OREGON STATE UNIVERSITY EXTENSION SERVICE

SWD series #3

Host Range and Characteristics Affecting Fruit Susceptibility to Spotted-wing Drosophila

M.V. Rossi-Stacconi, L. Brewer, D. Dalton, J. Lee, R. Nieri, K. Park, F. Pfab, G. Tait, V. Walton

Fruit that are susceptible to SWD

Spotted-wing drosophila can develop on a wide range of cultivated and wild, soft-skinned fruits. This complicates pest management because SWD populations can move among several hosts with different ripening times throughout the year, allowing them to survive and reproduce in many environments.

Host susceptibility is influenced by such characteristics as color intensity, sugar content (°Brix),

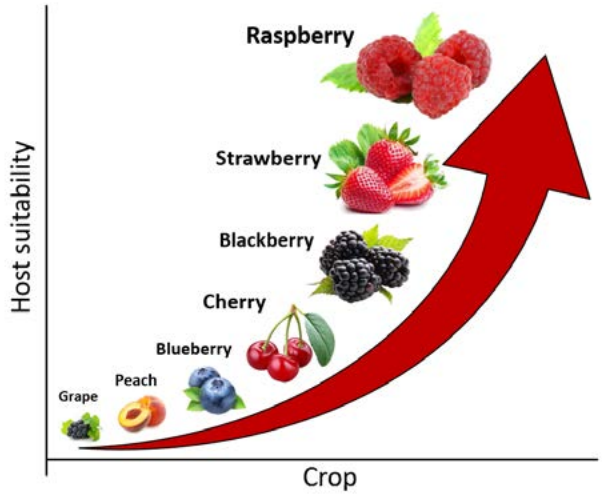

Illustration: Marco Rossi-Stacconi, © Oregon State University

Figure 1. Susceptibility ranking of fruits based on aroma preference, egg-laying performance and reproductive success of SWD (after: Bellamy et al. 2013).

Key points in this fact sheet

- *Commercially important fruits in Oregon susceptible to spotted-wing drosophila (SWD) (from most susceptible to least susceptible) include raspberry, strawberry, blackberry, cherry, blueberry and table grapes (Figure 1).*
- *Other fruits such as peaches, cranberries and wine grapes are susceptible when damaged. Other commercial fruit that are intact are not likely to be infested in the field.*
- *Key fruit characteristics indicating susceptibility to SWD are firmness and °Brix (sugar). Increasing sugar and decreasing firmness are correlated with increased susceptibility to SWD damage.*
- *The easiest way to determine fruit susceptibility is to measure sugar content.*
- *Probability of SWD infestation increases above 50% when Brix level increases above 10°Brix.*
- *Fruit are usually too firm for SWD egg-laying when the sugar levels are below 10°Brix.*
- *Most wine grape cultivars resist SWD because of the firmness of the skin.*
- *Pest pressure on an individual crop can vary from season to season.*

Oregon State University

EM 9263
December 2019

flesh firmness, penetration resistance of the skin, and acidity. Fruits become more susceptible to SWD as they begin to take on color and ripening progresses. Maturation indices predict the risk of infestation. For example, blueberry fruit are often not sprayed until the onset of coloration. As fruit ripens, sugar content increases, whereas penetration resistance, firmness and acidity decrease (Figure 2).

The increase in sugar content is the easiest way to determine fruit susceptibility and can be measured

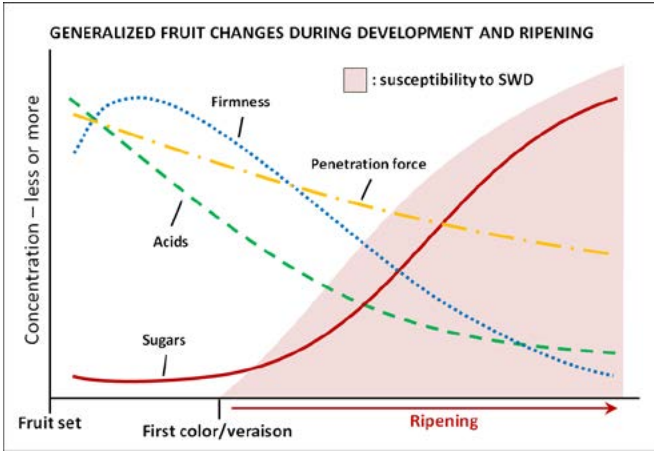

Illustration: Marco Rossi-Stacconi, © Oregon State University

Figure 2. Fruit susceptibility to spotted-wing drosophila associated with changes of physical and chemical features (adapted from Lee et al. 2016).

directly in the field with a refractometer. Fruit are usually too firm for SWD egg-laying when sugar levels are below 10°Brix. Above that threshold, the probability of SWD infestation increases by 50%.

Differences in susceptibility between cultivars are influenced by physical characteristics such as texture, firmness, and the force required to penetrate the skin. Selecting thicker-skinned cultivars of cherry, blueberry, peach and grape may reduce SWD infestation. SWD are less successful and spend more time trying to lay eggs in thicker-skinned fruit. In cherries, cultivars that are resistant to fruit cracking also limit SWD infestation and their population buildup.

Multiple studies indicate that SWD do not prefer wine grape as a host. The majority of grape cultivars resist SWD attack during the harvest period because of relatively high skin penetration resistance. Nonetheless, SWD are able to lay eggs in damaged fruit and intact fruit of soft-skinned varieties. SWD feed on damaged berries during the harvest period. When berries are cracked, diseased or damaged by birds, heavy rainfalls or hail, levels of SWD feeding and egg laying increase, along with the possibility of spreading spoilage bacteria and fungi.

