ENTOMOLOGY

RESEARCH & EXTENSION

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2. TITLE: Validation of the Spotted Wing Drosophila (SWD) Male Trap Capture Threshold

OBJECTIVES & INTRODUCTION

Previous work had shown that captures of SWD males can be used as a reliable method for determining when fields are at risk from larval infestation. Excellent validation of this risk-based threshold resulted from work in 2016 and 2017. However, the SWD threshold system appeared to have broken down in 2018. The 2018 growing season was atypically hot during the SWD buildup period of July and August in both the Downeast and Coastal growing areas. Early harvest still avoided SWD infestation, but fields harvested starting in mid-August did not show a delay between the male SWD threshold and fruit infestation. In 2018, many threshold levels that in the past would suggest a low probability of fruit infestation actually became infested. Because of the unusual results observed in 2018, research was completed in 2019 to further validate and fine-tune our current risk-based threshold recommendations.
LOCATIONS: Union, Stockton Springs, Frankfort, Northport and Hope, ME
PROJECT TIMEFRAME: July 2016 – September 2019

METHODS

Cooperating growers allowed us to trap adult SWD and sample fruit for larval infestation on a weekly basis. The fields were maintained by the growers using typical wild blueberry production practices. Traps were placed in eleven wild blueberry fields in Mid-coast, Maine. Trapping for adult SWD began in early July and continued until larval infestation of fruit was detected or until fields were harvested. Traps were monitored at three to nine-day intervals. All traps were constructed from Solo®, 16 fl. oz, red polystyrene cups with light-blocking lids. Seven to ten, 3/16-inch holes were punched on the side of each container near the top, evenly spaced around the rim. Bait consisted of live yeast (1tbsp) + sugar (4tbsp) + 12oz water (makes enough for four traps). Three traps were placed at each site and were hung 1-2 ft above the top of the canopy using 36-inch plant stands. Throughout the study and on each sample date, traps set the previous week were collected and returned to the laboratory and processed to determine the number of SWD males per trap. New traps were deployed weekly. Using these data, we calculated the number of males per trap captured from each site on each date and the mean cumulative number of SWD males captured over the collection period.

To compare adult abundance with larval infestation, weekly fruit samples were taken from the eleven fields beginning in mid-July until the fields were harvested. The samples were processed using the Salt Extraction Method described in Maine wild blueberry factsheet #210 (http://umaine.edu/blueberries/factsheets/insects/210-spotted-wing-drosophila/). Each sample consisted of a ca. 1-cup sample collected from the vicinity of each of the three adult traps (three samples per field). Using these data, we calculated the mean

number of larvae collected at each site on each sample date. These data were compared with the adult abundance data collected over the same time period.

RESULTS

In 2019 we found that out of the eleven fields in the study, six had fruit infestation detected prior to harvest (Table 1). Five fields did not have infested fruit at the time of harvest. Two of the five fields had no male SWD detected prior to harvest; and, two of the fields had very low cumulative trap captures of males (0.3 and 2.0) resulting in prediction of 0.1 and 5% likelihood of infested fruit. The fifth field did have a fairly high rate of cumulative male capture at 6.3 males / trap. However, even this level translates into only a 20% chance of infested fruit the following week. This may be too high for many growers, but it does demonstrate that even a 20% chance more often than not will result in no fruit infestation. The six infested fields (except for one field) had extremely high cumulative male SWD trap captures (7.5 - 91.3) resulting in predicted chances of fruit infestation the following week of 28-90%. One field had a SWD cumulative trap capture of 4.7 which results in a prediction of only a 15% chance of infestation, yet this field did have infected fruit. Comparing this field to the non-infested field with a male SWD capture of 6.3 just shows that predictions of 15-20% can result in risk of infestation in our case 50% or 1 of 2 fields. Overall, our model for predicting fruit infestation was quite accurate. If we look at 7.5 male SWD as a threshold then there were 7 fields that were at or under this threshold. The predicted probability of infested fruit is 28%. In our study two of these seven fields had infested fruit, 28.6%. Therefore, we feel that our predictive model performs well.

Table 1. Fruit Infestation, male SWD capture, and PREDICTED probability of fruit infestation based upon mean cumulative SWD captures.

Field (Mid-Coast)	First male SWD detected	Status of fruit infestation before or at harvest	Date fruit infestation found, or field harvested	Mean #SWD males' week before infestation detected	Probability of fruit infestation week after male SWD threshold [a]
1	6-Aug	YES	16-Aug	17.7	50%
2	5-Aug	YES	19-Aug	12.3	40%
3	29-Jul	YES	23-Aug	91.3	90%
4	29-Jul	YES	18-Aug	20.0	60%
5	22-Jul	YES	12-Aug	7.5	28%
6	22-Jul	YES	12-Aug	4.7	15%
7	28-Jul	no	5-Aug	0.3	0.10%
8	6-Aug	no	16-Aug	6.3	20%
9	5-Aug	no	12-Aug	2.0	5%
10	no males	no	5-Aug	0.0	0
11	no males	no	5-Aug	0.0	0

[a] approximate probabilities based upon interpolation of the probability density function.

DISCUSSION

This study completes four years (2016-2019) of validating our predictive model for SWD fruit infestation based upon the average cumulative male SWD trap capture. Over this

time, we have monitored 46 wild blueberry fields in both the Mid-Coast and Downeast regions of Maine. Observations in three of the four years have resulted in model predictions that were supported by what we found in the field. Predictions for 2018 were not well supported by fruit infestation observations in the field. Therefore, we have a fairly accurate model for predicting fruit infestation, but caution should be observed in using the model predictions.

CURRENT RECOMMENDATIONS

Two recommendations should be followed when using this model for management of SWD. First, a conservative approach is recommended. By this we mean that, as a buffer from infestation, growers should use somewhat lower infestation likelihoods than their perceived risk level. Second, as we have recommended for the past four years, the predictive model should NOT be used WITHOUT sampling fruit and determining the status of infestation during the season, especially after SWD captures begin to climb. If these two recommendations are followed, then we believe that predictions of infestation can be a viable and important part of SWD management in wild blueberry.

NEXT STEPS

Project is complete.