

Native predators and parasitoids for biological regulation of *Drosophila suzukii* in Germany

C. Englert¹ and A. Herz¹

Abstract

The invasive fruit pest *Drosophila suzukii* currently spreads in Europe without being regulated by adapted specific natural enemies. Due to its polyphagous nature, *D. suzukii* causes high risk in cherry and berry production, especially since weather and wild host plants provide suitable conditions for population outbreaks. Ongoing research aims to identify native predators and parasitoids of *Drosophilidae* in Germany and tries to assess their ability for natural control as well as their suitability for being used as biological control agents in pest management of *D. suzukii*.

Keywords: enemy release hypothesis, invasive species, biological control, beneficials

Introduction

In recent years organic cherry and berry production has been highly challenged by the arrival of the invasive spotted wing drosophila, *Drosophila suzukii* MATSUMURA. In contrast to native European drosophilid flies, females of this species are able to damage healthy ripe berries and fruits due to their serrate ovipositor. *D. suzukii* propagates also in many wild host plants in hedgerows, forests and gardens. Successful invasiveness of an exotic species may be caused by the absence of well adapted specific antagonists in the invaded region. It is not clear yet, if the European native natural enemy communities in the (agro-) ecosystems, which are being invaded by *D. suzukii*, will be able to limit its population growth. Current research at the Institute for Biological Control aims to identify potential antagonists (pathogens, predators, parasitoids) of *Drosophilidae* and to evaluate their ability to control the new pest species.

Material and Methods

The knowledge on species diversity and regulative efficacy of the German natural enemy communities of *Drosophilidae* is rather scarce. Therefore the first aim was to collect different parasitoid species in various habitats and to start rearing cultures from them. Earwigs, lacewing larvae and *Orius* bugs frequently occur on host plants of *D. suzukii* and were therefore selected as potential predatory species. They were also obtained by field collection or from rearing cultures. We assessed the ability of these natural enemies to accept different developmental stages of the fly in petri-dish assays in the laboratory. In short, the particular natural enemy was individually provided with five to ten eggs, larvae or pupae as prey or host. The behaviour was observed for two hours, then the natural enemy was removed and fly stages were further incubated to determine successful development or mortality caused by the antagonist.

¹ Julius Kühn-Institut, D-64287 Darmstadt, Germany, Camilla.Englert@jki.bund.de

Results and Discussion

We were able to collect several parasitoid species from fruit samples and traps baited with fruits and also were able to start rearing cultures of them. The pupal parasitoid *Trichopria drosophilae* was found in our field collections for the first time in Germany (collected in August 2015 at Dossenheim, Baden-Württemberg). Whereas several populations of the larval parasitoid *Leptopilina heterotoma* were not able to parasitize *D. suzukii* successfully, first evidence now exists that the collected pupal parasitoids are able to do so. All predatory species that we tested so far were able to prey on most of all *D. suzukii* developmental stages when offered in petri-dish, but not always when offered in infested fruit (Table 1, Englert *et al.*, 2015).

Table 1: Host-/prey acceptance of different natural enemies when provided with different developmental stages of *D. suzukii*. +: used as prey or host in petri-dish assay. ++: used also as prey on the infested fruit, 0: larvae were not parasitized/prey not attacked, /: no relevant combination, n.t.: not tested yet. Tests with parasitoids were in petri-dish, not on fruit.

Natural enemy tested	Developmental stage of <i>D. suzukii</i> in the test			
	egg	larvae	pupae	adult
Parasitoid in petri-dish				
<i>Leptopilina heterotoma</i>	/	0	/	/
<i>Pachycrepoideus vindemmiae</i>	/	/	+	/
<i>Trichopria drosophilae</i>	/	/	+	/
Predator in petri-dish/on fruit				
<i>Chrysoperla carnea</i> – larvae	++	+	++	++
<i>Orius majusculus</i>	++	+	0	n.t.
<i>Forficula auricularia</i>	n.t.	+	+	n.t.

Further investigations will try to assess the role of these natural enemies in regulating of *D. suzukii* under natural conditions, i.e. in natural habitats and in various fruit growing systems.

Acknowledgements

In particular we thank Adem Karacoban for technical assistance and Dr. Peter Katz, Katz Biotech AG, for the providing of *Orius majusculus*.

References

Englert, C., Herz, A. & Scheewe, P. (2015). Kirschessigfliege: Gibt es Nützlinge? Heimische Florfliege (*Chrysoperla carnea*) und Blumenwanze (*Orius majusculus*) als potentielle Gegenspieler von *Drosophila suzukii* getestet. *Obstbau* **2**: 243-245.

Citation of the full publication

The citation of the full publication will be found on Ecofruit website as soon as available.