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# The effect of distance between parasitoid and host on the parasitism of *Psytalia concolor* (Szépligeti) in organic olive orchards.

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## Abstract

*Bactrocera oleae* (Rossi) is a major pest of olive fruits. Biological control of olive fruit fly mainly relies on the activity of the Braconid species *Psytalia concolor* (Szépligeti), which parasitizes *Bactrocera oleae* at the larval stage. Parasitism tests have been carried out at the insect growing facility (insectarium) of the Mediterranean Agronomic Institute of Bari (C.I.H.E.A.M.). The critical point of the use of *P. concolor* as a biological control agent in organic olive crop is the assessment of its effectiveness against *B. oleae*. Its lower presence in fruits of cultivated olives rather than in small fruits of wild olives suggests an influence of the size of the fruit, and of the thickness of its pulp on the parasitization of *P. concolor*. Therefore, the aim of this research was to investigate the capacity of the females of *P. concolor* to lay their eggs into the target host according to the distance existing between the female and the host larva. In these tests, the substitution host *Ceratitis capitata* was used and parasitism of *P. concolor* was tested at different distances (0, 0.5, 1, 1.5, 2, 2.5 and 3 mm) to the host larvae at different times (7 min, 15 min, 30 min and 60 min) of interaction.

Predetermined distances between the parasitoids and the target larvae were arranged by locating the flying females into cubical cages of 40x40x40 cm with Plexiglas walls and the open roof covered with a tulle tissue in order to avoid that any insects from outside may enter the cages, and to allow the females to protrude their ovipositors. On these roofs, plastic cylinders containing the target larvae were placed with the open bases arranged with a tulle tissue, to allow the contact with the parasitoid females. Considering the width of the tissues negligible, distances were set by metal separators with increasing thickness.

Parasitism level at 7 min was not significantly different at 2, 2.5 and 3 mm distances. Parasitism level was the highest at 0, 0.5, and 1 mm distances with no significant changes. Parasitism at 15 min showed a high variability according to the distances. The highest level resulted at 0.5 and 1 mm distances, the lowest at 3 mm distance. At 30 min interaction, the highest level of parasitism was at 0 mm distance, whilst at 1 and 1.5 mm the level was lower with no significant changes. Again, parasitism level was the lowest at 3 mm distance. The highest level of parasitism at 60 min was detected at 1.5 mm distance and was as lower as the distance increased.

In conclusion, the study showed that the females of *P. concolor* were not able to parasitize the target larvae at distances higher than 2.5 mm. Generally, the parasitism level decreases with the increase of the distance between target larvae and parasitoid females. At the lowest distances (0, 0.5 and 1 mm) hyper parasitism occurred and the target pupae were killed, but also the development of the parasitoids into adults was very difficult for nutrient unavailability. Biological control of *P. concolor* against *B. oleae* larvae may give satisfactory results only if the depth at which the target larvae are located into the olive drupes is not higher than 2 or 2.5 mm from the surface.

**Keywords:** Organic agriculture; biological control; *Bactrocera oleae*; *Ceratitis capitata*; larval parasitoids; parasitism level; distance.