



FRUIT FLIES IN FIJI ISLANDS



Fig. 1: Adult female Fijian fruit fly
(*Bactrocera passiflorae*)

Fig. 2: Adult female Pacific fruit fly
(*Bactrocera xanthodes*)

Fig. 3: Adult female *Bactrocera kirki*

Fruit flies that cause damage to fruits and vegetables in Fiji Islands belong to the Order Diptera, family Tephritidae and subfamily Dacinae. These flies need to be distinguished from the small flies, *Drosophila* or 'vinegar flies' that infest fallen, rotten or damaged fruit. There are about 4500 fruit fly species in the world and 50 of these are known to be major pests. Of the 50 major pest species, 22 occur in the Pacific Island countries and territories.

Fruit flies are economically important because they cause damage to fruits and hinder international and domestic trade of fruits and fleshy vegetables. The activities of fruit flies are centred on the host plant, which provides sites for adult feeding, mating, egg laying, larval development and pupae development in the soil underneath the plant.

The adult female lays its eggs in clutches under the skin of the fruit using a needle like structure at the end of the abdomen, called the ovipositor. During egg laying, bacteria are also introduced into the fruit. The bacteria cause the fruit to break down, with breakdown products providing food for the larvae or maggots that hatch from the eggs.



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Larvae hatch from eggs in about 2 days and remain in the fruit to develop fully. Fruit damage caused by fruit flies becomes obvious 3 days after eggs are laid in the fruit. The fruit begins to breakdown and this is noticeable by brown or black spots that form on the fruit surface. After 5 to 7 days, the symptoms of fruit fly damage are very obvious because the fruit begins to rot. Eventually, the rotten fruit falls to the ground, the larvae exit the fruit and pupate in the soil. Adult flies emerge from the soil about 18 to 20 days after the eggs were laid. After fruit flies emerge, they feed on bacteria, which are found on the leaf and fruit surface.

In Fiji Islands (excluding Rotuma), there are five fruit fly species, *Bactrocera passiflorae* (Fijian fruit fly), *B. xanthodes* (Pacific fruit fly), *B. distincta*, *B. gnetum* and light form of *B. passiflorae*. Two of these are economic species (*B. passiflorae* and *B. xanthodes*). There are four species on Rotuma, these being *B. kirki*, *B. obscura*, *B. distincta* and *B. xanthodes*.

Economically Important Species

***Bactrocera passiflorae* (Froggatt)**

Fijian fruit fly (Figure 1) is native to Fiji Islands. It is present in Fiji Islands (excluding Rotuma), Wallis and Futuna, Niue and the Niua islands of Tonga. This fruit fly species has been reared from 49 plant species. Some of these major hosts are guava, *Terminalia catappa* (tropical almond), rose apple, kumquat, orange, mandarin, pomelo, mango, Malay apple (*Syzygium malaccense*) (kavika), Pacific lychee (*Pometia pinnata*) (dawa), *Amaroria soulameiodes*, *Ochrosia oppositifolia*, *Cerbera manghas* and Tahitian chestnut (*Inocarpus fagifer*) (ivi). Male flies are attracted to Cue-lure.

The body of the fly is divided into three parts - head, thorax in the middle and abdomen at the rear. The Fijian fruit fly is slightly smaller than a house fly and almost completely black. There are yellow markings on each side of the thorax near the wings and on the triangular section at the rear of the thorax. The wings are basically clear except for a dark margin at the front of the wing and one at the rear of the wing. The abdomen is divided into segments and is black.

***Bactrocera xanthodes* (Broun)**

Pacific fruit fly (Figure 2) occurs in Fiji, Rotuma, Tonga, Samoa, Cook Islands, Niue, French Polynesia (Raivavae Island only), Nauru, Wallis and Futuna, and American Samoa. This economic species has been reared from eight host fruit species, of which breadfruit (*Artocarpus altilis*), jakfruit (*A. heterophyllus*) and papaya are major hosts. Male flies are attracted to methyl eugenol.

This species is about the size of a housefly, but has a slender, almost translucent appearance. It is light brown-orange in colour with three yellow stripes on the upper surface of the thorax. Its abdomen is basically orange-brown and two darker spots towards the rear of the abdomen on the dorsal side. The legs are orange-brown and the wings are clear but have yellow-orange markings on the front margin and at the rear of the wings.

