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Banana fly (Insecta: Diptera: Drosophilidae).

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Drosophilidae which have a mycophagous habit, many flies use the fructifications of macroscopic fungi as the main resource for oviposition and feeding their larvae. However, these are not the only ways in which these structures are used: males of some species of *Zygothrica* Wiedemann 1830 use fungi as combat arenas for dominance over territory and females, and even present polymorphisms related to this behavior (Figure 1) [1-3].

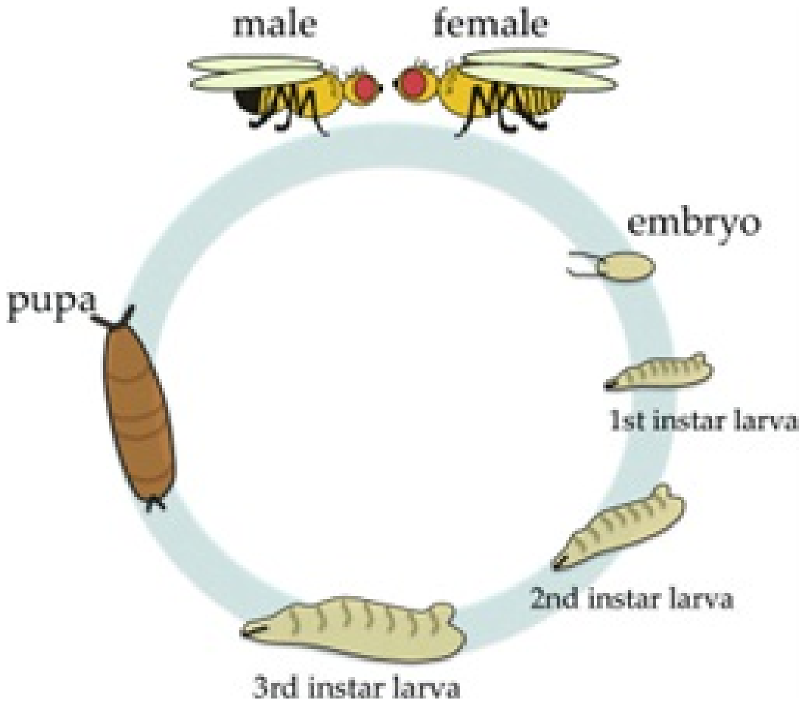

Figure 1. *Drosophila Melanogaster* (Meigem, 1830) life cycle. The entire life cycle lasts approximately 10 days at 25°C. Flies complete embryonic development as eggs before hatching as first instar larvae. The larvae eat, grow, and molt through three instar stages before pupariating. Flies undergo metamorphosis during the pupal stage and adult structures are formed. Upon completing metamorphosis, an adult fly hatch. Source: https://www.researchgate.net/figure/Drosophila-melanogaster-life-cycle-The-entire-life-cycle-lasts-approximately-10-days-at_fig2_323467189.

For this genus, only a part of the species seems to use fungi as resources for oviposition and feeding, therefore, the use of the term mycophilia is suggested. However, there are species whose larvae are found in nephric pads under the third maxilliped of crabs, eggs of spiders, dragonflies, Hemiptera, foamy secretions of frogs, leafhopper nymphs, and secretions from mammalian eyes. For a long time, it was believed that yeast and bacteria were the only source of nutrients for the larvae of these flies [4-7].

Exhibit predatory behavior of aquatic larvae of mosquitoes, a commensal of crabs, spiders, bees, parasitic from lepidopteran caterpillars, and even cannibalism, in the case of larvae that are found in an overpopulated resource. Yeast is considered a diffuse mutualism, as yeasts are not dispersed by wind, and depend on other insects, such as drosophiles, for their dispersal to other environments. Acting as vectors, drosophiles transport yeast to the outside of their bodies and eliminate them through defecation and regurgitation [8-11].

1. *Zaprionus indianus* Gupta, 1970 (Diptera: Drosophilidae).

The genus *Zaprionus* (Coquillett, 1902) is made up of 56 species, and *Z. indianus* seems to be the only species spreading out around the globe, mainly due to international fruit trading. This Drosophilidae is probably from Africa, where it was registered in fruits of 74 plant species. The first record of the occurrence of this fly in the American continent refers to samples observed in persimmon fruit in Santa Isabel, São Paulo. Its polyphagy and relatively fast development in hot weather environments have contributed to its setting and dispersion. The fig production recorded a loss of 50% in the state of São Paulo due to this fly (Figures 2-3) [12-15].

Figure 2. *Zaprionus indianus* Gupta, 1970 (Diptera: Drosophilidae). Sources: Photo#1312217 and https://bugguide.net/node/view/1312217.

