Cite as: Dieckhoff, C., Zimmermann, O., Köppler, K. (2022) BC-InStink – invasive stink bugs in fruit crops. *Proceedings of the 20th International Conference on Organic Fruit-Growing*, online 2022.02.21-23. Ed. FOEKO e.V. 2022: 138-139

BC-InStink – invasive stink bugs in fruit crops

C. Dieckhoff[1], A. Eben[2], O. Zimmermann[1] and K. Köppler[1]

Abstract

The objective of the federally funded joint project BC-InStink (duration: 04/2021 – 04/2024) is the development of biological plant protection strategies for the invasive stink bug species Halyomorpha halys and Nezara viridula in fruit crops. Damage caused by stink bugs feeding on ripening and ripened fruits will be assessed and characterized which is an important component of effective management strategies. In addition, a monitoring of orchards and their surrounding habitats for natural enemies of these two stink bug species, the assessment of their biological control potential, and rearings of strains of potential biological control agents will be established. Various field entomological methods will be applied to monitor the stink bugs and their natural enemies, including visual surveys of various fruit crops over time and placement of sentinel egg masses for assessment of parasitoid abundance and species diversity.

Keywords: *Halyomorpha halys*, *Nezara viridula*, biological control, natural enemies, *Trissolcus*

Introduction

Invasive stink bugs, especially *Halyomorpha halys* and *Nezara viridula* (Heteroptera: Pentatomidae), have been a threat to fruit crops worldwide and management of these pests has been notoriously challenging (Leskey & Nielsen, 2018). These species are known for their strong dispersal capacities and continuous movement across orchard crops throughout the growing season in dependence of the ripening state of the fruit. Due to this constant migration of both adults and nymphs between fruit crops, allocation of observed damage patterns on fruit to the causing agent as well as execution of pest management measures can be difficult. Crop losses can arise both pre- and post-harvest when seemingly marketable fruit are put into storage and damages manifest themselves over time rendering stored products unsellable. The consequences can be significant economic losses for fruit growers. The successful implementation of control strategies against pest species, thus requires profound knowledge regarding the movement behavior and subsequent damage caused by the target pest. An important component of a long-term successful management strategy against invasive stink bugs is the involvement of natural enemies, primarily parasitoids. Especially egg parasitoids are known for their potential for population control of pentatomid pests (Orr, 1988), such as species within the genera *Trissolcus*, *Telenomus*, and *Anastatus*. Also, tachinid parasitoids (Diptera: Phasiinae) parasitizing adult stink bugs can be valuable biological control agents. In April 2021, a federally funded, 3-year joint project (acronym: BC-InStink) started its research efforts addressing the above-mentioned key aspects with the goal to develop biological control strategies against *H. halys* and *N. viridula* for German fruit growers. The project is a cooperation between the Agricultural Research Center Augustenberg (LTZ), the Julius Kühn-Institut for Plant Protection in Fruit Crops and Viticulture, Dossenheim, and Katz Biotech AG.

Materials and Methods

In 2021, in and around research plots at the LTZ and JKI, respectively, where both pentatomid species have been established, monitoring of *H. halys*, *N. viridula*, and their respective natural enemies was conducted. For the stink bug monitoring, pheromone traps (*H. halys* only, as no pheromones for *N. viridula* are currently available) were placed in the fringe habitats, and additional regular, visual inspections of selected crops within the plots were carried out. Natural enemy survey methods included (a) collection of naturally laid egg masses and (b) placement of sentinel egg masses. In addition, at the LTZ a study on apple fruit damage to different varieties occurring during the harvesting period as well as the effect of post-harvest storage on the development of damage patterns in apple was conducted. Here, preliminary results of these research efforts are presented.

[1] 1 Agricultural Research Center Augustenberg (LTZ), 76227 Karlsruhe, contact: christine.dieckhoff@ltz.bwl.de
[2] Federal Research Centre for Cultivated Plants, 69221 Dossenheim, astrid.eben@julius-kuehn.de

Results and Discussion

In 2021, *H. halys* was the dominant pest species in different fruit crops at the LTZ experimental station. An unusually harsh cold spell in the beginning of the year was probably the main cause for overwintering *N. viridula* populations to crash early on in the season. At the LTZ, the prevalent natural enemy species recovered from naturally laid and sentinel egg masses of both *H. halys* and *N. viridula* where parasitoids in the genus *Trissolcus* (Hymenoptera: Scelionidae).

During the first project year in 2021, at the JKI field station, most *H. halys* were found in pheromone traps deployed in late summer and early fall. *N. viridula* were only occasionally observed on berry fruits. Overall, less stink bugs were present in the orchards at the field station compared to 2020. Natural enemies obtained at the JKI field station from both naturally laid and sentinel egg masses could also be identified as egg parasitoids from the genus *Trissolcus* (Hymenoptera). Scarce fruit damage observed on harvested apples and pears could not be related to stink bug feeding.

The fruit damage monitoring showed a varying percentage of damages from 8 % to 76 % caused presumably by *H. halys* (being the dominant pest species) in apple varieties. Observed damages at the LTZ experimental station were higher in areas close to hedges than away from fringe habitats. Damages did not increase after cold storage as well as after storage in controlled atmosphere. These results give a first impression of post-harvest risk potential of *H. halys* for apple. The monitoring will be continued in different fruit crops in the following years.

Acknowledgements

The project is supported by funds of the Federal Ministry of Food and Agriculture (BMEL) based on a decision of the Parliament of the Federal Republic of Germany via the Federal Office for Agriculture and Food (BLE) under the innovation support programme. (FKZ: 2818713A19)

References

Leskey, T.C.; Nielsen, A.L. (2018). Impact of the invasive brown marmorated stink bug in North America and Europe: History, biology, ecology, and management. Annual Review of Entomology, 63(1): 599-618

Orr, D. B. (1988). Scelionid wasps as biological control agents: a review. *Florida Entomologist*, 506-528.