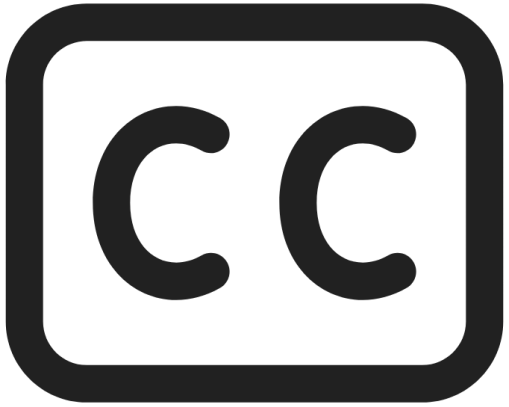
Corn Earworm Integrated Pest Management Updates for Sweet Corn

February 11, 2025

USDA National Institute of Food and Agriculture
U.S. DEPARTMENT OF AGRICULTURE

Northeastern IPM Center

Webinar Details



Live transcription

Recorded

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We Welcome Your Questions

- Please submit a question **<u>at any time</u>** using the Q&A feature to your right
- If you would like to ask a question anonymously indicate that at the beginning of your question

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Project Director

Dr. Kelly Hamby
University of Maryland

CEWIPM.org
Corn Earworm Integrated Pest Management

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Presenters Today

Dr. John Mahas
Cornell AgriTech

Dr. Tom Kuhar
Virginia Tech

Brian Currin
Virginia Tech

Northeastern IPM Center

Some Questions for You

Northeastern IPM Center

Effective Monitoring Strategies for Corn Earworm (*Helicoverpa zea*) Management in Sweet Corn

John W. Mahas, Christophe Duplais, David Owens, Kelly Hamby, Galen Dively, Anders Huseth, Thomas Kuhar, Helene Doughty, Brian Currin, Brian Nault

Cornell AgriTech
New York State Agricultural Experiment Station

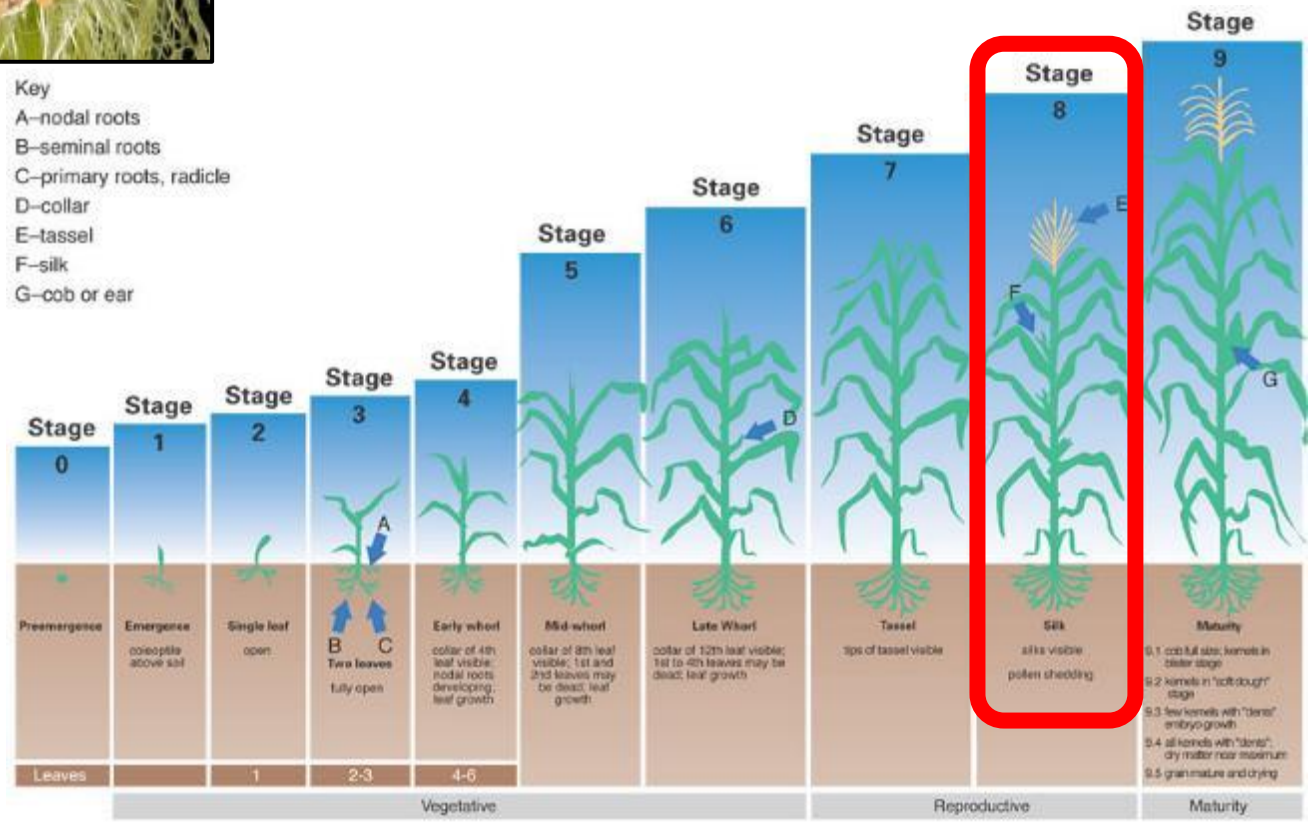
Corn earworm (*Helicoverpa zea*)


