

Landscape-level movements and a molecular approach to analyze the diet of *Drosophila suzukii*

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The invasive pest species Spotted Wing *Drosophila* (SWD), *Drosophila suzukii*, has been first recorded in the USA and Southern Europe in 2008. Since 2011 it is also known from Germany. *D. suzukii* is an extremely polyphagous pest species. It feeds and reproduces on more than 120 cultivated and wild fruits from 20 plant families. Infested fruits quickly collapse and become unmarketable. *D. suzukii* overwinters as adult in a reproductive diapause at sheltered sites, especially in forests and hedges. Since this invasive pest is active at mild days in winter and spring it needs nutritional resources.

To investigate which resources are used, monitoring adult activity, laboratory bioassays and molecular techniques were applied to identify wild host plants sustaining *D. suzukii* during winter and spring. The occurrence of *D. suzukii* at landscape level and its remigration into orchards was observed all year round. Further, an automatic trap was developed to examine the diurnal activity of *D. suzukii*. No-choice assays with mistletoe berries were established to investigate egg laying, feeding activity and survival of *D. suzukii*. For investigating the attraction of *D. suzukii* to trees parasitized with mistletoe, *Viscum album*, we analyzed the volatile organic compounds (VOCs) of berries by GC-MS. Feeding experiments (FEX) were established to examine the digestion time and to develop a molecular approach to identify

food sources during winter and spring. Additionally, bleaching experiments (BEX) were conducted in order to decontaminate the body surface which should not negatively affect the DNA of the gut content.

During fall and early winter, catches in monitoring traps indicated a shift of fly activity from orchards towards forests and hedges. Significantly higher numbers of flies were captured in the canopy of *Pinus sylvestris* parasitized with *V. album* compared to non-parasitized trees. From April onwards we found females with mature eggs coinciding with ripe berries of *V. album*. Under laboratory conditions eight adult individuals emerged from 1.100 field-collected berries in 2015. The odor spectrum identified from the berries was comparable to common berry odors. Further, we succeeded in identifying ingested chloroplast-DNA in the gut content *D. suzukii*. First results of the FEX show that females ingest more DNA than males. Following, the results of the BEX show that the body surface was decontaminated whereas the chloroplast DNA of the gut content stays unaffected.

The combination of the presented field studies and laboratory assays will provide important information to identify the nutritional resources of *D. suzukii* in winter and spring, and to get a better understanding of *D. suzukii* behavior on host plants in the course of a day.