



Overwintered *Drosophila suzukii* are the main source for infestations of the first fruit crops of the season

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Extended Abstract: In the Netherlands, the invasive pest *Drosophila suzukii* (Matsumura; Diptera: Drosophilidae) was first recorded in the beginning of October 2012. At that time, the harmfulness of this new insect remained unnoticed since no damage to fruit or plants was observed. However, six years after they were first detected, the number of *D. suzukii* fruit flies in the Netherlands has exploded and threatens the soft fruit industry, in particular raspberries, blackberries, blueberries, red and black currants, strawberries and cherries. Current control strategies are inadequate and rely heavily on the use of broad-spectrum insecticides, such as organophosphates, pyrethroids and spinosyns, to kill mainly adult *D. suzukii*.

In this context, the best prospects for controlling *D. suzukii* infestations may come from integrated pest management (IPM) of combined biocontrol approaches. To be successful, such integrated pest management strategies have to rely on a good knowledge of the biology and ecology of the pest species. In fact, it is essential to identify periods of vulnerability in *D. suzukii*'s life cycle and the factors that limit its fitness in order to make informed decisions on control measures.

In this research, we studied the seasonal biology of *Drosophila suzukii* to identify the factors that regulate their population ecology; these could be exploited in the development of IPM strategies. Though consistently captured during winter and early spring, *D. suzukii* is recorded in small numbers during this period. The pest has to cope with low temperatures in winter, and restricted availability of host plants for food and reproduction in early spring. After this bottleneck period, a massive increase in the number of captures is then observed in orchards from mid-June onwards. The mechanisms that allow *D. suzukii* to survive from early spring until the availability of the earliest commercially produced fruit are still poorly understood. Some studies hypothesize that *D. suzukii* winter survivors establish a generation on early spring oviposition hosts (plants found in nature, gardens and parks) that then migrates into the orchards to infest the fruits. The goal of this study was to test this hypothesis, using experiments and field monitoring combined with a cumulative degree-days (DD) analysis. We specifically 1) identified alternative hosts available to *D. suzukii* in early spring, 2) assessed their suitability as hosts for *D. suzukii* oviposition and reproductive success, and 3) correlated the infestation of these alternative hosts with long-term monitoring data on seasonal reproductive biology and morphology of the pest. Results obtained from the survey of alternative host plants revealed that, both under natural and controlled conditions, *Aucuba japonica* was a hotspot for *D. suzukii* oviposition during early spring. Interestingly, this host showed a low success of adult emergence. Seasonal reproductive biology of field captured *D. suzukii* showed that the first gravid females were found at the end of March,

coinciding with collection of the first infested early host fruits, in particular *A. japonica*. The latter was continuously infested by the pest from early spring until May and yielded a few summer morph offspring. However, field monitoring in orchards showed that *D. suzukii* individuals trapped there consisted solely of winter morphs until mid-June. Contrary to our working hypothesis, these observations strongly indicate that overwintered *D. suzukii* females are the predominant source for the infestations of the first available commercial crops. We highlight important aspects that should be taken into account to efficiently target this new invasive pest species.

Key message:

- Seasonal biology and population dynamics of *D. suzukii* in the Netherlands were investigated.
- Overwintered females were physiologically able to lay eggs at 87 DD which coincided with the detection of the first infested alternative hosts.
- Only few summer-morphs emerged from these unfavorable hosts and did not play a major role in the infestations of the first available fruit crops of the season.
- Overwintered females predominantly infested the first commercial fruit crops and should be targeted in an area-wide control approach.

Key words: alternative host, seasonal biology, phenotypic plasticity, integrated pest management

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