

Bionomics and Bio-friendly Management of Oriental Fruit fly *Bactrocera dorsalis* (Hendel) on Guava Fruit Crop (*Psidiumguajava* L.)

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Abstract:

Oriental fruit fly *Bactrocera dorsalis* (Hendel) formerly known as *Dacus dorsalis* also called as Papaya fruit fly is a major and key pest of Guava fruit, causing adverse effects in various growth stages from initiation of buds to flowering, from fruit prematurity stage to ripening stage. It is reported to cause 95-100 per cent damage to Guava fruits during rainy season. In winter season adult fruit flies are found in inactive state, outbreak of this insect occurs from month of July- August. Most of the insecticidal treatments are ineffective to control fruit fly since eggs and maggots remain protected inside the host tissues and only adults are exposed. Moreover, the use of chemical insecticides causes residue problems. Thus Bio-friendly management are required to focus among different Integrated Pest Management strategies. The Bio-friendly measures in the management of guava fruit crop can have a great scope for getting higher yield of the crop with lower pest incidence. So, there is an immense need for exploration training and demonstration programmes for motivating the farmers of the country to adopt Bio –friendly measures in pest management.

Keywords: Oriental fruit fly, Bio –friendly, Bionomics, *Bactrocera dorsalis*, Papaya fruit fly.

Introduction:

Guava (*Psidiumguajava* L.) is an important commercial fruit crop. It is native to tropical America. Guava is successfully grown under both tropical and subtropical climatic conditions. It is commonly called a poor man's apple in the tropics and well known for its delicious, pleasant aroma and outstanding nutritional values throughout the world. It is a

good source of vitamin C, pectin and minerals like calcium and phosphorus. The roots, bark, leaves and immature fruits, because of their astringency, it is having medicinal value to control gastroenteritis, diarrhoea and dysentery and scurvy diseases throughout the tropics. Globally, India is the second largest producer of fruits with 102.48 million metric tonnes production during 2021-22 after China. The area under Guava cultivation in India is 308 thousand hectare with estimated annual production of 4582 thousand metric tonnes. Different biotic and abiotic factors are responsible for low yields of guava. Out of biotic ones, the insect-pests have been reported to attack guava at different stages especially during rainy season crop. Around 80 species of insect pests causing damage in guava by heavy infestation, out of which fruit fly is the major insect pest causing heavy loss in the guava fruit yield. In India, 392 species of fruit flies have been recorded among which *Bactrocera dorsalis* (Hendel) are highly destructive pests of guava causing up to 95-100per cent fruit damage, In general, fruit flies are very difficult to manage due to the fact that they are multivoltine, polyphagous, adults have high fecundity and mobility and alsodue to its habitat and feeding behaviour all the developmental stages are not exposed. For management of pest, the basic pre- requisite is to have a good knowledge on biology, important characteristics and feeding behaviour of the pest which has been discussed below:

Oriental fruit fly:

Scientific name: *Bactrocera dorsalis* (Hendel)

Taxonomic position:

- ❖ **Kingdom:** Animalia
- ❖ **Phylum:** Arthropoda
- ❖ **Class:** Insecta
- ❖ **Order:** Diptera
- ❖ **Family:** Tephritidae
- ❖ **Genus:** *Bactrocera*
- ❖ **Species:** *dorsalis*



Fig. 1. Oriental fruit fly (*Bactrocera dorsalis*)

Host plants:

The oriental fruit fly is a Polyphagous pest attacks over 300 cultivated and wild fruits including Guava, Mango, Banana, Papaya, Citrus, Annona, Avocado, Coffee, Peppers,

Persimmon, Tomato and Passion fruit. This pest is usually seen in breeding in all fleshy fruits.

Distribution:

India, Japan, Taiwan, Indonesia, Pakistan, Micronesia, Mariana Islands and Hawaii also distributed every cultivated part of guava crop.



Fig. 2. Damaging Symptoms of Oriental fruit fly on Guava fruits

Marks of identification:

The female lay eggs in groups ranging from 3-30 in numbers which appears like white, elongate and elliptical in shape. Larvae or maggot is in creamy white colour. Pupation occurs in puparium which is tan to dark brown in colour and colour of the fly is variable, but there are mostly yellow and dark brown to black markings on the thorax is present.

Nature of damage:

The female of oriented fruit fly puncture the soft and tender fruits by its ovipositor and lay eggs lower portion of the fruit epidermis. The larvae/maggots feed inside the pulp. The punctured part suffer from tissue break down may also serve as a site of secondary infection by pathogens causing rotting, appear as water soaked condition and cause heavy fruit drop.

Life cycle (Bionomics):

Females lay eggs in groups of three to 3- 30 under the skin of host fruits; the female can lay more than 1,000 eggs in her lifetime. Egg hatches within 2-3 days and larvae/ maggot duration lasts about 7-12 days later it pupates in soil after 10 to 14 days, adult emerge from puparium. The newly emerged adult female needs 8 to 12 days to mature sexually prior to egg laying. Total life cycle completes in 1-3 months.

