EVALUATING MASS TRAPPING AS A TOOL FOR NON-CHEMICAL SPOTTED WING DROSOPHILA (SWD) MANAGEMENT

FARM ADAPTATION INNOVATOR PROGRAM | RESEARCH SUMMARY | APRIL 2019 - MARCH 2022

Geographic Applicability

- Research sites: Fraser Valley
- Applicability : South Coast and Interior fruit growing regions

Commodity Relevance

- Berries
- Soft fruit (e.g. cherries, peaches, plums)

Practical benefits

- Mass trapping has the potential to reduce SWD populations and decrease reliance on insecticides and can be cost effective
- More research is needed to increase the effectiveness of mass trapping methods to prevent crop damage

Project lead

- E.S. Cropconsult Ltd.

Research Team

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Project Overview

Spotted wing drosophila (SWD) has been a major concern for all small fruit crops, including berries and soft fruits, in British Columbia since its detection in 2009. SWD females lay their eggs in ripe fruit, causing them to become unmarketable and resulting in high crop losses. SWD can multiply quickly, due in part to having a wide range of crop and non-crop host plants. Climate change is increasing the occurrence of mild winters and unpredictable summer weather that create ideal conditions for SWD, while also making it more difficult for growers to manage the pest.

Currently, the most effective and widely used method of management for SWD is regular insecticide applications from the beginning of fruit ripening until the end of harvest. Concerns about the risk of spray resistance are increasing, and there are few treatment options for organic growers. Unpredictable summer weather is also making management with insecticides less effective. Alternative management methods for SWD are much needed.

In this three year study mass traps were placed in hedgerows adjacent to blueberry fields of early to mid-season varieties in the Fraser Valley, BC (Figures 1 and 2). After comparing between two trap types using the same lure, the pairing of the Scentry IPM-MLT SWD trap and the SC-SWD L pouch lures (Scentry Biologicals Inc.) was found to be the most effective at catching higher levels of SWD, even during the early spring.

The mass trapping treatment methods used did not appear to reduce SWD pressure to the crop. However, mass trapping methods could be adjusted to increase effectiveness, for example by placing mass traps along all field edges in a perimeter set-up, or by changing the lure to a fruit-odour based type just before the crop ripens.

The cost of mass trapping, including equipment and labour, is comparable to what growers are currently spending to apply insecticides. For those using the most expensive insecticide available, which includes organic growers who are limited to a single option, mass trapping is much less expensive.

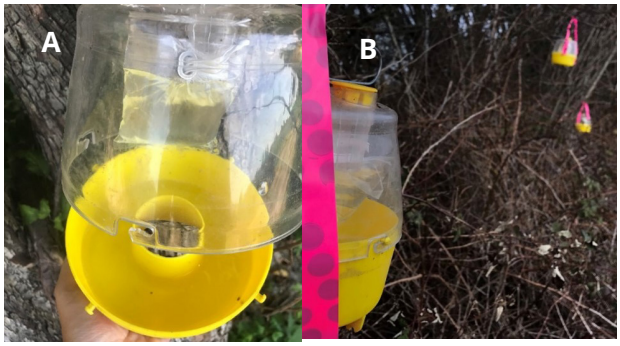

Figure 1.
(a) Scentry IPM-MLT SWD trap with SC-SWD L pouch lure (Scentry Biologicals) and soapy water catch solution,
(b) multiple traps hung 2 m apart in a hedgerow as the Mass Trapping treatment area.

