The invasive *Drosophila suzukii* and native parasitoids in Central Europe

Jana Collatz, Valery Knoll, Thomas Ellenbroek, Jörg Romeis
Agroscope, Biosafety group, Reckenholzstrasse 191, 8046 Zurich, Switzerland
E-Mail: jana.collatz@agroscope.admin.ch

Introduced into Europe in 2008, the invasive vinegar fly *Drosophila suzukii* has caused large economic damage in stone fruit, berry and vine cultivation during recent years. Control of this pest remains challenging due to its high mobility, the large number of crop and non-crop hosts, and its development inside fruits shortly before harvest.

To investigate the potential role of hymenopteran parasitoids for *D. suzukii* control, we conducted a field survey in various regions of Switzerland. Using *D. melanogaster* sentinel hosts we collected a total of eight hymenopteran parasitoid species. Capture of particular species varied among regions, time of the growing season, and habitat type. Laboratory no-choice assays with the field-collected species demonstrated that the larval parasitoids *Leptopilina boulardi* and *Leptopilina heterotoma* (Figitidae) were able to parasitize and kill *D. suzukii*, but did not develop with this host. In contrast, the pupal parasitoids *Pachycrepoideus vindemmiae*, *Vrestovia fidenas*, *Spalangia erythromera* (all: Pteromalidae) and *Trichopria drosophilae* (Diapriidae) could all successfully utilize *D. suzukii* for reproduction. Thereby *P. vindemmiae* and *T. drosophilae* produced most offspring. Thus, native parasitoids could contribute to the control of *D. suzukii* and information on their phenology and habitat preference is particularly important in this context.

Current status of the *Drosophila suzukii* management in Trentino (Italy), research achievements and perspectives for sustainable control

Claudio Ioriatti[1], Gianfranco Anfora[2,3], Alberto Grassi[1], Davide Profaizer[1], Marco Valerio Rossi Stacconi[1]
[1] Technology Transfer Centre, Fondazione Edmund Mach, Via Edmund Mach 1, 38010 San Michele all'Adige (TN), Italy.
[2] Research and Innovation Centre, Fondazione Edmund Mach, Via Edmund Mach 1, 38010 San Michele all'Adige (TN), Italy
[3] Center Agriculture Food Environment, University of Trento, Via Edmund Mach 1, 38010 San Michele all'Adige (TN), Italy

In September 2009 in Trentino, for the first time in Europe economically important damage by *Drosophila suzukii* on soft fruits was reported. The consequent increasing use of insecticides, augmented the pesticide residues on the harvested fruits and jeopardised the results obtained with IPM on soft fruits. Development of alternative control methods appeared urgent to ensure an economic future for the concerned fruit industry and researchers and technicians of Fondazione Edmund Mach responded rapidly to this new threat. We considered that possible solutions would only arise from a coordinated and international network of diverse expertise, from molecular biology and neurophysiology to pest management techniques, aiming at understanding the fundamental aspects of the ecology of this pest. Accordingly, we have determined the genome sequence of Italian *D. suzukii* in order to assist both basic and applied research and to provide information about genes involved in processes such as intra- and inter-specific communication and overwintering. The mechanisms of fruit recognition and selection mediated by the olfactory and/or gustatory systems are being investigated. The population dynamics and seasonal migrations in different agroecosystems have been followed taking into consideration the population bottleneck after the winter reproductive diapause. Development, comparison and selection of the most reliable attractants have been performed to provide the growers with effective tools to track fly activity over time and properly time control measures. Mass trapping, physical crop protection by using anti-insect nets as well as botanicals and synthetic insecticides are under experimental evaluation in order to set up sustainable control strategies for the local soft fruit industry. Because of the legal preclusion from developing classical biocontrol, several indigenous parasitoids of larvae and pupae are under investigation as possible biocontrol agents in the framework of augmentative biocontrol. Pros and cons of the present control strategies will be discussed as well as the future directions of research on pest management of *D. suzukii*.

Integrated Pest Management strategy for fruit flies in China – a successful case of area-wide Integrated Pest Management Programme for controlling *Bactrocera minax*

Puyun Yang, Ping Li, Yang Zhou, Binyuan Ren, Xiaoming Zhu
National Agro-technical Extension and Service Center, Ministry of Agriculture, Beijing 100125, China

The conventional Integrated Pest Management (IPM) Strategy for Fruit Flies in China is resorted to the implementations of key technologies such as sterile insect technique (SIT), fruit bagging, insect pheromone trapping and spraying chemical insecticides etc., but each key technology of the conventional IPM strategy used in China has constraints which are especially difficult to overcome in small holder fruits farming systems. From the year 2007 to 2009, there was a sharp decline in citrus production in China due to the infestation and outbreaks of *Bactrocera minax* (Diptera: Tephritidae). In the year 2010, a national area-wide IPM programme was launched for controlling *B. minax* across major citrus regions in China. The specially designed fruit fly protein bait (FFPB) products based on biological behaviour of tephritid fruit flies was developed and used by mass baiting in accordance to accurate determined time of applications under field pest monitoring. Field demonstrations indicated the citrus fruit damage rates were drastically reduced from over 10% to less than 1% before and after the implementation of the Area-Wide IPM strategy. Our innovative Area-Wide IPM strategy for the fruit fly involved systematic planning, technical support, proper farmer training, organization, and involvement of all of the key stakeholders in the citrus production including citrus farmers, farmer associations and local governments. From 2010 to 2014, over 370 IPM demonstration plots were established, while over 160 IPM farmer field school (IPM-FFS) had been held with 5,120 farmers graduated from the IPM-FFSs in the programme. Farmer cooperatives or specialized associations were organized to ensure collective and coordinated actions of small holder farmers in the programme areas by contracting. 2,300 contracts were signed and enforced covering 616,200 acres of citrus orchards between the farmers and the farmer pest control cooperatives in the programme period.