The Mediterranean Fruit Fly

Ceratitis capitata (Wiedemann)

The Mediterranean fruit fly 'Medfly' is considered one of the world's most destructive pests. It is a rapid colonizer and unlike most species of fruit flies, it can tolerate cooler climates. These traits along with its' broad host range make the Medfly the most economically important fruit fly species.

Actual size

Photo courtesy of USDA-ARS

Distribution

The Medfly originated in sub-Saharan Africa. Since the 1880's, it has since spread throughout the Mediterranean region, southern Europe, the Middle East, Western Australia, South and Central America, and Hawaii. In general, it is found in most tropical and subtropical areas of the world. It has spread more broadly than any other fruit fly species.

The Medfly became established in Hawaii in 1910. Hawaii remains infested with this pest, and no eradication program is currently under way. On the U.S. mainland infestation occurred in Florida from April 1929 to July 1930, April 1956 to November 1957, June 1962 to February 1963, June to August 1963, 3-14 August 1981, and April to August 1998, with one or two flies found in various counties during 1967, 1983 to 1988, 1990 to 1991 and in May to October, 1997. Infestations occurred in Texas from June to July 1996; and in California in 1975, and chronically after 1980 in the Los Angeles basin. However, State and Federal eradication programs in California, Florida, and Texas have prevented it from becoming established.

On September 16, 2004, five adult Medfly were detected in a residential neighborhood within the southern limits of the city of Tijuana, Mexico, by program personnel with the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) during routine servicing of pest detection traps. Since the initial detection, APHIS personnel have trapped an additional 82 adults and have discovered 796 larvae, all within 1-square mile of the initial detection. To date, Medfly has not been detected in Arizona.

Hosts

The Medfly attacks more than 260 different fruits, flowers, vegetables, and nuts. Thin-skinned, ripe succulent fruits are preferred. It can be especially damaging to citrus, stone fruits, pome fruits, peppers, tomatoes, and figs. Although several species of cucurbits including watermelon and musk melons have been recorded as hosts of the Medfly, they are considered to be poor hosts. However, host preferences vary in different regions and what may be considered a good or poor host in one region may be differ in another.

Life Cycle

Under optimum conditions, Medfly can complete its life cycle, which consists of four stages (adult, egg, larvae, and pupae), within 21 days. At temperature below 50ºF, development ceases, and under cool conditions the Medfly may require as long as 100 days to complete its life cycle.

Photo courtesy of USDA-APHIS

Adult Medfly are smaller than a housefly, about 6 mm in length. They are known to disperse up to distances of 12 miles. However, they do not usually disperse beyond 300-700 ft when host fruit is present. The female lays eggs in groups, 10-14 eggs usually, depositing them under the surface of the fruit. Females generally lay about 300 eggs during her life time. Oviposition essentially ceases at temperatures below 60ºF.

The eggs are laid just under the skin of the susceptible fruits, hatch within a few days and the emerging maggots or larvae feed on the fruit pulp. Hard or semi-ripe fruit are generally preferred for ovipositon over soft, ripe fruit. Fully grown, a Medfly maggot will measure about one centimeter in length, and will require 7-24 days to reach its third and final instar. When mature, they make their way to the surface of the fruit, drop to the ground, and tunnel into the soil and pupate.

The adult fly is formed within the pupa and emerges within 8-46 days forcing its way to the surface of the soil. The newly emerged adults require about 2-3 days to mature before starting to lay eggs.

Damage

The damage to crops caused by Medfly result from 1) oviposition in fruit and soft tissues of vegetative plant parts, 2) feeding by the larvae, and 3) decomposition of plant tissue by invading secondary microorganisms.

Photo courtesy of Florida Division of Plant Industry

Larval feeding damage in fruits is the most damaging. Mature attacked fruits may develop a water soaked appearance. Young fruits become distorted and usually drop. The larval tunnels provide entry points for bacteria and fungi that cause the fruit to rot. These maggots also attack young seedlings, succulent tap roots, and stems and buds of host plants.

In addition to physical damage, Medfly inflicts economic damage due to costs associated with quarantine and monitoring programs, limits on export from fly infested areas, and quarantine treatments of fruit from infested areas.

Control

Preventive Regulatory Action

The most effective mechanism for controlling Medfly it to prevent its introduction through regulatory laws and actions. Many of the insects, weeds, and plant diseases that attack U.S. crops are foreign invaders. APHIS and State departments of agriculture administer agricultural quarantine laws to help keep foreign plant pests and diseases out and to control domestic pests and diseases of limited distribution.

Travelers returning to the continental United States from Hawaii or a foreign country are prohibited from bringing into the country fresh fruits, meats, plants, birds, and plant and animal products that may harbor pests or diseases.

Eradication/Exclusion

The eradication of the Medfly is accomplished by action in three areas: survey, regulation, and control.

1. Survey - The USDA-APHIS, along with State departments of agriculture, maintains trapping programs in high-risk areas of States susceptible to Medfly establishment. Early detection of Medfly is critical for a successful a eradication/exclusion program. When Medfly is found near an uninfested area, survey efforts will be increased to insure early detection. When one or more Medflies is collected in an previous uninfested area, APHIS and State officials immediately implement a delimiting survey. Using the detection site as the focal point, field crews position additional traps to determine if an infestation exists and to locate and define the limits of the infested area.

Photo courtesy of USDA-APHIS

2. Regulation - If an infestation exists, Federal and State quarantine regulations are imposed to help prevent artificial spread of the pest. Federal quarantine laws regulate the interstate movement of any article that may harbor the fly. State regulations control the movement of these articles going to uninfested areas of the same State. Articles regulated by State and Federal authorities include all Medfly-host fruits and vegetables present in the area. Open-air fruit and vegetable stands must provide protective covers for the produce to prevent infestation, and commercial and home-grown produce may not be moved without special inspection and treatment.

3. Control - Three kinds of treatment are used alone or in combination to eradicate the Medfly.

a. Aerial and Ground Bait Spray Application - This spray is approved for use by the Environmental Protection Agency. The spray contains minimal amounts of an insecticide and a protein/sugar bait that attracts the flies.
b. Sterile Insect Technique (SIT) - In the SIT, Medflies are reared in large quantities, sterilized with a small amount of irradiation, and released into areas where they mate with wild Medflies. Such matings do not produce offspring. Eventually the wild population is eliminated through attrition. SIT is most effective against low-level Medfly populations where a high proportion of sterile to wild flies can be achieved to ensure success. Initial applications of insecticide bait spray are sometimes necessary to bring local populations down to low densities.
c. Insecticide Application to Soil Under Host Trees - These products will kill some larvae as they enter the soil to pupate and most of the adults as they later emerge. Currently, application of insecticide to the soil is used only when larvae are detected. The preferred and most popular eradication strategy is an integrated approach combining all three treatments, with emphasis on the use of SIT.

References

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