

**Monitoring the arrival and source of pepper weevil using pheromone-baited sticky traps**

Final summary to the OVSFRDP

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**Why was this project funded? (Project Objectives)**

The pepper weevil (PW) (Figure 1) is a major pest of peppers throughout North America, wherever peppers are grown. Even moderate infestations can lead to devastating crop loss. Pepper weevils do not survive during the winter months in northern states like Ohio, mainly because there are no food resources to support populations in the field. However, it has appeared and destroyed pepper crops consistently over the last 2-3 growing season in Ohio. Given the lack of food resources during the winter and early spring, it is likely that a new group of PW arrive to Ohio each year in shipments of infested peppers. We need more information about the arrival of PW in Ohio and the tools available for monitoring activity in the field so that growers are armed to combat this pest. **This project was funded to (1) gather information about the arrival and peak activity of pepper weevils throughout the season, and (2) test the efficiency of pheromone-baited sticky traps for detection of adult weevils in active pepper fields.** Our goal was to provide growers with an effective and easy-to-use trap to detect PW so that they might better plan when to apply insecticides to prevent or slow PW infestations.



**Figure 1.** Adult pepper weevil. Photo courtesy of cooperating grower.

**Project outline (Materials and Methods)**

We used pheromone-baited sticky traps (Figure 2) to monitor adult PW from 6-June-2017 to 13-September-2017. These ready-to-use kits function by way of a lure, which releases the odor of food and potential mates, and attracts adult weevils to a yellow sticky card where they land and are captured (Figure 1). Each of the lure components (food odor and mate odor) are inserted into pre-punched holes on the sticky cards which are then clipped to a rod high enough to avoid debris from the ground. The bottom of the sticky card should be placed at plant height, and moved up as plants grow. The lures can be inserted at either the top or bottom of the sticky card. Additionally, the lures must be replaced monthly to maintain PW attraction. These ready-to-use kits can be purchased from Great Lakes IPM (<http://www.greatlakesipm.com/pepperweevilkit.html>).

We placed traps in three active pepper fields (and one cull field) (Figure 3). The recommendation is to place one trap per every half-acre of crop; however, for our preliminary test of pheromone-baited sticky traps, we focused our efforts on field edges given our suspicion that PW were migrating into the crop from external sources. Thus, the traps were spaced and placed to accommodate as much of the field edge as was accessible. Each field varied in both its distance

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from the cull field and proximity to major roadways: Field C was farthest from the cull field (6.36 miles) and located next to a country road used mainly for agricultural purposes (i.e., little thru traffic). Field A was next farthest from the cull field (2.52 miles) and located next to a heavily-used roadway. Field B was closest to the cull field (1.75 miles) and was relatively isolated from any major roadways. We monitored traps weekly and any captured weevils were collected and returned to the laboratory for identification. The number of confirmed PW adults were recorded for each field.



**Figure 2.** A) Example packages of PEW I and PEW II lures; B) PEW I and PEW II lures out of package; C) example set-up of lures in sticky card; D) final set up of pheromone-baited sticky trap in field. Photos by: R. Sepesy.



**Figure 1.** Google Earth images of the three active pepper fields. Field B, A, & C were close, intermediate, and farthest in distance from the cull field respectively. Numbers indicate the placement of traps.

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Beginning 24-July-2017, we scouted pepper fields on a weekly basis. Scouting consisted of walking 100 feet of row from the edge to the center of each field and examining the buds and fruits on each plant. We recorded the number of adult weevils and egg laying scars, and fruits showing signs of damage or egg-laying scars (Figure 4) were brought back to the lab for examination.



**Figure 2.** A) Pepper weevil oviposition scar; B) pepper weevil pupa found in pepper fruit.  
Photos by: R. Sepesy & E. Long.

### What was discovered? (Results)

- **Pheromone-baited sticky traps are effective in detecting adult PW activity.** We successfully detected adult PW throughout the growing season, with the first detections occurring 19-June-2017 at both an active pepper field and the cull pepper field. *This date was well in advance of pepper fruiting, suggesting that weevils arrived to the area from sources outside of the field.*
- **Number of trap captures at the different fields varied from week to week throughout the monitoring period.** Interestingly, the number of adult captures did not increase or decrease in a predictable manner (Table 1); however, this was likely due to differences in the timing of PW arrival/spread to each field, proximity to busy roadways, and possibly even the emergence of a new generation of adult weevils, particularly in late August and early September.

**Table 1. The number of adult pepper weevils detected on pheromone-baited sticky traps at four monitoring locations in Ohio during 2017. Yellow boxes denote date of first weevil detection for each location. Traps set on 6-Jun-2017.**

<b>Date</b>	<b>Field A</b> (next closest to cull field)	<b>Field B</b> (closest to cull field)	<b>Field C</b> (farthest from cull field)	<b>Cull field</b>	<b>Weekly Total</b> (all sites)
12-Jun	0	0	0	0	<b>0</b>
19-Jun	2	0	0	4	<b>6</b>
26-Jun	0	0	2	0	<b>2</b>
3-Jul	0	0	0	1	<b>1</b>
*10-Jul	1	0	0	0	<b>1</b>
17-Jul	14	1	0	5	<b>20</b>
24-Jul	3	0	7	0	<b>10</b>
31-Jul	1	3	3	1	<b>8</b>
7-Aug	3	1	3	3	<b>10</b>
**25-Aug	21	1	4	15	<b>41</b>
1-Sept	9	0	3	20	<b>32</b>
7-Sept	1	0	3	4	<b>8</b>
13-Sept	9	2	1	3	<b>15</b>
<b>Season Total</b>	<b>64</b>	<b>8</b>	<b>26</b>	<b>56</b>	<b>154</b>

\*Date of lure change; \*\*Collection occurred after lure change on 16-Aug-2017

**What are the take-home messages (Discussion)**

1. Vigilant monitoring is the first and best line of defense against PW infestations. Pheromone-baited sticky traps are effective in attracting and capturing adult PW that may be present in a pepper field and these traps are easy to use. Adult PW on sticky cards can be identified relatively easily with minor training and use of a hand lens or magnifying glass. Furthermore, use of these traps can inform growers about the early arrival of this pest into fields so that insecticide applications can be timed appropriately. Because the eggs and larvae of this pest develop unseen within the plant/fruit, monitoring adult activity is critical to preventing crop damage and loss. *Thus, detecting adult PW activity as early as possible (with baited sticky traps) should be a key strategy for pepper growers in affected areas.*
2. Fields containing intact, culled PW food resources (i.e., pepper, eggplant, tomato) increase the risk of infestation for surrounding pepper fields. Research in the northeast suggests that PW is more likely to infest fields that are within ¼ of a mile of a cull field or processing facility. *Thus, it is recommended that growers destroy culled fruits, so that any PW life stages living unseen within fruits are also destroyed.* This will further reduce the risk of PW

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emergence from culls and subsequent infestation of neighboring active pepper fields.

3. In our monitoring study, there was no clear relationship between distance from the cull field and PW infestation levels. Field B, which was closest to the cull field was least infested, while Fields A & C (next closest and farthest, respectively) were heavily affected by PW. *This suggests that factors other than proximity to culled fruits are important for predicting PW infestation. With this in mind, field proximity to busy roads used to transport crops was likely an important factor.* This would explain why Field A (next to a major road) was infested so heavily even though it was not closest to the cull field. Furthermore, PW is known to hitchhike on cars, equipment, and machinery from one field to the next. *Thus, special care must also be taken to avoid the accidental movement of adults from one field to the next during harvest activities.*

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