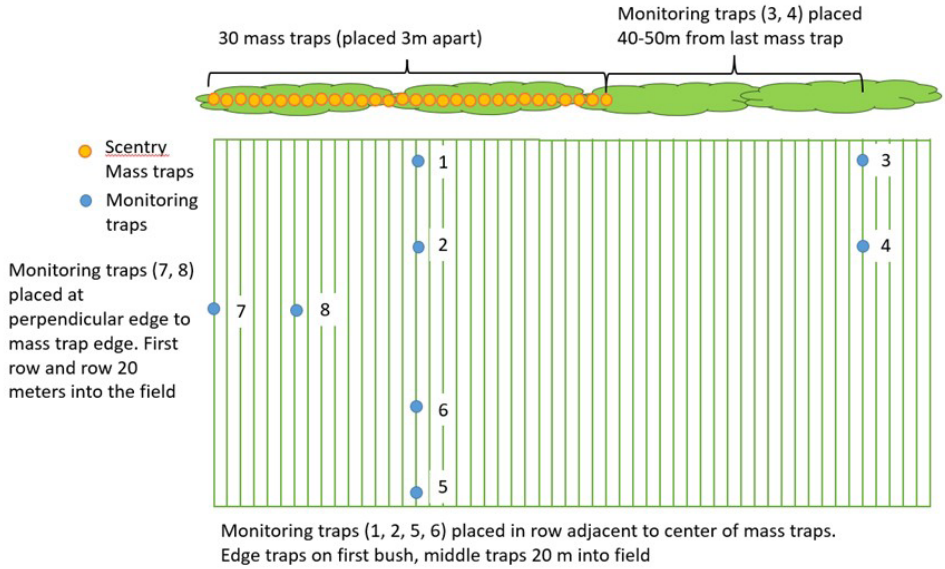

Figure 2. Diagram of the spotted wing drosophila (SWD) mass trap within the hedgerow adjacent to a commercial blueberry field and monitoring trap placements in Year 3 of the study. In 2019, traps 7 and 8 were not used. In 2019 and 2020, only 20 mass traps were set up, alternating between trap types (Scentry and Trécé).

KEY FINDINGS

Trap Performance

Two trap types were tested, the Scentry IPM-MLT SWD trap (Scentry Biologicals Inc.) and the Trécé TR-SWD RT Mesh trap (Trécé Inc.), both baited with SC-SWD L pouch lures (Scentry Biologicals Inc.). The Scentry trap was determined to be more effective at catching higher numbers of SWD.

Mass Trapping Effectiveness

The mass traps were found to be effective in catching large numbers of SWD throughout the three trapping seasons, even when set-up in early March (Figure 3).

Despite the effectiveness of the traps, the field monitoring did not consistently catch less SWD in the mass trapping treatment sites compared with the control sites. However, in three Bluecrop fields the mass trap treatment area had lower mean SWD catches in the monitoring traps compared to the control area in years two and three. This indicates that the mass traps were drawing more SWD away from the fields, potentially reducing the amount of adult SWD in the adjacent crop.

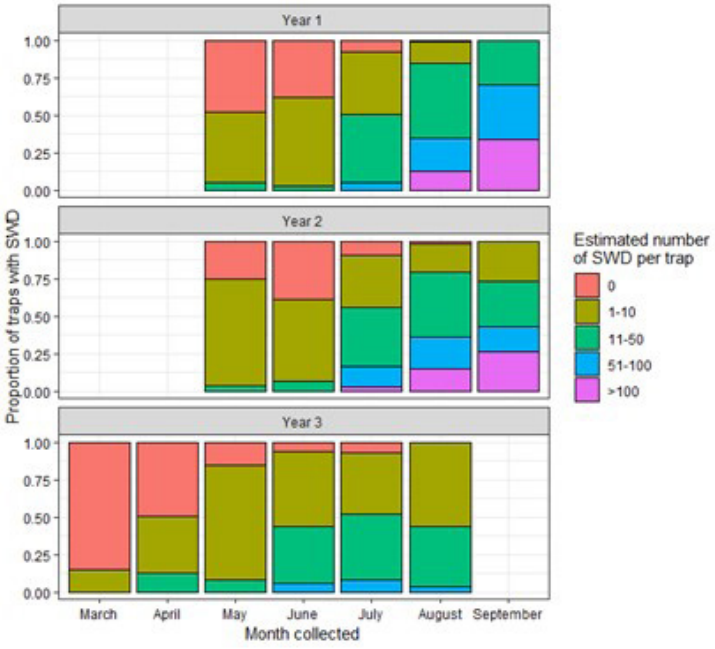

Figure 3. Proportion of estimated number of spotted wing drosophila (SWD) per trap in five categories (0, 1-10, 11-50, 51-100, over 100) in Scentry mass traps for all three years of study.

Crop Protection

Berry assessments used to evaluate the impact of SWD on the blueberry crop also showed inconsistent results. In some fields the Mass Trapping treatments had higher SWD infestations than the Control sites.

Despite the trends observed in the monitoring trap catches, no clear conclusions could be drawn from the berry assessments. High variability in field ecology and the dispersibility of SWD are likely the main factors that make assessing mass trapping impacts in a field such a challenge. Due to the variability in the data, it was difficult to fully assess the impact of the Mass Trapping treatment on the infestation within blueberry fields in the study.

KEY FINDINGS

Distance between traps (m)	Length of field edge (m)	# of traps	Time, initial set-up (4 min/trap)	Time, maintenance (2 min / trap / week)	Trap set-up fee ($14/trap)	Cost of lures ($11/lure)	Total cost per field edge	
							hrs	$
5	100	20	80	40	$280	$220	1.3	$500
	200	40	160	80	$560	$440	2.7	$1,000
10	100	10	40	20	$140	$110	0.7	$250
	200	20	80	40	$280	$220	1.3	$500
15	100	7	28	14	$98	$77	0.5	$175
	200	13	52	26	$182	$143	0.9	$325

Table 1. Labour (hours) and cost ($CAD) estimates of mass trapping for spotted wing drosophila (SWD) along one edge of a berry field at three densities (5, 10, 15 m) and two edge lengths (100, 200 m) using the Scentry trap over a 14-week trapping period.

