

Control of Mediterranean fruit flies in organic citrus orchards

Problem

The Mediterranean fruit fly (medfly), *Ceratitis capitata*, is a key pest in citrus. Egg laying and larvae feeding have negative impacts on yield and export markets.

Solution

Use sticky traps and baits to monitor and control the medfly in citrus orchards. Apply conservative and inoculative biocontrol.

Benefits

Traps allow the detection of the medfly and the reduction of damages. Functional biodiversity (i.e., predators in the ground cover) decreases the emergence of medfly adults.

Practical recommendation

- Apply control strategies accordingly to the life cycle of the medfly (Picture 1)^{1,2,3}.
- Use traps composed of (i) a pheromone (i.e., trimedlure) or food attractants; (i.e., hydrolysed proteins); and (ii) a pyrethroid (e.g., deltamethrin) or Spinosad (Picture 2A).
- Make your trap! Fill a transparent bottle with a 9% water solution of protein hydrolysate (or the fertiliser sulfur ammonium) and 2% borax (Picture 2B). As an alternative, attach a vial with food attractant to a plywood panel soaked in deltamethrin (2.8%) (Picture 2C).
- Place 50-75 traps/ha, from late August (before fruits change colour) in orchards with a minimum extension of 2-3 ha or isolated ones.
- Check available biocontrol agents (Table 1) and consider the agent biology before applying (e.g., nematodes require the presence of pupating larvae in the soil)^{4,5,6}.
- Apply cultural control methods: eliminate infestation sites and destroy infested fruits.
- Promote biodiversity (e.g., plant combinations, ground cover management, etc.) to increase predation on medfly pupae and parasitisation of larvae.
- If infestations are too high to be managed with mass trapping alone, treat with clays (kaolin at 4% concentration) before fruits change colour in plots below 3 ha. Treat plot perimeters and repeat in case of intense rainfalls.

Applicability box

Theme

Crop production, environment and society

Keywords

Crop production, Pest control, Biological control, Citrus

Context

Global, Mediterranean basin

Application time

During the cropping season, depending on the control strategy and medfly's life cycle

Required time

From two weeks to one year, depending on infestation rates and strategies employed