Photo: Brian Nault

- **Major pest of sweet corn**
- **Migrates consistently south to north**
- **Moths active from May through Oct.**

Corn earworm (*Helicoverpa zea*)

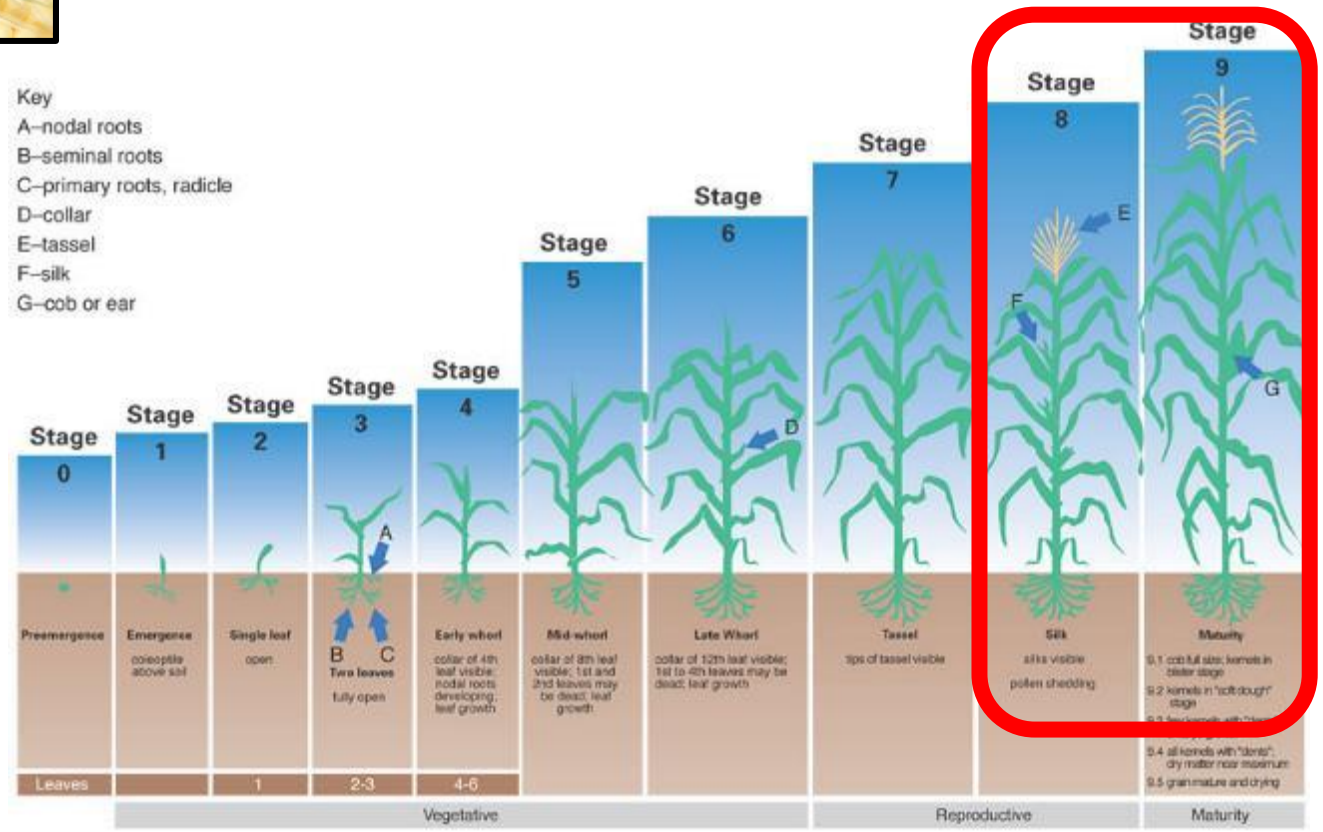
Attracted to green silk where eggs laid



Source: *U.S. Department of Agriculture Technical Bulletin 976* and Hanway, J. J., *1966 Special Report 48*, Iowa State University

Corn earworm (*Helicoverpa zea*)

Damage occurs from dry silk to ear maturity



Source: *U.S. Department of Agriculture Technical Bulletin 976* and Hanway, J. J., *1966 Special Report 48*, Iowa State University

H. zea management

Most effective management strategies…

Bt sweet corn

Attribute® II Insect protection

Attribute® Plus Trait stacks

Vip3A

H. zea management

Most effective management strategies…

Bt sweet corn

Attribute® II Insect protection

Attribute® Plus Trait stacks

Vip3A

All other varieties must be sprayed with insecticides

Monitoring *H. zea* moth activity

- **Number of *H. zea* moths caught in traps is used as a proxy for estimating abundance**

Pheromone-baited trap

Scentry® Heliothis trap

Male moths only

+

