



### Area-Wide Integrated Pest Management Framework Components:

- Population Monitoring
- Field Sanitation
- Protein Bait
- Male Annihilation
- Biological Controls

### What is Biological Control?

Biological control is the action of parasitoids, predators, or pathogens in controlling pest populations. A parasitoid is an organism that is parasitic in the immature stage, killing its host, and free-living as an adult. Fruit fly parasitoids are insects that develop by laying their eggs in fruit fly eggs or larvae. The host is killed when the parasitoid's larval development is completed. Parasitoid wasps were introduced to Hawaii for fruit fly control. They are fairly specific to certain fruit fly species or genera.

For more information, contact:  
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### HAW-FLYPM

Hawaii Area-Wide Fruit Fly Integrated  
Pest Management

The HAW-FLYPM program integrates cultural, chemical, and biological control measures to suppress and maintain pest populations below economic injury levels.

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## Fruit Fly Biological Control



### HAW-FLYPM

Hawaii Area-Wide Fruit Fly Integrated  
Pest Management

*Improving Hawaii's Agriculture Through  
Research, Education, and Innovation*

A USDA/Agricultural Research Service-funded partnership with the University of Hawaii College of Tropical Agriculture and Human Resources Cooperative Extension Service and the Hawaii Department of Agriculture

### Are there any parasitoids in Hawaii?

The important fruit fly parasitoids currently established in Hawaii are *Fopius arisanus*, *F. vandenboschi*, *Diachasmimorpha longicaudata*, and *D. tryoni* (hosts are Oriental and Mediterranean fruit fly) and *Psytalia fletcheri* (host is melon fly). Other less effective parasitoids also are present. Exploration for effective new parasitoid species is ongoing at UH and the Hawaii Department of Agriculture. Classical biological control is the release of a new natural enemy (parasitoid) into an area to control a pest. Augmentative control takes advantage of established natural enemies to augment their existing numbers to higher levels.



### What is the sterile-insect technique?

The sterile-insect technique, also referred to as the sterile male technique, has been successfully used to eradicate fruit flies in many parts of the world. Male fruit flies are reared, sterilized, and then released into the wild, where their matings with fertile females result in infertile eggs being laid. Fruit flies are sterilized using radiation. The method aims to flood the field population with sterile males. The result of the sexual encounters of sterile with wild fruit flies is that no progeny are produced.

### How do sterile insects and parasitoids suppress fruit flies?

Sterile insects are employed to compete with wild male flies to reduce the number of fertile mating events and cause female flies to lay infertile eggs. To ensure success, sterile male flies must be present in much greater numbers than the fertile wild male flies in order to reduce production of progeny. The method is only effective after the fly population has been greatly reduced by other means, because it only takes one fertile male fly to inseminate many female flies.



Parasitoids help reduce the overall population of flies by ensuring that some of the fly progeny are killed when the parasitoid eggs develop inside them and more parasitic wasps emerge. When these wasps were introduced to Hawaii, scientists documented that the Mediterranean fruit fly population was reduced to less than half of what existed before the releases.

Both of these biological control practices are advantageous. The sterile insects and parasitoids both are naturally programmed to search out the target pest. Parasitoids and sterile insects can disperse into areas where other techniques cannot be applied.

### Can sterile insects and parasitoids sting my fruits and vegetables too?

Sterile flies have been used in many countries. In the past, both male and female flies were released. Sterile female flies' eggs did not develop; however, some cosmetic damage to the fruit did result. To counter this problem, USDA has developed a genetic strain that allows separation of males from females in several fruit fly species. Flies that will be released in Hawaii will be only *male* sterile flies.



Parasitoids do not eat or sting fruit. They lay their eggs in fruit fly larvae that are developing in previously stung fruit. Therefore,

parasitoids have no damaging effect on fruit that has not already been infested with fruit fly eggs or larvae.