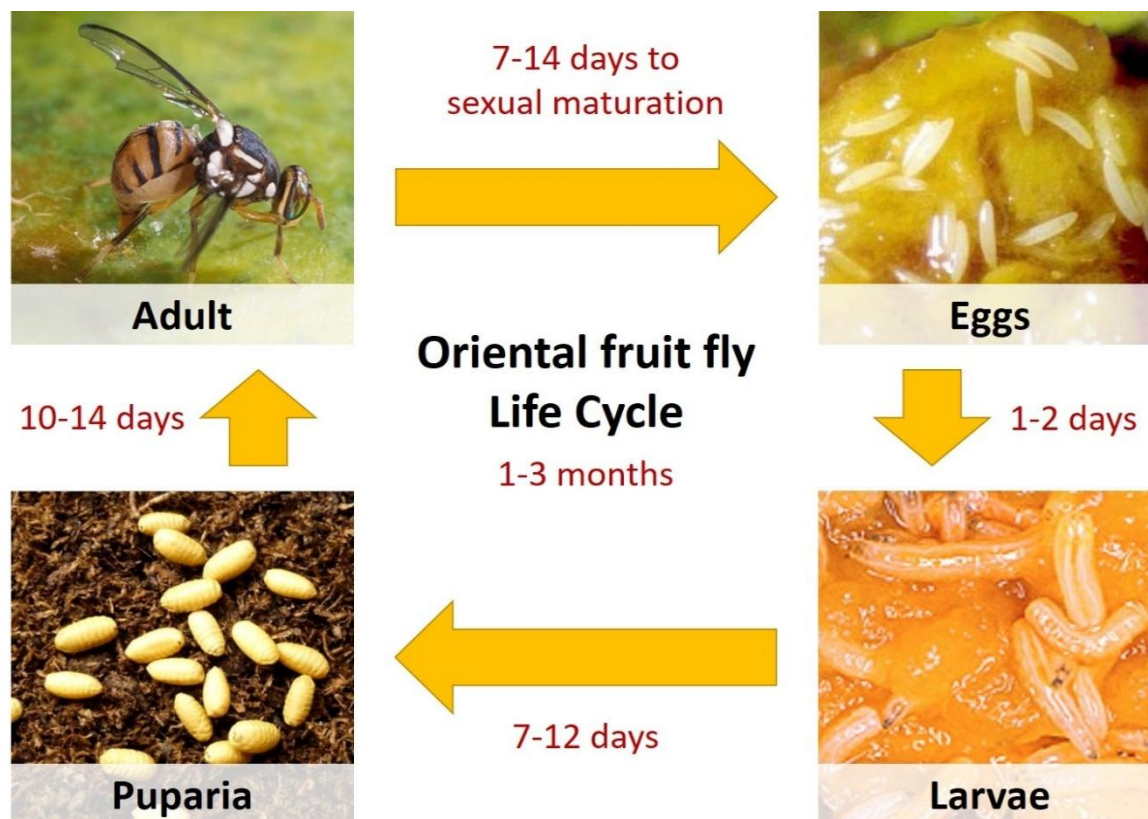


Fig. 3. Life Cycle of Oriental fruit fly

Bio- friendly management Practices:

- ❖ Collect and destroy fallen and infested fruits every alternate days
- ❖ Summer ploughing to expose pupa
- ❖ Wrapping/bagging/netting the guava fruits with newspaper, polythene or paper bags before it reaches to maturity may escape infestation.
- ❖ Grow resistant varieties of guava such as Lucknow 49, A.C. 10, etc.
- ❖ Use methyl eugenol lure (pheromone) trap 16/ha to monitor and yellow sticky and UV light traps also effectively used to kill Oriental fruit flies.
- ❖ Methyl eugenol traps + three sprays of NSKE 5% proved most effective against guava fruit fly.
- ❖ Spray of NSKE 5% also act as oviposition deterrent for oriented fruit fly on guava fruit crop.

- ❖ Food lure or Protein bait can also be applied as mass trapping tool, in combination with methyl eugenol. Because protein bait attracts females and males while methyl eugenol attracts males only,
- ❖ Physical methods of fruit fly management by the post-harvest quarantine treatments *i.e.*, Irradiation with gamma rays from a Cobalt-60 or Caesium-137 source to kill the developing fruit flies.
- ❖ Behavioural methods of fruit fly management includes Male Annihilation Technique (MAT) by using attractant Methyl eugenol and Cuelure for *Bactrocera* species.
- ❖ Spraying the soil under trees with *Metharhizium anisopliae* or other entomopathogenic fungi may be helpful in reducing fruit fly larvae in the soil.
- ❖ Bait spray combining molasses or jaggery 10g/l and one compatible insecticide show positive response in the management of oriental fruit fly.
- ❖ Field release of parasitoids such as *Opiuscompensates*, *Spalangiaphilippinensis* and *Diachasmimorphakraussi*.



Fig. 4. Bagging of Guava fruits



Fig. 5. Trapping of Fruit flies through: Pheromone, Yellow sticky and UV light

Conclusions:

Guava is an important fruit crop grown over 308 thousand hectare with estimated annual production of 4582 thousand metric tonnes in India. Its cultivation is done on a large scale in almost all the states of the nation. *Bactrocera dorsalis* is a major and regular pest of Guava which causes 95-100 % damage to fruits. For the management of the *Bactrocera dorsalis* (Oriental fruit fly) an Integrated Pest Management (IPM) strategy excluding synthetic chemical management is effectively used. This management strategy considered as bio-friendly measures, which act as anti-resistant mechanism in pests.

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