



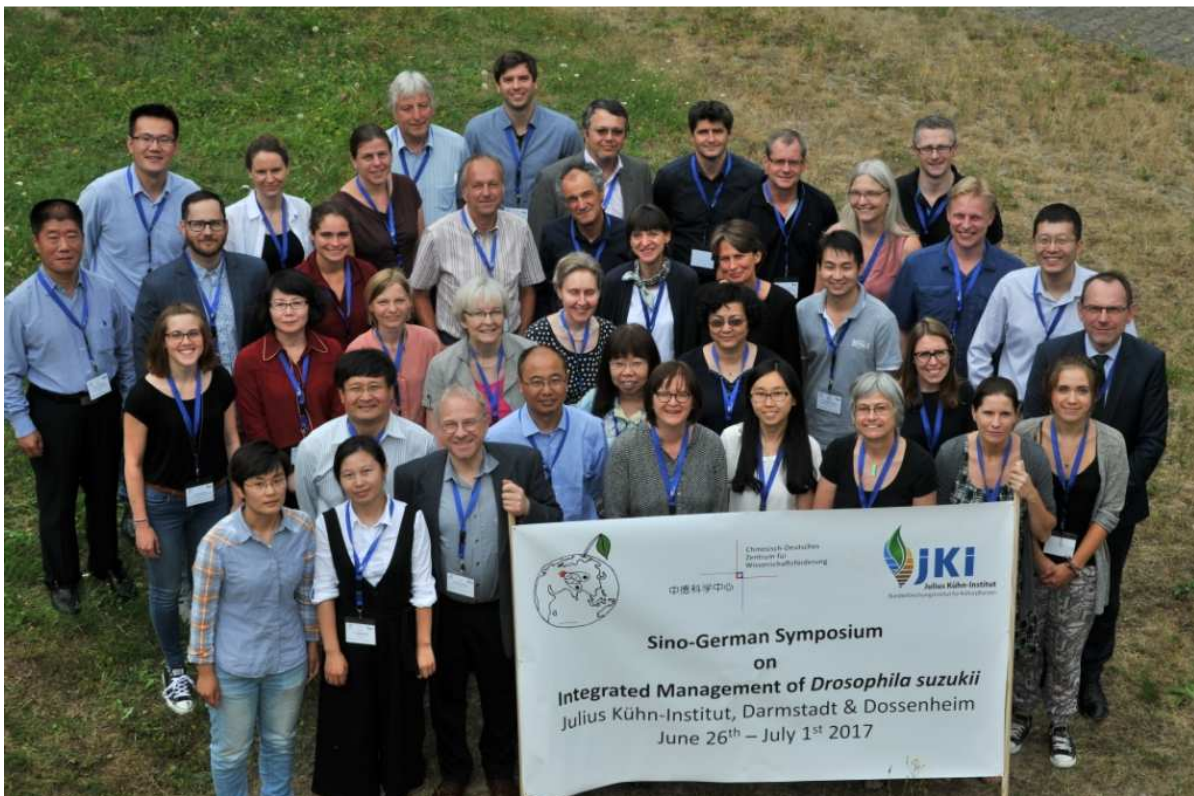
## Sino-German Symposium on Integrated Management of *Drosophila suzukii*

Julius Kühn-Institut, Darmstadt/Dossenheim  
26.06. – 01.07. 2017

### Report

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## 1. Motivation to organize this Symposium

The Spotted Wing Drosophila (SWD), *Drosophila suzukii* (Diptera: Drosophilidae), is a highly polyphagous pest on soft fruits due to multiple oviposition and subsequent larval development. This insect is considered a minor pest in the Asian area of its origin. However, since its arrival in North America and Europe, SWD has become an invasive species and has inflicted huge financial losses in soft fruit and berry production. While new control measures are still being developed in the world, there is an urgent need for the prompt development of sustainable control tools.

German and Chinese experts had already met in June 2015 at Beijing to discuss current research and future cooperation on this topic in a workshop and a subsequent field excursion to Yunnan Province. Both events had been organized by the Department of International Cooperation of MOA and the National Agro-Technical Extension and Service Center (NATESC) as well as the German-Sino Agricultural Center (DCZ) (Vogt et al. 2017: Journal für Kulturpflanzen 69, 16-24). As a follow-up of this activity, Chinese and German scientists successfully submitted a proposal to the Sino-German Center for Science Promotion (CDZ) with the aim to organize a Sino-German Symposium on Integrated Management of *Drosophila suzukii* two years later in Germany.

