*11th Conference on Dynamical Systems Applied*
*to Biology and Natural Sciences DSABNS 2020*
*Trento, Italy, February 4-7, 2020*

# INCORPORATING MATHEMATICAL MODELS AND BIOCONTROL INTO IPM PROGRAMS FOR INVASIVE ALIEN INSECTS

Gianfranco Anfora*[1,2], Andrea Pugliese[3],
Livia Zapponi[1], Marco Valerio Rossi Stacconi[1,4], Claudio Ioriatti[5]

[1]Research and Innovation Centre, Fondazione Edmund Mach (FEM),
via E. Mach 1, 38010, San Michele allAdige (TN), Italy

[2]Centre Agriculture Food Environment (C3A), University of Trento,
via E. Mach 1, 38010, San Michele allAdige (TN), Italy

[3]Department of Mathematics, University of Trento,
via Sommarive, 14, Povo, Italy

[4]Department of Horticulture, Oregon State University,
Corvallis, OR 97331

[5]Technological Transfer Centre, Fondazione Edmund Mach (FEM),
via E. Mach 1, 38010, San Michele allAdige (TN), Italy

gianfranco.anfora@unitn.it (*corresponding author)

Biological invasions are now considered a major form of human-induced global change, due to trade globalization and the increasing movements of people, goods and vehicles, combined with climatic and environmental variability. In particular, climate change is expected to favour the spread of several species also toward higher altitudes and latitudes. The spotted wing drosophila *Drosophila suzukii* and the brown marmorated stink bug *Halyomorpha halys*, both native to Asia, are polyphagous insects with a broad climate range tolerance, facility to passive transportation and a high invasive potential. They became noxious crop pests anywhere introduced, causing heavy economic losses, and represent a serious threat for agriculture in Trento Province. Since their first detection in Trentino, many efforts have been made to develop nontoxic effective management strategies, nonetheless chemical control remains the principal tool used by farmers to reduce the pest population. There are a number of drawbacks associated with the massive use of pesticides, including increased risk of residues on fruit, worker safety reduction and ecological imbalances resulting in secondary pest outbreaks. Moreover, the use of broad-spectrum chemistries jeopardizes the results obtained with IPM on cultivated fruits. In this context, the development of alternative control methods appears urgent to ensure an economic future for the concerned fruit industry. Possible solutions would only arise from a multidisciplinary approach, from genetics to biological control and mathematical population models, aiming at understanding the fundamental aspects of the ecology of these pests and paving the way for implementing effective and sustainable control strategies. In particular, for *D. suzukii* we have characterized the life history

©DSABNS ISBN: 978-989-98750-7-4

traits of the pest and the population structure after key bottleneck periods, such as winter diapause, in order to better predict serious outbreaks and improve the effectiveness of pest management decisions. We also evaluated the potentiality of the *D. suzukii* indigenous parasitoids in open field and semi-field conditions, and the effectiveness of different biocontrol techniques. A similar approach is ongoing also for *H. halys*, for which adventive populations of the native parasitoids have been recently found in our territory.

©DSABNS
ISBN: 978-989-98750-7-4