

Overwintering of two pupal parasitoids of *Drosophila* under natural conditions

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The overwintering capacity of both indigenous and exotic biocontrol agents of *Drosophila suzukii* (Drosophilidae) is of fundamental interest for biocontrol projects in temperate regions. In this context, the microclimatic conditions of the overwintering habitat, as well as the phenology of parasitoids and their host and the cold tolerance of the overwintering parasitoid developmental stage play an important role. We evaluated the suitability of orchards and three types of semi-natural habitats for overwintering of the indigenous pupal parasitoids *Pachycrepoideus vindemiae* (Pteromalidae) and *Trichopria drosophilae* (Diapriidae) by exposing different preimaginal parasitoid stages to microclimatic conditions in soil. Further, we investigated the host availability in these habitats during autumn while simultaneously assessing the parasitism activity and offspring development of both parasitoids in a semi-field experiment.

We found that overwintering survival did not differ between the tested habitats although we measured significant differences in microclimatic conditions. Eclosion rates for *T. drosophilae* in general were very low and did not differ among preimaginal stages, whereas *P. vindemiae* eclosion rates were higher for the larval and pupal stage, but no parasitoid egg survived. Host availability in semi-natural habitats strongly decreased one month earlier than in orchards, where also the overall host availability was highest. Parasitism activity ceased when field temperature permanently dropped below 7.5°C, yet successful offspring development of *P. vindemiae* was already strongly reduced by shorter temperature drops beforehand. These results demonstrate that *P. vindemiae* is overwintering in either the larval or pupal stage, while the overwintering stage for *T. drosophilae* is not yet clear. More interestingly, we provide evidence that both parasitoids can overwinter in a wide range of habitats and that host availability is likely to be a limiting factor in habitat choice only during late autumn.

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