Effects of rearing host species and oviposition experience on host preference of *Leptomastix dactylopii* (Hymenoptera: Encyrtidae)

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Agris
Leptomastix dactylopii is widely used in biological control programs against the citrus mealybug, Planococcus citri (Risso) (Hemiptera: Pseudococcidae)
Planococcus ficus (Signoret) (Hemiptera: Pseudococcidae)

*P. ficus* colony under the vine bark

*P. ficus* damage on clusters

GLRa Virus symptoms on grape leaves
Both mealybug species were suitable hosts for the complete development of *Leptomastix dactylopii*

Parasitoids reared on *P. ficus* produced a progeny smaller in size and showed a significantly lower fecundity
Aim of the study

Investigate the host preference of *L. dactylopii* when exposed to *P. citri* and *P. ficus* at the same time.
Materials and methods

The host preference of *L. dactylopii* for *P. citri* or *P. ficus* was studied in choice tests considering two variables:

**Rearing line of *L. dactylopii***
If *Leptomastix* females are reared on a mealybug species, are they able to parasitize other species or do they show a preference for the natal host species?

**Oviposition experience of *L. dactylopii***
If *Leptomastix* parasitizes a host species at first, does it stick with that species or parasitizes also other species?
Materials and methods

Rearing line

P. ficus

P. citri

26°C; 70-80% UR; 16:8 L:D

60 L. dactylopii females

20 naïve

Oviposition experience

5 P. ficus

5 P. citri

24 hours

Choice test

5 P. ficus

5 P. citri

30 min

5 P. ficus

5 P. citri

5 P. ficus

5 P. citri

5 P. ficus

5 P. citri
Materials and methods

Parasitized mealybugs (MUMMIES) were collected from both rearing lines and placed individually into plastic vials in order to obtain *L. dactylopii* adults used in the choice tests.

Newly-emerged females were fed with honey and paired with a young male for 24 hours for mating.

![Mummy](image1.png)

![Vial](image2.png)

![L. dactylopii female](image3.png)
Materials and methods

The test arena consisted in a Petri dish with a grape leaf which had the lower surface up and the upper facing a water-soaked cotton pad.

Mealybugs of the two species were marked with food coloring powder and allowed to settle on leaves for 12 hours.
Materials and methods
Choice test

A single *L. dactylopii* female was released in each arena and its foraging and ovipositing behavior was observed for 30 minutes.

Four behavioral events were recorded during the experiment:

- **Encounter** occurred when the parasitoid bumped into a mealybug in its searching for the host.

- **Examination** occurred when the female touched and drummed the host body with the antennae.

- **Probing** occurred when the parasitoid turned around and attempted to insert the ovipositor.

- **Oviposition** was the insertion of the egg inside the mealybug body and took few seconds.
Materials and methods

Choice test

The number of behavioral events recorded in each experimental arena were used to generate a “preference index”

Preference index = \frac{\text{N. of events occurred on } P. \text{ ficus}}{\text{N. of total events } (P. \text{ ficus} + P. \text{ citri})}

Preference index = 0.5 \quad \text{Event occurred in the same number on } P. \text{ citri and } P. \text{ ficus} \\
\text{(no preference)}

Preference index > 0.5 \quad \text{Event occurred more often on } P. \text{ ficus \ than on } P. \text{ citri} \\
\text{(preference for } P. \text{ ficus)}

Preference index < 0.5 \quad \text{Event occurred more often on } P. \text{ citri \ than on } P. \text{ ficus} \\
\text{(preference for } P. \text{ citri)}

Data were analyzed by a two way factorial analysis of variance using the rearing line and the oviposition experience as the two variables and Tukey’s test for post-hoc pairwise comparison among means
Results

Rearing line

Females reared on *P. ficus* examined, probed and oviposited on *P. ficus* significantly more often than those reared on *P. citri*.
Encounters and examinations were not affected by the oviposition experience in *Leptomastix* females reared on *P. ficus*. Parasitoid females which had oviposition experience on *P. ficus* probed more often on the same species, compared with females experienced on *P. citri* or naive. *Leptomastix* females experienced on the vine mealybug oviposited preferentially on the same species.

### Results

#### Oviposition experience

**P. ficus rearing line**

Parasitoid females which had oviposition experience on *P. ficus* probed more often on the same species, compared with females experienced on *P. citri* or naive.

*Leptomastix* females experienced on the vine mealybug oviposited preferentially on the same species.

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**Probing**

![Graph showing probing frequencies](image)

**Oviposition**

![Graph showing oviposition frequencies](image)
Results

Oviposition experience

**P. citri rearing line**

Parasitoid females reared on *P. citri* encountered and examined both species showing no significant preference.

Parasitoids reared on the citrus mealybug but experienced on the vine mealybug **probed** and **oviposited** preferentially on the vine mealybug.
Conclusions

*Leptomastix* females showed the ability to oviposit on the vine mealybug also in the presence of the citrus mealybug.

The rearing line affected the host preference of parasitoids. *Leptomastix* females reared on *P. ficus* oviposited preferentially on the same species.

The oviposition experience affected the host preference only on parasitoids which gained experience on the vine mealybug. Parasitoids from both rearing lines that were experienced on *P. ficus* showed a preference for the same species.

*Leptomastix* females experienced on *P. citri* did not show a significant preference for *P. citri*, independent of the rearing line.
Conclusions

Mechanisms behind *L. dactylopii* behavior need to be further investigated. However some hypotheses can be done

Influence of the rearing line might be due to cues produced from the rearing host (olfactory conditioning)

Host preference might have been affected by the oviposition experience through a learning process that enabled the parasitoids to adapt to the trophic environment (olfactory memory)

The results shown here are not conclusive. However, our studies showed that *P. ficus* is a suitable host of the parasitoid in the presence of *P. citri*, that *Leptomastix* females oviposit preferentially on the vine mealybug when are reared or gain experience on *P. ficus* under laboratory conditions

The next step is in process and concerns the evaluation of *L. dactylopii* as a biological control agent in vineyards with inoculative releases of mass-reared parasitoids
Thank you for your attention