Monitoring *H. zea* moth activity

Hartstack

Scentry® Heliothis

Monitoring *H. zea* moth activity

Original Hartstack

75 cm

>

3x more moths

(Gauthier et al. 1991)

Scentry® Heliothis

50 cm

…but the bottom opening was 33% larger than the Scentry trap

Monitoring *H. zea* moth activity

Hercon®
Luretape®

Scentry® Corn Earworm

Trécé® Pherocon Corn Earworm

Alpha Scents Corn Earworm

Same sex pheromone composition:
97% Z11-16Ald, 3% Z9-16Ald

Monitoring *H. zea* moth activity

Hercon®
Luretape®

Scentry® Corn Earworm

Monitoring *H. zea* moth activity

Hercon®
Luretape®

>

2x more moths

Scentry® Corn Earworm

(Gauthier et al. 1991)

Monitoring *H. zea* moth activity

Insecticide application intervals based on Scentry® Heliothis trap with Hercon ® luretape ®

Action thresholds (number of CEW moths per trap) 		
Moths per night	**Moths per week**	**Spray Interval**
<0.2	<1.4	No spray
0.2-0.5	1.4-3.5	Every 6 days
0.5-1	3.5-7	Every 5 days
1-13	7-91	Every 4 days
>13	>91	Every 3 days

Modified from Adams and Clark (1996). Northeast sweet corn production and integrated pest management manual. University of Connecticut Cooperative Extension System.

