and poison feeding male and female fruit flies.

Spraying Protein Bait for Oriental Fruit Fly

Apply protein bait in or around approved host fruit trees.

Spray the underside of leaves...

...or **Spray** protein bait on tree trunks

Suppression Tactic #3

Trapping

Fruit fly traps using male lures reduce the number of flies in your farm area. Trapping is the most important tactic in Oriental fruit fly control. Keys to successful trapping: 1) Correct lure, 2) Good trap placement, 3) Timely trap maintenance

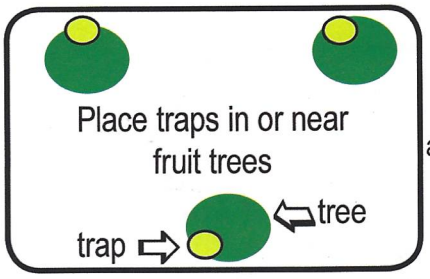
# of Oriental Fruit Fly Traps

3-5 traps/acre
1-3 traps per backyard

Male Lure

Methyl Eugenol *in basket*

Trap Placement



Hang traps as high as possible in semi-shade

Trap Service

Replace lures every 3-4 months or as recommended

Melon Fly

Identifiable Traits:
Black spot at wing tips
Black streak on wings

Major Hosts

Bittermelon, cucumber, eggplant, melon, pepper, pumpkin, sequa, squash, tomato, zucchini

Other Hosts

Gourds, guava, ivy gourd, papaya, strawberry guava, spiny cucumber, wild bittermelon

Melon Fly Behavior

Common at sea level to 1500-foot elevations, melon fly adults spend considerable time on favored wild hosts and certain crop plants in and outside of crop fields. Adult fly behavior is affected by temperature. On cooler mornings, flies warm-up on top of leaves. In warmer temperatures, flies tend to avoid the sun and stay inside foliage. Fruit flies are active from after sunrise to mid-day, up until mid-afternoon depending on the temperature. They usually mate late in the afternoon as the light intensity drops and sleep among the leaves in the evening.

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Common Sanitation Techniques for Melon Fly

Rid the area of wild hosts

Plow the field 1 week after crop harvest

Bag culls in thick plastic bags

Feed but do not leave leftovers around for over a day

Suppression Tactic #2

Protein Bait

Fruit flies need sugars for energy and proteinaceous food to mature and reproduce. Protein baits attract and poison feeding male and female fruit flies and is the most important tactic in melon fly control.

Spraying Protein Bait for Melon Fly

Apply protein bait in roosting host borders or in nearby fruit trees.

Roosting hosts include cassava, castor bean, Christmas berry, corn, hibiscus, panax, sudex, ti and wiliwili.

Spray the underside of leaves

Suppression Tactic #3

Trapping

Fruit fly traps using male lures reduce the number of flies in your farm area.

Keys to successful trapping: 1) Correct lure, 2) Good trap placement, 3) Timely trap maintenance

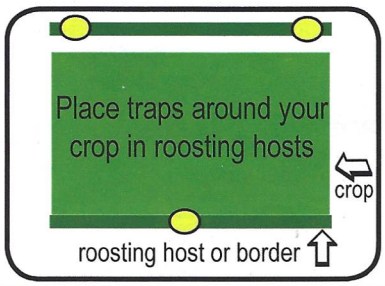
of Melon Fly Traps

2-3 traps/acre
1-3 traps per backyard

Male Lure

Cue Lure
in basket

Trap Placement



Hang traps at eye level in semi-shade

Trap Service

Replace lures every 6 months

Suppression Tactic

#1 Field Sanitation----------

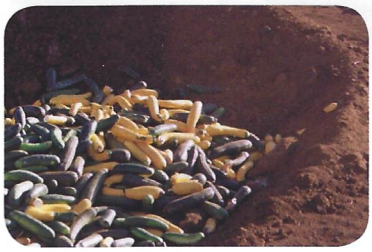
Sanitation is the disposing of infested fruit so fruit fly eggs and larvae do not survive. It is one of the easiest suppression methods, and a very important one for two reasons: First of all, one infested fruit may hold hundreds of larvae and/or eggs, so by getting rid of that one fruit, you are eliminating future fruit fly swarms. Secondly, pesticides applied to fruit do not kill larvae and eggs inside fruit. Sanitation destroys infested fruit to KILL FRUIT FLIES.

Sanitation Techniques

Use any one of these methods to control fruit fly

Compost

Must be covered in plastic and maintain an internal heat of at least 140°F.



Burying

Buried culls must be at least 18 inches deep.

Bagging

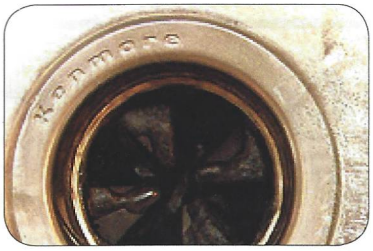
Bag infested fruit tightly in thick plastic bags. May be used as compost after one month.

Drowning

Submerge fruit for at least 48 hours. Once out of the water, be careful of re-infestation.

Animal Feed

Feed the infested fruit to your animals! Be sure that uneaten fruit does not stay on the ground for over a day.



