STUDIES ON BIOLOGY OF GUAVA FRUIT FLY, BACTROCERA DORSALIS (DIPTERA : TEPHRITIDAE)

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ABSTRACT :

Extensive surveys were carried to find out status& life cycle of insect herbivores associated with Guava (*Psidium Guajava L*) plantations from Pandharpur Tehsil. In all, 20 Guavaplantations were observed from Pandharpur Tehsil. The observations were carried from June 2022 to December 2023. Most observations were conducted during fruiting period i.e. rainy season. The Oriental Fruit Fly, scientifically known as *Bactrocera dorsalis* is a pest that affects a wide variety of fruits, in different parts of the world. It is crucial to understand its life cycle to develop strategies for controlling its population. This review aims to provide an overview of the stages in the development of *B. dorsalis.* The life cycle of B. Dorsalis can be divided into four stages; egg, larva, pupa and adult. The female *B. dorsalis* lays her eggs inside the tissues of fruits making it challenging to detect and manage their presence. Once the eggs hatch the larvae start feeding on the fruit causing damage and resulting in losses. The larval stage consists of growth phases or instars that vary depending on conditions and food availability until they enter the pupal stage. Pupation occurs in soil where the larva undergoes transformation into an adult fly.

Keywords: Insect Herbivores, Pests, Guava, Oriental Fruit Fly, life cycle, developmental stages, Pandharpur

Introduction

Guava, Psidium guajava L., is considered a native to Mexico and grows in all the tropical and subtropical areas of the world (Stone 1970). Guava is grown commercially in India, China, Indonesia, South Africa, Florida, Hawaii, Egypt, Yemen, Brazil, Mexico, Colombia, West Indies, Cuba, Venezuela, New Zealand, the Philippines, Vietnam and Thailand (Wilson 1980; Yadava 1996; Le et al. 1998; Tate 2000), and it is popular due to its all-season availability, rich nutritional and medicinal value, affordable price, suitability for transportation, handling and consumer preference (Nimisha et al. 2013). Guava-growing areas in tropical and subtropical regions are expanding due to the high demand for fresh fruits and processed products in global trade. Guava production and productivity are greatly hindered by insect

pests, one of the major biotic factors. Due to the wide area monoculturing and intensive cultivation practices on guava, there is a significant reason for the serious pest problems.Many insect pests have been observed on guava at different stages of growth, but a few pose a serious threat to the crop's production.Fruit flies are economically important; their favourable hosts are mango, guava, peach as well as other fruits (Gafoor et al., 2010). The annual loss of fruits and vegetables by fruit flies are about 144.4 million US dollars (Stone house et al., 2002. The major pest species belong to the genus Bactrocera are B. cucurbitae, B. dorsalis and B. zonata, while other species, such as B. correcta, B. diversa and B. latifrons, are still localized in their distribution (Kapoor, 2005). The oriental fruit fly, Bactroceradorsalis (Hendel) was first reported in Taiwan Island. It is the most destructive pest of horticultural crops around the world (Wei et al., 2017) and is a serious pest on a wide range of fruit and vegetables in the Indian subcontinent (Kamala Jayanthi et al., 2011). David and Ramani (2011) reported 325 species, of which 243 families and 79 genera are from India alone. The stage of ripening in the fruit provides the required choice for female flies to find the site at the time of oviposition (Ratna et al., 2016)