***Bactrocera kirki* (Froggatt)**

Bactrocera kirki (Figure 3) is present in Rotuma, American Samoa, Samoa, Niue, Tonga, French Polynesia and Futuna. This species is a medium-sized fly and is attracted to Cue-lure. *B. kirki* is primarily black with yellow markings on each side of the thorax, particularly in the area closest to the head and the wing. The abdomen is glossy black with orange-brown longitudinal bands in the middle of the abdomen.

This species, which is reared from guava, mango, avocado, orange, Pacific lychee (*Pometia pinnata*) (dawa) and tropical almond (*Terminalia catappa*) (tavola), is present on Rotuma, but not present on Viti Levu, Vanua Levu and other parts of Fiji Islands. It poses a major quarantine threat to the fresh fruit and vegetable industry on the major islands of Fiji Islands if quarantine treatments are not carried out on fruits.

Non-pest fruit fly species

Bactrocera distincta (Malloch) is a medium-large fly and is partially black. The wings have distinct dark patterns. This fly is reared from only one host fruit species in Fiji Islands, *Manilkara zapota* (sapodilla), and it is found in fruit fly traps baited with Cue-lure throughout the year. It occurs in Fiji Islands, including Rotuma, and also in Futuna, Tonga, Samoa and American Samoa.

Bactrocera gnetum Drew and Hancock is a new species and occurs only in Fiji Islands. It was reared from a host plant species, *Gnetum gnemon* (Gnetaceae) on Vanua Levu. This fruit fly species belongs to a new subgenus and possesses a bubble (called a bulla) on the wing of the male fly. This species is a small species, black in colour and is not attracted to synthetic male lures.

The light form of *B. passiflorae*, as its name suggests, is a lighter coloured strain of the Fijian fruit fly and occurs in the northern interior of Viti Levu and Lau group in Fiji Islands and Tuvalu and Tokelau. This species was reared from *Ochrosia oppositifolia* and males are attracted to Cue-lure. This strain is conspicuous because of the pale coloration of segments on the abdomen.

Bactrocera obscura (Malloch), is present in Rotuma and also occurs in American Samoa, Niue, Samoa, Tonga and Wallis and Futuna. It is a medium-sized species with yellow patches on the area of the shoulder and rear end of the thorax. The abdomen, which is orange-brown, has a dark band in the middle of the abdomen and dark markings on two segments. The wings are clear except for broad dark areas on the foremargin and at the rear of the wing. Males are attracted to Cue-lure.

Trapping and fruit surveys: quarantine surveillance

Fruit fly trapping and host fruit surveys are techniques used to confirm the presence of existing fruit fly species and detect new introductions of exotic species. Modified Steiner traps, baited with chemical lures that attract male fruit flies and an insecticide, are used to trap the flies. Cue-lure and methyl eugenol are two commonly used attractants. A third lure, trimedlure, is used to trap Mediterranean fruit fly (*Ceratitis capitata*), which is not present in Fiji Islands. These traps are placed in backyards and institutions in towns and cities, dumps, farms, villages, hotels and resorts, research stations and in ports of entry, such as Suva, Nadi and Lautoka. Traps are placed on host or potential host fruit trees, at a height of about 2 metres in a shady position. They are suspended from wires that are coated with non-drying adhesive, such as Tanglefoot. Care is taken to ensure that leaves or branches do not touch the trap and also that contamination between lures does not take place. Traps that are located in ports of entry in Suva, Nadi, and Lautoka and on farms that are producing fruit for export in the Sigatoka Valley are cleared every two weeks. Traps located in other areas in Fiji Islands and Rotuma are cleared every month. The traps are re-charged every three months and are replaced when they are damaged.

Host fruit surveys are carried out to confirm the presence of fruit flies that are not attracted to the male lures and to monitor the levels of damage, parasitism, seasonal abundance and geographical distribution. Data generated are used for pest risk assessments for trade negotiations on fresh fruit and vegetables.

A network of 132 trap sites covering 15 islands and regular host fruit surveys provide Fiji Islands with quarantine surveillance or an early warning system to detect new incursions of exotic fruit fly species. Without this network, international trade in fresh fruit and fleshy vegetables with countries such as Australia, New Zealand or USA, will not be opened or sustained.

Further Reading

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