Grinding

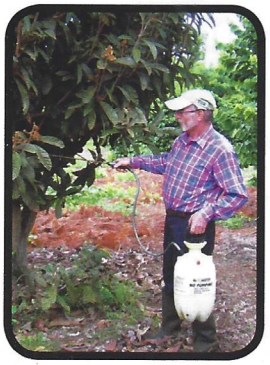
Use a thorough mechanical processor to grind up infested fruit. A garbage disposal will do.

Augmentorium

A tent-like structure designed to retain fruit flies while allowing beneficial insects to re-enter the farm.

Suppression Tactic

#2 Protein Bait----------



Fruit flies need sugars and protein to survive and mature. Protein baits attract and poison feeding fruit flies and are intended to control female flies.

Currently there are two protein bait sprays commercially available in Hawaii: **Nulure®**, which is used in tank mixes with registered pesticides, and **GF-120 Fruit Fly Bait Concentrate®**, a combination of protein bait and spinosad insecticide for ease of use and is very safe to humans. Neither of the protein baits are labeled as restricted-use chemicals. GF-120 NF is listed for use in organic production.

Preparation

GF-120 is designed for low volume and low toxicity application. Read label instructions before preparing and applying bait. Wear personal protective clothing and use protective equipment in accordance with the instructions on the protein bait label.
The recommended dilution ratio ranges:

1 part GF-120 to 4 to 10 parts water

The GF-120 solutions are used as sprays. They should not be stored for future applications as the mixture quickly breaks down. Spray bottles should be washed thoroughly after each use to prevent clogging.

When to Spray

Protein bait works best when applied to the underside of leaves every 7 days.

Re-apply after rain.

Seasonal growers should start applying protein bait soon after crops flower and continue weekly sprays until 6-8 weeks after the last harvest.

Year-round gardeners should apply protein bait at 7-day intervals throughout the year.

Application

Apply approximately 1/4-1 ounce of spray to each tree in several "spray spots" or every 10 feet in border crops or roosting hosts. Adjust the amount of spray according to severity of infestation and amount of foliage requiring spray coverage.

A thick GF-120 mixture at 1 part GF-120 to 4 parts water may be applied to cotton wicks or sponges inside lightweight buckets. These protein bait "umbrellas" are useful in very humid, rainy areas and are hung where the bait would normally be sprayed. These umbrellas require cleaning and bait re-application should the bait become moldy or dirty.

Suppression Tactic

#3 Trapping----------

These traps do not require a killing agent. Flies find their way into the trap up through the mouth of the bottle and have difficulty finding a way out. Easy to maintain, these fruit fly traps are an effective way to reduce fruit fly populations in your farm area.

How to Make Your Own Trap

Traps can be made from plastic water or soda bottles. Use the following instruction as guidelines to make your own fruit fly trap:

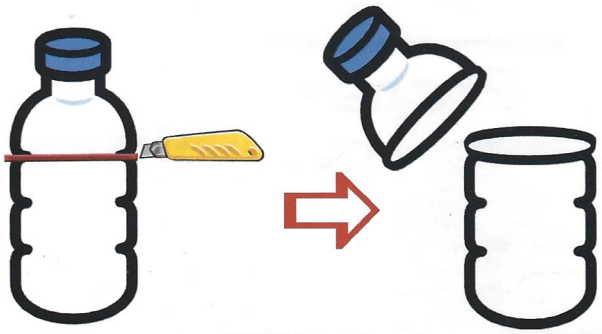
1) Cut bottle in half crosswise, about 1/4 inch below the end of the upper curve so that cut ends are the same diameter. The bottle cap is not needed.

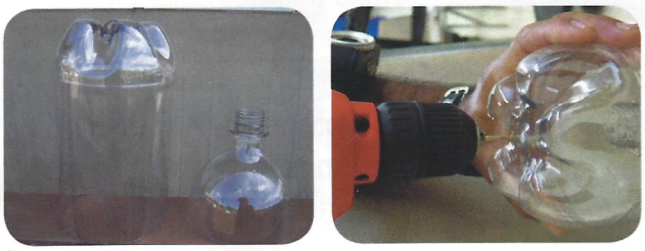
2) Handle lures only in a manner consistent with label instructions. Use latex or nitrile gloves or a small plastic bag to protect your hands from touching the lure. Protect the lure by enclosing it in a plastic basket or covering it with a mesh-like cloth (old stockings work well). Attach the fruit fly lure plug at one end of 12 inches sturdy but flexible 16-gauge galvanized utility wire.

3) Drill a 1/8-1/16" hole through the center of the bottom piece. Insert the wire through the hole so that the lure hangs on the inside of the cut bottle. The wire sticking out of the bottle will be used for hanging the trap.

4) With the bottom held upside down, insert the top of the bottle into it, making sure that the bottle mouth faces upward. Be sure that the lure does not obstruct the bottle opening.

5) Hang trap in a semi-shady area (out of reach of children and animals), according to the fruit fly species you aim to catch. Remove dead flies from trap as needed.





Preparing the plastic bottle

Trap with plastic basket | Trap with mesh-wrapped lure

Oriental Fruit Fly
Lure - Methyl Eugenol

Melon Fly
Lure - Cue Lure