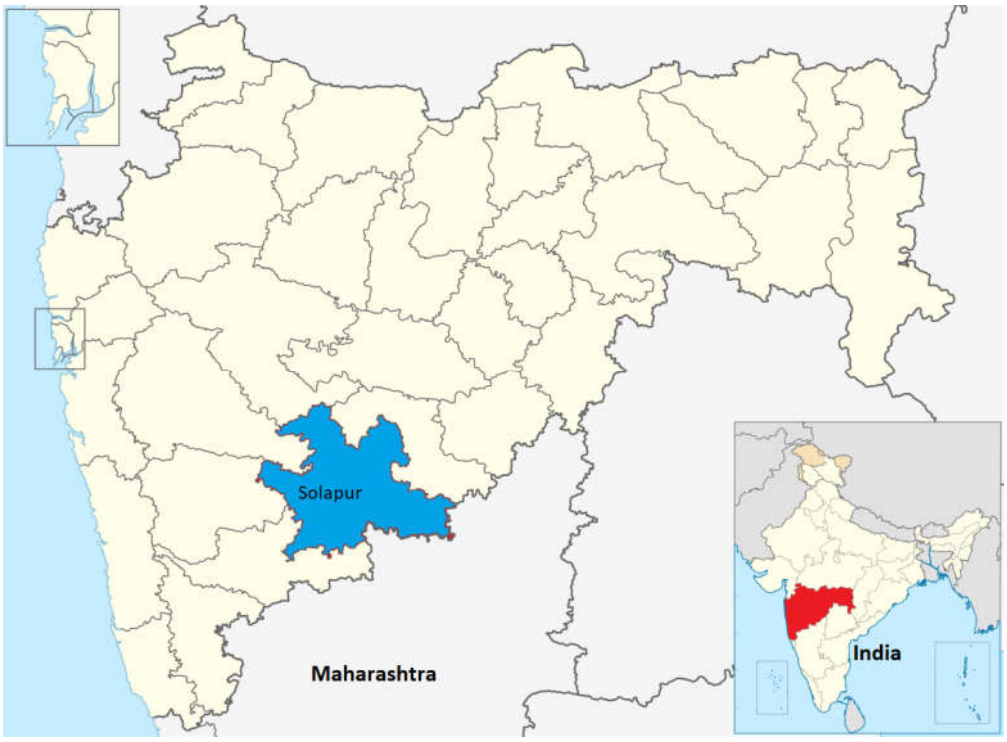
For example, about 32% of B. dorsalis females preferred ripe guavas (Ratna et al., 2016) while Mohd Nur et al. (2011) showed that the ripened fruit is more suitable for larval development of B. dorsalis which allows easier penetration of ovipositor (Yashoda et al., 2007). However, a small number of B. dorsalis can also oviposit eggs into unripe fruits (Rattanapun et al., 2009).

Material & methodology

During the fruit season, which runs from June to December, the infected fruits were picked from fields in different locations and specific plots in the Solapur region.Infested fruits were kept in the rearing cages(20 cm height with 14 cm diameter) provided 4-5cm thick layer of sterilizes sand for pupa. Larval phases are divided into three (instars). In order to pupate, the third instar larvae were housed separately in a plastic container (Box) filled with 4-5cm thick layer of sterilizes sand. The container was checked daily &recorded any sign of pupation. The pupation stage, dark brown pupae were gathered and kept in big screened cages, so they may eventually mature into adults.The room temperature (30^0-35^0c)were placed in the cage for the adult survival. Moisture level inside rearing cages are maintained by adding water periodically.

Study area:

Solapur District is located on the south east edge of the state Maharshtra and lies entirely in the Bhima and Seena basins. The whole district is drained by the Bhima River which is originated at Bhimashankar of Palghar district. Solapur is located at 17.68°N 75.92°E. It has an average elevation of 458 metres and bordered by Ahmednagar district on the north; Osmanabad district on the north and northeast.



RESULT

Biology:

Oviposition During the fruiting season, female flies insert eggs in small cluster inside the mesocarp of the ripen fruits.While puncturing the fruit, the fly pushes bacteria from the skininto the flesh. These bacteria cause fruit decay, which results in a substrate inwhich the larvae feed (Drew and Lloyd, 1989; Fletcher, 1987). Ripe fruits are preferred by females for egg laying .

The B. dorsalis egg is 0.8 mm long and 0.2 mm broad, with a white to creamy colour. At room temperature and relative humidity, eggs hatch in two days. Fruits had brownish rotting streaks on them. Fruit eventually falls.

