The dispersal capacity and host choice of BMSB nymphs

(AKA painting nymphs and watching them move)

Brett Blaauw, Doo-Hyung Lee, Anne Nielsen, and Tracy Leskey

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1. Dispersal capacity
   - Lab-based study
   - Field-based studies:
     • Direct observation on walking
     • Mark-release-recapture study

2. Nymphal host choice
Dispersal Capacity
Walking capacity test in the lab

- Tested 2\textsuperscript{nd} through 5\textsuperscript{th} instars
- Petri-dish arena
- Video tracking system
- Observed for 1 hour
Under lab conditions 3rd instar nymphs moved the greatest distances.

![Graph showing walking distances for different life stages.]

- 3rd instar nymphs walked the greatest distance, indicated by the tallest bar labeled 'a'.
- 5th instar showed a slightly lower distance, labeled 'ab'.
- Adult showed the shortest distance, labeled 'b'.

Life stages: 2nd, 3rd, 4th, 5th, Adult.
Marked nymph position every 5 minutes

- Tracked 3rd and 5th instars
- 30 min for each individual
- Varying temperature throughout day
Under field conditions 5\textsuperscript{th} instar nymphs moved further at higher temperatures.

![Graph showing total walking distance over 30 min (cm) vs. temperature on ground (°C)]

- 3rd instar: 121 ± 23 cm
- 5th instar: 234 ± 42 cm
Marked 4th and 5th instar
Mark-release-recapture study
20m
<table>
<thead>
<tr>
<th>Distance to trap</th>
<th>Trial date</th>
<th>Life stage</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4th instar</td>
<td>5th instar</td>
<td></td>
</tr>
<tr>
<td>5 m</td>
<td>July 23</td>
<td>40%</td>
<td>57%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>July 30</td>
<td>69%</td>
<td>82%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>54%</td>
<td>69%</td>
<td></td>
</tr>
<tr>
<td>20 m</td>
<td>August 7</td>
<td>19%</td>
<td>41%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>August 14</td>
<td>34%</td>
<td>62%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>27%</td>
<td>51%</td>
<td></td>
</tr>
</tbody>
</table>
At 5m peak recapture after 3 hours

Number of stink bugs recaptured by traps

Hours after release

No. Nymphs recaptured by traps
At 20m peak recapture after 7 hours

Number of stink bugs

No. Nymphs recaptured by traps

12
10
8
6
4
2
0

Hours after release

1 2 3 4 5 6 7 8 9 10 11 12

4th
5th
Nymphal host choice
Field set up

- Four host plants: bell pepper, Swiss chard, soybean, and sweet corn

- Experimental plots:
  - 3 m x 3 m plantings
  - 4, 1 m² subplots
  - Planted to one of the four host plant
  - Fifth host plant positioned in the center as a release point.
  - Arranged in a random Latin square
  - Four replications
Mark-release-recapture

- Marked with oil-based paint pens
  - 10 - 20 nymphs
  - Nymph instars corresponding to field
- Placed on one of the center host plants
- Plants with the nymphs were placed in the center of each of the 16 plots
- Plots were monitored 1, 3, and 5 days after each release
- Releases of marked nymphs were made six times
Attraction index

When center plant and dispersal plant are the same:

\[
\text{Attraction index} = \frac{\text{nymphs center} + \text{nymphs dispersal plant}}{\text{total nymphs recovered in plot}}
\]

When center plant and dispersal plant are different:

\[
\text{Attraction index} = \frac{\text{nymphs dispersal plant}}{\text{total nymphs recovered in plot}}
\]
Host plant attraction changes throughout the season: Swiss chard

Attraction index

Sampling period (week of year)

- Swiss chard
- Pepper
- Corn
- Soybean

- N.S.

6/17 7/1 7/15 7/29 8/12 8/26

(a)
Host plant attraction changes throughout the season: Pepper never preferred

Attraction index

Sampling period (week of year)

- Swiss chard
- Pepper
- Corn
- Soybean

6/17 7/1 7/15 7/29 8/12 8/26

N.S.
Host plant attraction changes throughout the season: Corn

- Swiss chard
- Pepper
- Corn
- Soybean

Attraction index

Sampling period (week of year)

6/17 7/1 7/15 7/29 8/12 8/26

N.S.
Host plant attraction changes throughout the season: Soybean

Attraction index

Swiss chard
Pepper
Corn
Soybean

Sampling period (week of year)

6/17 7/1 7/15 7/29 8/12 8/26

(Confidence intervals and letters indicating statistical significance are included in the graph.)
Host attractiveness may be dependent on plant phenology

- Swiss chard
- Pepper
- Corn
- Soybean

Attraction index

$r^2 = 0.21$
$r^2 = 0.33$
$r^2 = 0.004$
BMSB nymphs have strong walking capacity. Their capacity is affected by temperature with greater distances observed more frequently at >25°C.

BMSB nymphs show strong response to the olfactory attractant and traverse large distances to reach source.

BMSB nymphs are also highly capable of dispersing from a central host plant to find a new host.

Host attractiveness changes depending on host species and plant phenology.
Acknowledgements

- The Nielsen Fruit Entomology Lab
- The Leskey Lab
- SCRI
- OREI
QUESTIONS?