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October 2016

Biology and control of the spotted-wing drosophila, *Drosophila suzukii*

The spotted-wing drosophila (SWD), *Drosophila suzukii*, is a polyphagous invasive pest species native to Asia that is able to attack a wide variety of small-fruit crops. This fly is able to lay eggs in fresh ripening fruits due to the serrated ovipositor of the female. The insertion of the ovipositor produces physical damage to the host fruits, and the feeding larvae cause soft and rot fruits. Resulting damage can be up to 80% crop loss. In this context, the development of IPM programs for the control of *D. suzukii* is of great importance to reduce the huge economic impact that this fly can potentially exert on European agriculture.

The objectives of the project IPMDROS were to contribute to the existing knowledge about basic aspects of the biology of SWD and to evaluate possible alternative control methods, that are more environmentally friendly than those currently employed against the fly. In addition, protocols for early detection on the pest have been developed.

Cold tolerance and overwintering potential of SWD is crucial to anticipate population build-up and dynamics in the early season. Different experiments revealed that winter morph adults were more resilient to direct and indirect chilling injury than summer morphs. In winter conditions, oviposition by winter morph females was ceased for approximately six weeks. Females of any age exposed to more favourable conditions could resume egg-laying within one week. These results could indicate the occurrence of a short and shallow reproductive diapause in winter morph females of SWD.

A complete quantification of the effect of temperature on the developmental and reproductive biology of the fly was performed under laboratory conditions. The results showed that the greatest population increase was around 25ºC. At this temperature, a population of SWD doubled its numbers in only three days.

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This explains the huge potential of this fly to produce damage in susceptible crops. With the information gathered, different models were obtained, which could be used in integrated pest management programs of this pest.

The influence of temperature on SWD populations was also evaluated under field conditions. Positive correlation between increasing field temperatures and abundance of SWD adults was found in coastal and inland areas of central Italy in winter and early spring. The SWD abundances recorded were better fit by temperature data interpolated by the Allen method than by the average daily temperature. The Allen interpolation of temperature data seems to give stable forecasting to be considered in strategies to SWD control.

Regarding the laboratory evaluation of alternative control methods, different insect growth regulators, a type of insecticide with lower environmental toxicity, were tested against adults. The percentage of emergence of the offspring of treated flies decreased drastically for cyromazine, lufenuron and pyriproxyfen. However, a continuous exposure to the insecticides was necessary to achieve this effect, so further investigation should focus on the possibility of reducing the time of application of these products for their practical use. In addition, the efficacy of organic labelled products for controlling the pest was evaluated. Promising results were obtained with *Metarhizium anisopliae*, an entomopathogenic fungus that caused a mortality of more than 80% on SWD adults and around 60% on SWD preimaginal stages in direct toxicity trials.

The finding of efficient traps for monitoring and mass-trapping is an important contribution for the control of SWD. A comparison of an enhanced self-made trap type and a commercial available trap type was carried out regarding the catch efficiency for SWD and the position of the traps in the orchard. Results revealed a significantly higher number of SWD in the self-made traps and in traps positioned at a height of 1.5 m. Significantly more females were caught in the traps. Therefore, the self-developed traps are an effective, suitable alternative to commercially available traps.

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Additionally, the status of SWD in Turkey, which is considered a non-invaded country, was clarified. For early detection of SWD, a trapping system baited with apple vinegar was used to determine the presence of the pest in the major Turkish fruit grown areas. Training activities were organized at national level and technical instructions were prepared including description, biology, hosts, pathways and damages of the pest. A leaflet was printed and distributed to technical staffs and producers to increase public awareness. To date, SWD has not been detected in Turkey and surveys and sample evaluation will be continued.

Project ID: Integrated pest management strategies against *Drosophila suzukii* (IPMDROS)