Larvae feed on the pulp after hatching, which seems normal from the exterior. There are three larval stages (instars). The larva of fruit fly is elongated, legless, cylindrical- maggot shape, anterior end narrowed, flattened caudal end, and creamy white color.

First instar: Larvae that hatch initially are small and delicate 1st instar (first larva). The body of the first instar is about 4 mm in length and 1 mm width. The anterior part of the body is white and is dull yellow. The duration period of the first larva is three days.

Second instar: They molt into slightly more robust second instar larvae. The 2nd instar is 5 mm in length and 1-1.5 mm width. The body changes into creamy color. In this stage, all segments become distinct.

Third instar (Prepupa): *These* in turn moult into quite stout and tough third instar larvae. The body is 7 mm in length and 1.5-2 mm width. The first and the second larvae occurred in pulp of the rotten fruit. At the larva reached the third stage, it stopped feeding and comes out of the fruit to pupate. Because the 3rd stage of larvae has been finished the feeding stage. After completing larval development, the larvae leave the host fruit, and entered into the sawdust. In this stage the larva is very jumpy. The duration period of third instar is four days at room temperature and relative humidity. Thus, in this present study, the entire larval stages lasted for 11 days

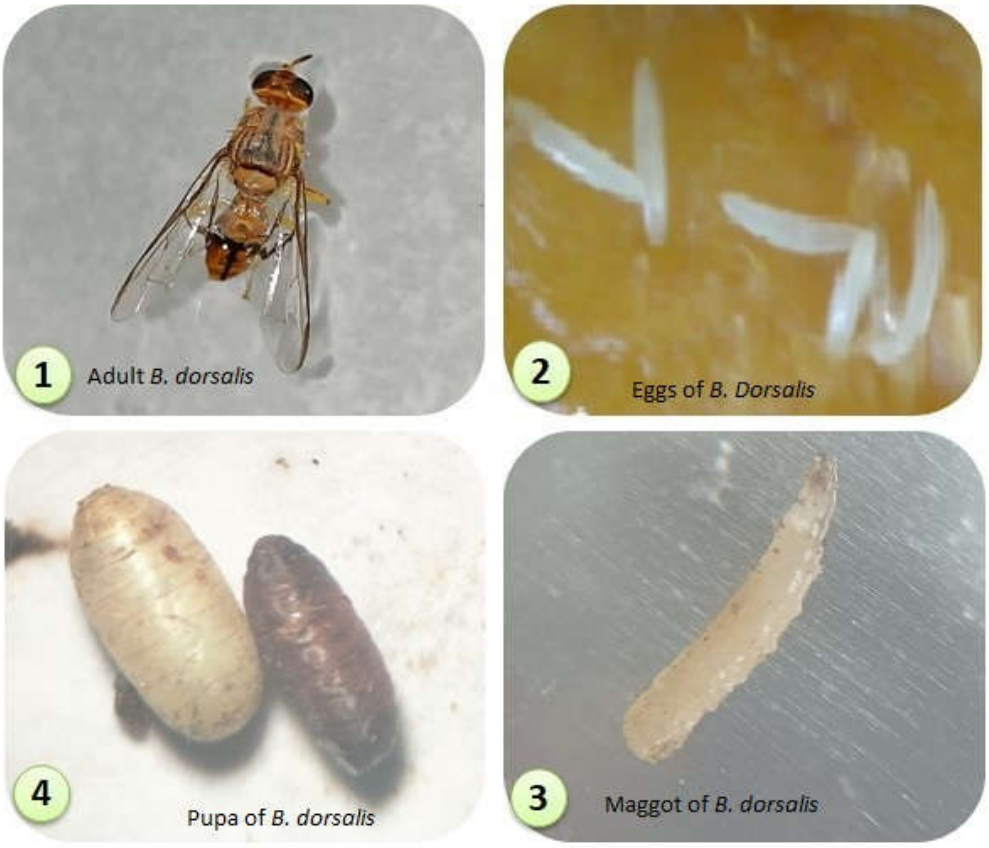
Pupa: After completing larval development, the mature larva emerges from the fruit, they were then put into the moistened sand. After a short period larva burrowed into the sand, and then its body become shorten and ceases to move. The cuticle then transforms into which is initially soft and white but soon hardens, turning tan and eventually into brown and brittle, forms a tan to dark-brown pupa and they are seeds like 4-9 mm in length. Each larva forms a hard, brown barrel-like shell from its skin. Inside this case the pupa develops into a fly. Among the pupae the tan-color of pupae are the immature and the darkbrown are mature stages that hatch into adult fly. In the present study, the pupation period lasted 10-12days.