Period of impact

One year

Equipment

Tools depend on the employed strategy

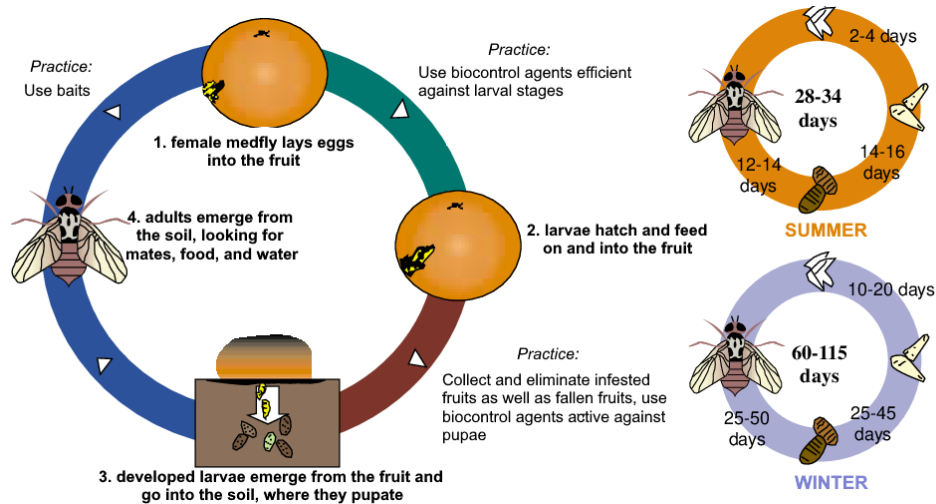
Best in

Low-input management cropping systems

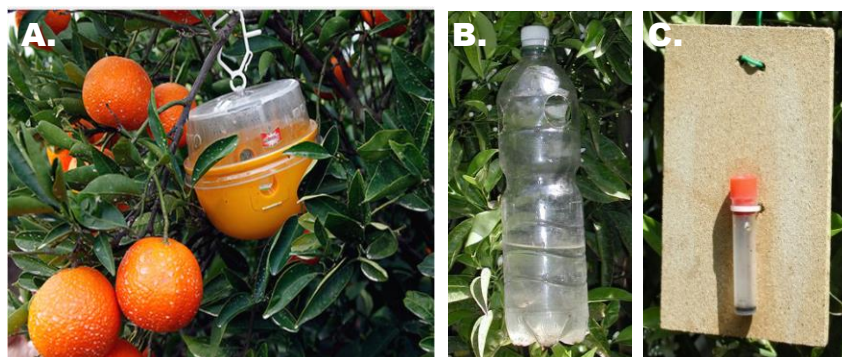


Biological agent species	Group	Main fruit fly host
✓ <i>Diachasmimorpha longicaudata</i>	Parasitoid	<i>Ceratitis capitata</i>
<i>Fopius arisanus</i>	Parasitoid	<i>Bactrocera dorsalis</i>
✓ <i>Beauveria bassiana</i>	Fungus	<i>C. capitata</i>
✓ <i>Metarhizium anisopliae</i>	Fungus	<i>C. capitata</i>
<i>Steinernema carpocapsae</i>	Nematode	<i>B. dorsalis</i> and <i>B. oleae</i>
✓ <i>Metarhizium brunneum</i>	Fungus	<i>C. capitata</i> , <i>B. oleae</i>
<i>Psytalia concolor</i>	Parasitoid	<i>B. oleae</i>
✓ <i>Steinernema feltiae</i>	Nematode	<i>C. capitata</i>
✓ <i>Diachasmimorpha tryoni</i>	Parasitoid	<i>C. capitata</i>
✓ <i>Opius bellus</i>	Parasitoid	<i>C. capitata</i>

Table 1: Main biocontrol agents (BA) used for the control of fruit flies worldwide. Table: modified from Dias, Montoya, and Nava, 2021¹. Green ticks indicate BA effective against the medfly.



Picture 1: Scheme showing the life cycle of the medfly and the practices that can be applied to reduce infestation rates and damages. Modified from Broughton, Sonya, and Francis de Lima².



Picture 2: A) Commercial trap. B) and C) Homemade traps for the medfly. Photos: Francesco Ancona.



Further information

Further reading

1. Dias, NP, Montoya, P & Nava, DE (2022) A 30-year systematic review reveals success in tephritid fruit fly biological control research *Entomologia Experimentalis et Applicata* 170: 370- 384. <https://doi.org/10.1111/eea.13157>
2. Broughton, S, & de Lima, F. (2002) Control of Mediterranean fruit fly (Medfly) in backyards.
3. Papadopoulos N.T. (2008) Mediterranean Fruit Fly, *Ceratitis capitata* (Wiedemann) (Diptera: Tephritidae). In: Capinera J.L. (eds) *Encyclopedia of Entomology*. Springer, Dordrecht. https://doi.org/10.1007/978-1-4020-6359-6_1774
4. Abdel-Razek, A. S., & Abd-Elgawad, M. M. (2021). Spinosad combined with entomopathogenic nematode for biocontrol of the Mediterranean fruit fly (*Ceratitis capitata* [Wiedemann]) on citrus. *Egyptian Journal of Biological Pest Control*, 31(1), 1-5.
5. de Pedro, Luis, José Tormos, Ahlem Harbi, Fernando Ferrara, Beatriz Sabater-Muñoz, Josep D. Asís, and Francisco Beitia. "Combined use of the larvo-pupal parasitoids *Diachasmimorpha longicaudata* and *Aganaspis daci* for biological control of the medfly." *Annals of Applied Biology* 174, no. 1 (2019): 40-50.
6. Hallouti, Ayoub, Mohamed Ait Hamza, Abdelaziz Zahidi, Rachid Ait Hammou, Rachid Bouharrou, Abdellah Ait Ben Aoumar, and Hassan Boubaker. "Diversity of entomopathogenic fungi associated with Mediterranean fruit fly (*Ceratitis capitata* (Diptera: Tephritidae)) in Moroccan Argan forests and nearby area: Impact of soil factors on their distribution." *BMC ecology* 20, no. 1 (2020): 1-13.

Weblinks

- [EU project for the management and detection of the medfly](#)
- [Useful webinars regarding management and early detection of the medfly](#)
- Check the [Organic Farm Knowledge](#) platform for more practical recommendations.

About this practice abstract

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Permalink: organic-farmknowledge.org/tool/44811

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