

Richardiidae Loew 1868 (Insecta: Diptera) as a pest of pineapple.

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Richardiidae is a small family, of the order Diptera, superfamily Tephritoidea Acalyptratae. The family Richardiidae is a small group of semitropical to tropical flies restricted to the New World. They are related to the true fruit flies. The knowledge about the biological and ecological aspects of two adults and two immatures of the still and incipient family [1-3].

The Richardiidae family is made up of medium to small flies 3 to 15 mm, with body color ranging from yellow to brown or even black. Its species are recognized mainly by presenting generally long antennae, absent anterior setae, and vibrissae, ventral face two posterior femurs with strong spines, except in Epiplateinae, tergite II with strong lateral setae, cleft in the costal vein and small spots on the loops (Figure 1) [4-6].



Figure 1. Pineapple fruit fly" *Melanoloma viatrix* Hendel, 1911 (Diptera: Richardidae) A: adult ovipositing in the "eyes" of ripe fruit, B and C: larvae in pineapple pulp and extracted larvae, D: Pupae. Source: https://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0718-34292020000400037.

Females chase beetles in flight, laying an egg on the beetle's back, under the elytra, where the beetle cannot reach it. The egg hatches and the fly larva enter the beetle's body cavity, feeding on and eventually killing the host before turning into a pupa [5-6].

Larvae of flies from the Richardiidae family have been found feeding on floral tissues of several plant species. According

to the literature, larvae of *Beebeomyia* sp. have already been observed developing in flowers of Araceae, Marantaceae, and Musaceae, in which it was seen visiting immature inflorescences of *Dieffenbachia oerstedii* Schott (Araceae), where eggs of *Beebeomyia taccarivora* Wendt, Gonçalves, and Maia 2018 (Richardiidae) were deposited, which also showed similar behavior, visiting the inflorescences of *Taccarum ulei* Engl. & Krause (Araceae) at different stages of maturation. There are records of collecting Richardiidae flying over vertebrate animal carcasses in Southeast Brazil [6-8].

Pests are one of the most important limitations of pineapple production, among which we find the species *Melanoloma viatrix* Hendel, 1911 (Diptera: Richardidae). The larvae of *M. viatrix*, do not have legs, are vermiform in appearance and are yellowish-white in color, with a pair of spiracles. very pronounced hind legs and body divided into 11 segments, each with small spicules that help with locomotion. The pupa is coarctate, brown in color, with 11 segments, approximately 5 mm long and 1.8 mm in diameter. The posterior spiracles are conspicuous, and the cephalic area is easily appreciated [9-11].

The family has an essentially neotropical distribution in the Antilles, Patagonia, Dominican Republic, Mexico, Belize, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, Trinidad, Venezuela, Colombia, Brazil, Ecuador, Peru, Bolivia, Cuba, Dominican Republic, Guyana, and Peru. Pineapple fruits with evidence of damage caused by larvae of *M. viatrix* (Figure 2) [12-14].

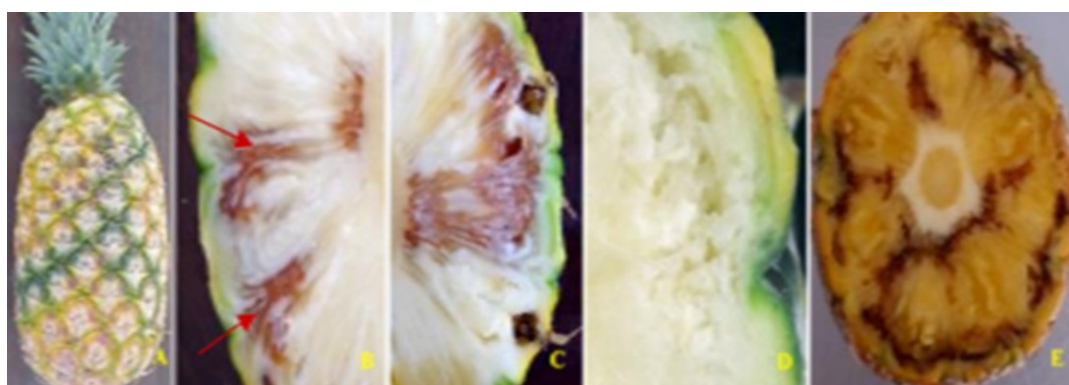


Figure 2. Symptoms and damage of *Melanoloma viatrix* Hendel, 1911 (Diptera: Richardidae) in pineapple 'Golden' A: mosaic-type external symptom in overripe fruit, B: arrow indicates the place of oviposition at the junction of the "eyes", C: damage reaches the "heart" of the fruit pulp D: pulp boring symptom without stain (late damage) close to harvest and E: typical MCG symptom. Source: https://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0718-34292020000400037.

Control and Management.

Genetic control: Pineapple germplasm collections are of vital importance in determining resistance, tolerance, or susceptibility to different pests and diseases. **Chemical control:** In a field trial to determine the effect of different chemical fungicides on the incidence of "fruit spot" in 'Smooth Cayenne' pineapple, the fungicides Benomyl, Thiabendazole, and Tebuconazole were found to significantly control "fruit spot" [15- 16].

Ethological Control: Traps and baits are the basic tools for population monitoring and the basis for planning control

measures. There are homemade traps and baits made from fruit juices, urea, molasses, urine, and chicken manure. Crop verification: It is the use of common agricultural practices, or some modifications of them, to prevent the attack of insects and diseases, providing the least favorable environment for their development and reducing their damage. Therefore, an important task, as it allows the harvest to be concentrated and, therefore, allows care for the inflorescences and later the fruit [16-19].

Mechanical control. This method consists of removing and destroying the infested insects and organs of the plants, in this case, the fruits. It also refers to the use of physical or other barriers to prevent insect contact with the organ to be protected. For this case, tests were carried out to protect pineapple inflorescences with PVC screens that provided relevant information for the control of the "pineapple fly" associated with GCM (Figure 3) [19-20].



Figure 3. Control methods for *M. viatrix*; A: homemade trap, B: PVC mesh, and C: polyethylene sleeve. Sources: Photos: Segundo Bello and https://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0718-34292020000400037.

Biological control: Basic information for future tests with possible biological controllers. The species *Spalangia drosophilae* Ahsmead, 1887 (Hymenoptera: Chalcidoidea: Pteromalidae), *Trichopria anastrephae* Lima, 1940 (Hymenoptera: Diapriidae) *Aganaspis* sp. (Hymenoptera: Figitidae) and *Spalangia* spp. (Hymenoptera: Pteromalidae) [21-23].

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