Adult: Adult flies emerge from the puparium on to the sand surface. Development from egg to adult takes 24-26 days. Upon emergence the adult soon starts looking for the nourishment. It needs to reach sexual maturity, copulate and lay eggs. The adult has a body length of about 6-8 mm, the wing is about 7.3 mm in length and is mostly hyaline. The upper margin of hyaline wing is blackish. The colour of the fly is very variable, but there are prominent yellow and dark-brown to black markings on the thorax. On abdomen dark T shaped band is

present. The female has a pointed slender ovipositor use to deposit eggs under the skin of host fruit.

Total life cycle:

Total life cycle of bactoceradorsalis from egg to adult is 24-26 days



Biology of *Bactocera dorsalis*

DISCUSSION

Several reserchres studied biology of *B. dorsalis* with different host plant, different geographical region and different climatic condition and recorded different reading about the biology. As the Oriental fruit fly, is of paramount importance due to its economic impact on agricultural produce and the intricate biological mechanisms that govern its growth and reproduction. This study aimed to elucidate various stages of its life cycle, providing insights that could potentially aid in pest management strategies.

Verghese *et. al.,* (2002) Mentioned economic significance *B. dorsalis* in India. They were noted that *B. dorsalis* is major fruit pest in an Indian subcontinent, especially

on mango, affecting local and export markets. They were reported that infestation of *B. dorsalis* varies with season and region. On an average 40% crops of mango losses due to infestation of *B. dorsalis.* In guava it may dame up to 70%. Also they were mentioned deferent pest controlling strategies.

Wigunda *et. al.,* (2009) Studied preference and performance of *B. dorsalis* on two mango verities at three stages of ripeness. In this study they were examined the influence of different ripening stages of mango. They were reported that the flies are Ripe and fully ripe mangoes were most preferred for oviposition. In contrast unripe mango was infrequently used by oviposition.

Simranpreet Kaur *et. al.,* (2021)Susesfully reared *Bactrocera dorsalis* on semisold artificial diet form Punjab University Ludhiyana, they were used five different artificial diets for artificial rearing. Such type of artificial rearing was carried out for mass culture of *B. dorsalis,* Cultured *B. dorsalis* further used for RNA interference.

Jena *et.al.,* (2022) Carried out Biological and Morphometric studies fruit flies infesting fruit crops with special reference to *B. dorsalis.* They were reported fruit flies are one of the major threats to the horticulture sector in the world. They cause significant losses in the quality and yield of fruits and vegetable crops. They were studied biology and recorded incubation period, maggot period, pupal period, adult male female longevity total developmental period and men fecundity are 1.5-3.5 days,7.8-11.3 days, 103-126 days 18.3-20 days, 20.4-23.9 days 19.8-27.5 days and 132.7-189.5 respectively, also studied eggs per female, lize of eggs, pupa, maggot and adult.

Present research studied biology of *B. dorsalis* on Guava fruit with low rainfall, semidried climatic condition. The duration of each stage in the life cycle can vary depending on factors such as temperature, humidity, host availability, and other environmental conditions. Warmer temperatures generally accelerate the life cycle, while cooler temperatures can prolong it.

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