Cost analysis

Based on the recommended trap density and field edge length, the most expensive option for implementing mass trapping for SWD management would be placing traps 5 m apart along a 200 m edge (Table 1). This option would require 40 Scentry traps (the most effective trap type) and would cost $1,000 for trap and lure supplies, plus the time input for trap set-up and maintenance. This expense is just over three times the cost of the maximum number of Malathion applications in a season in a ten acre field ($330), but almost four times less than the maximum cost of Exirel ($3,600) (Table 2). Compared to Entrust (spinosad), which is currently the only organic-registered SWD product, the most expensive mass trapping option is about half the cost of the maximum number of applications for ten acres, and slightly below the cost of applying this product to five acres (Tables 1, 2).

Product	Max # applications / year	Size of field (ac.)	Cost/ac.		Max cost/ac.	
			hrs (.5/ac.)	$	hrs (.5/ac.)	$
Exirel	4	1	0.5	$90	2	$360
		5	2.5	$450	10	$1,800
		10	5	$900	20	$3,600
Entrust	3	1	0.5	$75	1.5	$225
		5	2.5	$375	7.5	$1,125
		10	5	$750	15	$2,250
Delegate	3	1	0.5	$60	1.5	$180
		5	2.5	$300	7.5	$900
		10	5	$600	15	$1,800
Harvanta	3	1	0.5	$60	1.5	$180
		5	2.5	$300	7.5	$900
		10	5	$600	15	$1,800
Capture	2	1	0.5	$22	1	$44
		5	2.5	$110	5	$220
		10	5	$220	10	$440
Malathion	3	1	0.5	$11	1.5	$33
		5	2.5	$55	7.5	$165
		10	5	$110	15	$330

Table 2. Labour (hours) and cost ($ CAD) estimate of spotted wing drosophila (SWD) maximum allowed insecticide applications per pricing approximations of a selection of products registered for SWD in blueberries in 2021.

Future Research

Spotted wing drosophila is a highly damaging and wide-ranging pest where more research is needed to determine innovative management approaches. This study indicates that mass trapping shows promise as a management strategy, however, further research is needed that refines mass trapping methods to increase effectiveness. Setting up mass traps along all field perimeters or switching to a fruit-odour based lure before the crop ripens are refinements that will likely improve the effectiveness of this method that should be trialled.

RESEARCH METHODS

Over the three years of the study the research methods were continuously refined based on the previous year's findings. In years one and two, mass trapping treatments were set up on ten field sites. In year three the number of traps was increased and the number of field sites was reduced to four.

Mass Traps

A high density of traps containing SC-SWD L pouch lures (Scentry Biologicals Inc.) and soapy water (in which to capture the flies) were placed along the hedgerow of a selection of organic and conventional blueberry fields close to an area identified as containing non-crop spotted wing drosophila (SWD). Mass traps were checked weekly or bi-weekly by trained field technicians. Data was collected on the presence/absence of female/male SWD and the total number of SWD in the traps was estimated using the following categories: 0, 1-10, 11-50, 51-100, and >100 SWD per trap. Mass trapping continued until berries were harvested.

Monitoring traps

To test efficacy of the Mass Trap treatment, six to eight fruit fly monitoring traps baited with apple cider vinegar were placed within the field at varying distances from the Mass Trap area. Traps were placed in a paired design with one trap at the field edge and one trap approximately 20 metres into the field. In all three years of the study, monitoring traps were set up at the late green berry stage, which varied from late-May to mid-June depending on the season. All traps were checked weekly by trained field technicians, the total count of female/male SWD in monitoring traps was recorded.

Berry assessments

Berry assessments were conducted by collecting 100 berries near the monitoring traps. Berries were placed in labelled containers and covered with breathable material (Reemay) to ensure airflow while preventing emerging SWD from escaping. Berries were incubated at room temperature (19-24°C) with natural light for a number of weeks to allow the SWD to develop and emerge.

Cost analysis

A cost analysis was conducted based on a mass trapping method, refined based on the project's findings, and using the same trap type and lure as in the study. Mass trapping costs were estimated based on a range of trap densities (5, 10, 15 m apart) and field lengths (100 m and 200 m), to provide growers with a range of costs and effectiveness. Pesticide product and labour costs were estimated based on discussions with industry members and blueberry growers. The cost analysis compared mass trapping with the costs and labour associated with applying insecticides (Exirel, Entrust, Delegate, Harvanta, Capture and Malathion).

ACKNOWLEDGEMENTS

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