## 2. Organization and Main Results of the Symposium

This Symposium took place from 26th of June until 1st of July 2017 at the Julius-Kühn Institut (JKI), Federal Research Centre for Cultivated Plants at Darmstadt and Dossenheim, including a field excursion to concerned German fruit growing regions. The Symposium was organized by Dr. Annette Herz and Dr. Heidrun Vogt (both JKI) and Dr. Yifan Zhai (Shandong University), Prof. Dr. Pu-yun Yang (NATESC) and Dr. Feng Zhang (East Asia Centre, CABI). The Chinese delegation arrived on 26th of June safely in Darmstadt. The Symposium started on 27th of June with a workshop at the Institute for Biological Control, JKI Darmstadt, where 38 attendants, including Master and PhD students, were welcomed by Prof. Dr. Johannes Jehle, the director of the Institute and Prof. Dr. Pu-yun Yan, the head of the Chinese delegation (Fig. 1). During two days, more than 30 contributions were presented by experts from Germany (Julius Kühn-Institut, Landwirtschaftliches Technologiezentrum (LTZ) Augustenberg, Hochschule Geisenheim University, State Institute for Viticulture and Enology Freiburg, Fraunhofer Institute for Molecular Biology and Applied Ecology (IME), Max Planck Institute for Chemical Ecology (MPI), Central Institute for Decision Support Systems in Crop Protection (ZEPP), RLP AgroScience, Plant Protection Service of the Chamber of Agriculture Northrhine-Westphalia, Plant Protection Service of Regierungspräsidium Hessen, Technical University of Darmstadt, German-Sino Agricultural Center), from China (Shandong Academy of Agricultural Sciences, Shandong Agricultural University, China Agricultural University Beijing, Huazhong Agricultural University, Yunnan Agricultural University, CABI-East Asia Centre Beijing), from Italy (Technology Transfer Center - Edmund Mach Foundation) and from Switzerland (CABI-Switzerland Centre, Agroscope Reckenholz) (Fig. 2). The invited experts presented and discussed their latest results in research in the field of biology and ecology, overwintering, migration, climate adaptation as well as potential non-chemical strategies and novel approaches to control this serious pest. According to the reports, sufficient scientific evidence exists to conclude that SWD is difficult to control due (1) its short generation time resulting in several overlapping generations with all developmental stages present simultaneously, (2) high population densities, (3) area-wide

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distribution based on its polyphagy and its migration between orchards and natural habitats. Current eco-evolutionary approaches proof the exceptional position of *D. suzukii* in comparison to other related Drosophilidae and try to develop manipulative methods based on this knowledge. The fly is able to distribute/spread rapidly and settle new areas of different structural and climate conditions permanently not only because of its polyphagy, but also due to its morphological and physiological adaptations like oviposition apparatus, visual and olfactorial orientation, diapausing behavior and more. Natural enemies are explored intensively in Asia as well as in Europe. Innovative research looks for possibilities of resistance breeding or the manipulation of field population by the release of sterilized flies. Current IPM-systems which are used in China and Germany were also presented (monitoring, prognosis models, plant protection products, cultural measurements etc.).

At the final discussion, Dr. Marco Roelcke (DCZ) presented the objectives of the German-Sino Agricultura Center and also mentioned various funding programmes, including those of the CDZ for bilateral projects between Chinese and German research institutions. Dr. Heidrun Vogt and Dr. Annette Herz stressed the realized progress since 2015 (first workshop in Beijing) and initiated the discussion for ideas on future joint research projects between Germany and China. After the meeting, talks and abstracts will be disseminated to all participants of the workshop together with the complete participants list with the intention to facilitate communication between them (see annex of this report).

On 29<sup>th</sup> of June, the workshop continued at the Institute for Plant protection in Fruit Crops and Viticulture at JKI Dossenheim. After an opening address by Prof. Dr. Jelkmann, the participants were invited to visit laboratories and the experimental field site with the opportunity to discuss particular research topics, especially the development of control strategies aiming on the behavioural manipulation of the fly (Fig. 3). In a subsequent round table discussion during lunch, research areas for cooperation were identified.

The next venue was the LTZ Augustenberg/Karlsruhe, a governmental institution of the Federal State Baden-Württemberg with advisory and research duties in agriculture. Dr. Kirsten Köppler informed on several research projects at LTZ focussing on management of invasive pests. A trial testing different protective netting systems in raspberry cultivation was presented as well as the test design for study of migration of SWD within the landscape (Fig. 4 & Fig. 5). In the evening, the participants of the excursion on 30<sup>th</sup> of June travelled further south to the Ortenau region (Fig. 6).