Further reading

Bellamy, D.E., M.S. Sisterson, S.S. Walse. 2013. Quantifying host potentials: indexing postharvest fresh fruits for spotted wing drosophila, *Drosophila suzukii*. *PLoS ONE* 8: e61227.

Burrack, H.J., G.E. Fernandez, T. Spivey, D.A. Kraus. 2013. Variation in selection and utilization of host crops in the field and laboratory by *Drosophila suzukii* Matsumura (Diptera: Drosophilidae), an invasive frugivore. *Pest Management Science* 69 (10):1173–80

Diepenbrock, L.M., K.A. Swoboda-Bhattarai, H.J. Burrack. 2016. Ovipositional preference, fidelity, and fitness of *Drosophila suzukii* in a co-occurring crop and non-crop host system. *Journal of Pest Science* 89(3): 761–769

Entling, W., S. Anslinger, B. Jarausch, G. Michl, C. Hoffman. 2019. Berry skin resistance explains oviposition preferences of *Drosophila suzukii* at the level of grape cultivars and single berries. *Journal of Pest Science* 92(2): 477–484.

Ioriatti, C., V. Walton, D. Dalton, G. Anfora, A. Grassi, S. Maistri, V. Mazzoni. 2015. *Drosophila suzukii* (Diptera: Drosophilidae) and its potential impact to wine grapes during harvest in two cool climate wine grape production regions. *Journal of Economic Entomology* 108(3): 1148–1155.

Ioriatti, C., R. Guzzon, G. Anfora, F. Ghidoni, V. Mazzoni, T.R. Villegas, D.T. Dalton, V.M. Walton. 2018. *Drosophila suzukii* (Diptera: Drosophilidae) contributes to the development of sour rot in grape. *Journal of Economic Entomology* 111(1): 283–292.

Little, C.M., T.W. Chapman, D.L. Moreau, N.K. Hillier. 2016. Susceptibility of selected boreal fruits and berries to the invasive pest *Drosophila suzukii* (Diptera: Drosophilidae). *Pest Management Science* 73(1):160–166

Lee, J.C., D.T. Dalton, K.A. Swoboda-Bhattarai, D.J. Bruck, H.J. Burrack, B.C. Strik, J.M. Woltz, V.M. Walton. 2016. Characterization and manipulation of fruit susceptibility to *Drosophila suzukii*. *Journal of Pest Science* 89, 771–780.

Lee, J.C., D.J. Bruck, H. Curry, D. Edwards, D.R. Haviland, R.A. Van Steenwyk, B.M. Yorgey. 2011. The susceptibility of small fruits and cherries to the spotted-wing drosophila, *Drosophila suzukii*. *Pest Management Science* 67, 1358–1367.

Stewart, T.J., X. Wang, A. Molinar, K.M. Daane. 2014. Factors limiting peach as a potential host for *Drosophila suzukii* (Diptera: Drosophilidae). *Journal of Economic Entomology* 107(5): 1771–1779.

About the authors

Marco Valerio Rossi-Stacconi, post-doctoral researcher, horticultural entomology, Department of Horticulture; Linda Brewer, senior faculty research assistant, Department of Horticulture; Daniel Dalton, graduate student, horticultural entomology, Department of Horticulture, all of Oregon State University; Jana Lee, research entomologist, U.S. Department of Agriculture Horticultural Crop Research Unit; Rachele Nieri, post-doctoral researcher, horticultural entomology, Department of Horticulture; Kyoo Park, graduate student, Department of Horticulture; Ferdinand Pfab, post-doctoral researcher, ecology, evolution and marine biology, University of California, Santa Barbara; Gabriella Tait, post-doctoral researcher, horticultural entomology, Department of Horticulture; Vaughn Walton, professor of horticultural entomology, Department of Horticulture, both of Oregon State University.

We acknowledge contributions from multiple funding sources and collaborators. Oregon State Blueberry Commission, United States Department of Agriculture (USDA), National Institute for Food and Agriculture awards #2010-51181-21167, #2015-51181-24252, USDA OREI #2014-51300-22238, USDA NWCSFR, and Oregon State University Agriculture Research Foundation. We also thank Drs. Bernadine Strik, Chad Finn, Dave Bryla and Wei Yang for providing blueberry plots. We thank the many growers who have collaborated with us to better understand this pest. We thank OSU NWREC, OSU MCAREC and Lewis Brown research farm staff, WSU Research and Extension Center Staff, Prosser, WA for assisting in field setup, maintenance, trials and sample analysis.

About this series

This publication is one of a series of nine publications focused on strategies for controlling spotted-wing drosophila in Oregon. Find them at https://catalog.extension.oregonstate.edu/. The publications in this series include:

- *EM 9261: How Seasons Affect Population Structure, Behavior and Risk on Spotted-wing Drosophila*
- *EM 9262: Cultural Control Strategies to Manage Spotted-wing Drosophila*
- *EM 9263: Host Range and Characteristics Affecting Fruit Susceptibility to Spotted-wing Drosophila*
- *EM 9264 Alternate Reproductive Substrate Used By Spotted-wing Drosophila*
- *EM 9265: Chemical Control of Spotted-wing Drosophila: Spray applications*
- *EM 9266: Chemical Control of Spotted-wing Drosophila: Insecticide Efficacy*
- *EM 9267: Monitoring Techniques for Spotted-wing Drosophila*
- *EM 9268: Potential Impacts of Irrigation on Biocontrol on Spotted-wing Drosophila Populations*
- *EM 9269: Biocontrol of Spotted-wing Drosophila*

Published December 2019