Figure 3. Fig infested with *Zaprionus indianus* larvae Gupta, 1970. Source: https://www.researchgate.net/figure/Figo-infestado-com-larvas-de-Zaprionus-indianus_fig1_267833234.

Drosophila suzukii (Matsumura, 1931).

The main damage caused by *D. suzukii* is caused by the larvae feeding inside the fruits. However, the insertion of the ovipositor by the female opens entry points for infestations secondary, such as filamentous fungi, yeasts, and bacteria. Furthermore, the attack of this pest depreciates the quality of the fruits, reducing the useful life of the product in the post-harvest period [15-16].

Monitoring is generally carried out using traps (McPhail) with attractive baits, the same system used for Drosophilidae. The bait that was most attractive to *D. suzukii* was the combination of apple cider vinegar and red wine, in a 40:60 ratio. The control method most used in places where this pest occurs is chemical control. Organophosphates, pyrethroids, and spinous showed good results in control by tact and residual power on *D. suzukii*, on cherry, raspberry, blueberry, strawberry, and grapevine. Neonicotinoids and systemic organophosphates have ovicidal action and the ability to control larvae inside the fruits. The use of the insecticide Malathion in low doses appears to be efficient in controlling this pest (Figure 4) [15-17].

Figure 4. Male *Drosophila suzukii* (Matsumura, 1931). Sources: Photo by John Davis and https://www.researchgate.net/figure/Male-Drosophila-suzukii-Matsumura-1931-photo-by-John-Davis-source_fig1_291791689.

The difficulty in finding egg and larvae parasitoids that control this pest can be explained by the fact that*D. suzukii* is capable of ovipositing inside intact and healthy fruits, making it difficult for biological control agents to attack. *Ganaspis xantophoda* (Ashmead, 1896) (Hymenoptera, Figitidae) and *Asobara japonica* Belokobylskij, 1998 (Hymenoptera, Braconidae), *Leptopilinica japonica* Novković & Kimura (Hymenoptera, Figitidae) and *Pachycrepoideus vindemmiae* (Rondani, 1875) (Hymenoptera, Pteromalidae) [18-20].

The recent occurrence of *Drosophila suzukii* (Matsumura, 1931) (Diptera: Drosophilidae), also known as spotted-wing *Drosophila*, causing damage to small fruit crops (blackberries, raspberries, blueberries, and strawberries) and native fruits, has made is one of the main phytosanitary threats to these crops. The species, which is native to the Asian continent, quickly expanded throughout North America and Europe and, more recently, through Brazil. Among the species of insects belonging to the Drosophilidae family, *D. suzukii* is the only one in which the females have a serrated-type ovipositor apparatus, which allows them to lay eggs inside the fruits, causing damage to intact fruits with thin skins. In strawberry plants, the losses are even more pronounced, as in addition to the damage resulting from the oviposition of *D. suzukii*, they allow the infestation of the fig fly *Z. indianus* (Figure 5) [20-23].

Figure 5. Cherry fruit damaged by *Drosophila suzukii* (Matsumura, 1931)larvae feeding. Source: https://biblioteca.inia.cl/bitstream/handle/20.500.14001/67178/Informativo%20INIA%20N%C2%B0%2072?sequence=1&isAllowed=y.

To avoid economic damage and reduce the population rates of these insect pests, chemical control has been the most used management method worldwide, carried out mainly with phosphorus insecticides, pyrethroids, and spinosyns. In addition to chemical control, other measures are essential for adequate pest management, including:

1- Reduction in the harvest interval, minimizing the supply of ripe fruits, more susceptible to pest attack, in addition to eliminating spoiled fruits from the cultivation area.

2- Destruction of discarded fruits, either by burying them in the ground at a minimum depth of 20cm from the surface, macerating them and distributing them on a surface for direct exposure to the sun, or even exposing them inside plastic bags and, subsequently leaving them in the sun for three days.

3- Elimination of old leaves from strawberry plants to improve aeration, light penetration and decrease humidity between plants, since *D. suzukii* prefers sheltered and humid areas.

4- Use of screens (exclusion net with 0.80mm to 0.98mm mesh), such as in semi-hydroponic strawberry

cultivation, to prevent or reduce the entry of the pest into the cultivation.

5-Elimination of old leaves from strawberry plants, improving aeration, and light penetration, and reducing plant humidity, since *D. suzukii* prefers sheltered and humid areas.

6- Use of the entomopathogenic fungus *Beauveria bassiana* (Bals.) Vuil., 1912 (Hypocreales: Cordycipitaceae) to control adults when there is an increase in adult capture levels in monitoring traps.

7- There is potential for biological control using parasitoids. Parasitoids are natural enemies responsible for controlling the pest species, killing the host before its emergence occurs [23-37].

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