The Ortenau region is located in the South-Western part of Baden-Württemberg between the Rhine valley and the Northern Black Forest. Berry and stone fruit cultivation form the main part of fruit growing. Cherries are mainly harvested to produce the typical liquor “Schwarzwälder Kirsch” and come often from taller and older trees, difficult to harvest. The hilly landscape is dominated by a dense network of vineyards, cherry, plum, apricot etc. and berry plantations, hedges and small agricultural fields and therefore offers a rich and season-long supply of various suitable host plants for SWD sustaining high population densities and infestation levels. On 30<sup>th</sup> of June, the participants were first invited to a presentation at the “Obstgroßmarkt Oberkirch” where general methods of quality control and marketing of delivered fruits by growers to this central market of the region were explained. Mr. Beuschlein and Mrs. Früh, advisory services, reported the peculiarities concerning the management of SWD in the Ortenau region and demonstrated a standardized and easy implementable pest surveillance system for private farms which is now used to check potential infestation and to decide on control measures in time (Fig. 7). Thereafter, the participants had the opportunity

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to visit three highly specialized farms (Fig. 8). At first, intensive blueberry production was demonstrated at a farm growing blueberry on the field and in tunnel systems on several ha with staggered ripening and harvesting of various cultivars over the season. Secondly the particular challenges of open-field production of raspberries, and was demonstrated. The last farm produced cherries under rain-protection and the grower explained the implemented methods for pest surveillance and management in this particular condition. In addition he used nets to prevent the entry of birds. After these farm visits, the participants joint for lunch at a vinery of the region and returned then to Darmstadt.

### 3. General Conclusions and Prospects for Collaboration

All participants of the Symposium (workshop and excursion) agreed on the considerable progress which had been made regarding our knowledge on this particular pest insect and also the achievements in practice which help fruit growers to manage SWD until more sustainable pest management systems or natural control will keep population densities under damage thresholds. Nonetheless, further research is urgently needed to clarify many unsolved questions on the basic biology and ecology of SWD in both invaded and original regions of world. Furthermore, innovative approaches, e.g. Sterile Insect Technique, push-pull strategies or selective breeding of resistant berry cultivars, need to be explored further. The Symposium has inspired the participants for new ideas on research and was successful in building a scientific consortium from both countries covering a multi-discipline approach. Topics for bilateral research will be further discussed and funding possibilities explored, e.g. under the umbrella of CDZ. One bilateral project funded by the Ministries of Agriculture, between JKI (Dr. Annette Herz), CABI-East Asia Centre (Dr. Feng Zhang) and Fujian Agriculture & Forestry University (Prof. Dr. Quinge Li) already exists and helps to keep close contact. Thus, follow-up effects are expected for the development of integrated management of SWD in China and Germany as well as in other regions of the world.



Figure 1: Opening addresses by Prof. Dr. J Jehle, JKI (left) and Prof. Dr. Pu-yun Yang, NATESC (right) on June 27<sup>th</sup> 2017



Figure 2: Get-together during the meeting at JKI Darmstadt and dinner on 28<sup>th</sup> of June 2017



Figure 3: Workshop at JKI Dossenheim on 29<sup>th</sup> of June 2017: Opening address by Prof. Dr. W. Jelkmann, Director of JKI Dossenheim (left), Dr. Astrid Eben, Prof. Dr. Li Zheng and Dr. Feng Zhang discuss trap design for catching *D. suzukii*.



Figure 4: Dr. Kirsten Köppler informs on the work of LTZ Augustenberg, a governmental institution of Baden-Württemberg (left). Doris Betz explained experiments on *D. suzukii* management at LTZ Augustenberg (right) on 29<sup>th</sup> of June 2017.



Figure 5: Participants of the excursion at the first stop at LTZ Augustenberg on 29<sup>th</sup> of June 2017, afternoon.



Figure 6: Participants of field excursion at Ortenau fruit growing on 30<sup>th</sup> of June 2017.



Figure 7: Mr. Beuschlein (left) reported on *D. suzukii* management in the Ortenau region. Mrs. Früh (right) informed how the plant protection service cooperates with growers in order to monitor the infestation by *D. suzukii* in the harvested fruit.  
 Figure 8: Visit of two farms: blueberry (left) and cherry (right) and discussion with the growers how IPM of *D. suzukii* is



implemented in practice on 30<sup>th</sup> of June 2017.