



May 2024

Economic Analysis of using Exclusion Netting for Spotted Wing Drosophila Management in Organic Blueberry Production Systems

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INTRODUCTION

Spotted wing drosophila (SWD) is a small fruit fly and farm pest whose larvae feed on soft fruits, including cane berries (raspberries, blackberries, etc.), blueberries, strawberries, and wine grapes. It was first detected in New York in 2011 and by 2012 was found throughout the state.

Spotted wing drosophila infestation results in lower yields due to unmarketable fruit that reduces sales. Organic pesticides have been a go-to choice for organic fruit farms, but concerns about their effectiveness and environmental impact exist. Exclusion netting has emerged as a promising integrated pest management (IPM) solution as it provides both effective and profitable pest control. According to the Cornell Fruit Resources webpage, "Netting is 100% effective if effectively managed, meaning netting is installed before SWD arrives, no holes are present, and nets are routinely inspected and maintained throughout the season."²

This study has researched several farm management scenarios where exclusion netting outperforms organic pesticides for small-scale organic blueberry growers in New York state. In addition, researchers are developing a spreadsheet tool to help farmers calculate the cost-benefit of using netting versus spray according to their own farm inputs.

THE STUDY

Researchers provide a detailed economic analysis between insecticides applied in fields to

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² <https://fruit.cornell.edu/spottedwing/management/>

exclusion netting in high tunnels. The data used in the study are a combination of experimental trials, farmer surveys, and expert opinions regarding small-scale, organic blueberry operations in New York. Researchers examine the cost-revenue differences under various farm management scenarios to provide a nuanced understanding of the economic feasibility and benefits of the netting. Scenarios used in the calculations vary according to:

- losses in yield due to detectable infestation (2%, 4%, and 10% losses in yield of marketable fruit),
- the susceptibility of different blueberry cultivars to additional, undetectable yield losses from SWD (undetectable infestation) (a mid-season, mixed seasons, and late-season cultivars),
- historical New York, organic berry farm prices from different marketing channels (pick-your-own (PYO) only, average farm price for combined PYO, wholesale, and farm retail channels, and average farm price for wholesale and farm retail channels only).

The additional cost of using exclusion netting and the reduced cost of not using organic insecticides in the analysis remain consistent throughout all the scenarios.

In all of the scenarios analyzed, the benefits outweighed the costs for netting and for organic sprays and either management method is better than nothing. To learn more about which might be the preferred management, researchers looked at the benefit-cost ratio (BCR) of using exclusion netting *versus* spray. When the number is greater than 1, the netting benefits are greater than the spray benefits.

The table below presents the recommended pest control method (netting versus pesticides) according to each scenario of blueberry cultivar and price. In parentheses, is the ratio. In many scenarios using mid-season cultivars, the ratios are close to one, meaning that the two methods are similar depending on the berry price. As later cultivars are added, scenarios "mixed cultivars" and "late season only", netting almost always outweighs sprays.

According to this analysis, exclusion netting controls SWD under most of the scenarios better than organic pesticides and provides more financial benefits.

The recommendation for when to use netting does vary by the farm berry price as well as other factors on the farm that are not included here. Since farms are operating under so many different management styles and use different cultivars and pricing strategies, the researchers have developed a spreadsheet tool to help farms determine whether to install netting. Farms input their own costs and prices to see if exclusion netting would benefit them. The tool is still under development and information will be released when it is finished.

Sensitivity Analysis Using the Benefit-Cost Ratio (BCR) with Different Marketing Channels, by Cultivar Type

CULTIVAR TYPE	AVERAGE FARM PRICE		
MID-SEASON ONLY	\$3.18/lb (UPick only)	\$4.34/lb (mixed marketing channels)	\$5.50/lb (wholesale and retail only)

Detectable yield losses			
SCENARIO 1: 2% YIELD LOSS	Netting	Netting	Netting
	(BCR: 1.008)	(BCR: 1.028)	(BCR: 1.040)
SCENARIO 2: 4% YIELD LOSS	Spraying	Netting	Netting
	(BCR: 0.989)	(BCR: 1.008)	(BCR: 1.02)
SCENARIO 3: 10% YIELD LOSS	Spraying	Spraying	Spraying
	(BCR: 0.930)	(BCR: 0.947)	(BCR: 0.958)
MIXED CULTIVARS	\$3.18/lb (UPick only)	\$4.34/lb (mixed marketing channels)	\$5.50/lb (wholesale and retail only)
Detectable yield losses			
SCENARIO 1: 2% YIELD LOSS	Netting	Netting	Netting
	(BCR: 1.075)	(BCR: 1.099)	(BCR: 1.114)
SCENARIO 2: 4% YIELD LOSS	Netting	Netting	Netting
	(BCR: 1.054)	(BCR: 1.078)	(BCR: 1.092)
SCENARIO 3: 10% YIELD LOSS	Spraying	Netting	Netting
	(BCR: 0.992)	(BCR: 1.013)	(BCR: 1.026)
LATE SEASON ONLY	\$3.18/lb (UPick only)	\$4.34/lb (mixed marketing channels)	\$5.50/lb (wholesale and retail only)
Detectable yield losses			
SCENARIO 1: 2% YIELD LOSS	Netting	Netting	Netting
	(BCR: 1.152)	(BCR: 1.181)	(BCR: 1.199)
SCENARIO 2: 4% YIELD LOSS	Netting	Netting	Netting
	(BCR: 1.13)	(BCR: 1.158)	(BCR: 1.175)
SCENARIO 3: 10% YIELD LOSS	Netting	Netting	Netting
	(BCR: 1.06)	(BCR: 1.088)	(BCR: 1.104) a

DISCUSSION

The effect of different cultivars on the study recommendations is important. SWD populations grow exponentially from almost zero mid-season to high later in the season. According to Greg Loeb, "Most years, early season cultivars do escape the worst of the SWD pressure of the season. Over the past 10 years, there has been at least one year where earlier cultivars were fruiting with high SWD pressure."

Farms with a mix of cultivars will likely want to use netting unless farms are seeing losses of 10% or more AND their berry price is under \$3.18/lb. At this point, netting will still benefit your farm profitability, but organic sprays will benefit it more. According to the project calculations, netting is recommended under all the scenarios with only late season cultivars.

Established growers in New York usually have a mixture of cultivars, which produce from early to late season. These are sometimes planted together in blocks or rows or can be interspersed.

Therefore, growers may want to manage SWD at the level of the latest harvested cultivar. If they assume their mid-season cultivar will "get by" with organic sprays, they may compromise control for late-season cultivars.

Contact your Cornell Fruit Team specialist to see if exclusion netting is right for your farm. And stay tuned for further information on the spreadsheet tool so you can calculate the cost-benefits for your own farm.

This study was funded by the USDA National Institute for Food and Agriculture (NIFA), Organic Agriculture Research and Extension Initiative (OREI) *Award number 2022-51300-37890* and the New York State Berry Growers Association.

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