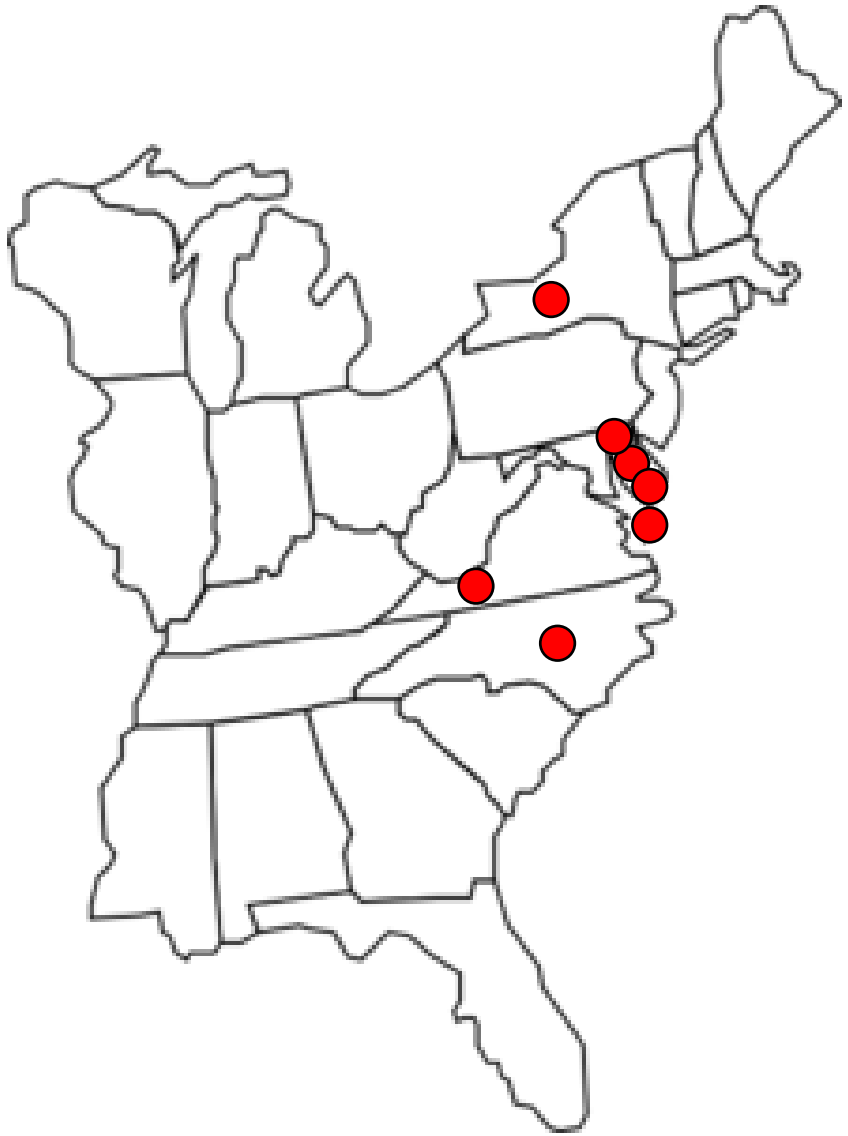
Monitoring *H. zea* moth activity

- Action thresholds are nearly 30 years old
- There is a need to re-examine these guidelines as differences in pheromone trap and lure types can influence the number of moths captured
- Information is limited regarding which trap and lure types capture the most moths

Objective

- **To identify the optimal trap and pheromone lure for capturing *H. zea* moths**

Materials & Methods: Locations



2022	2023
Bridgeville, DE	Calloway, DE
Concord, DE	Vincent, DE
Beltsville, MD	Beltsville, MD
Geneva, NY	Raleigh, NC
Eastville, VA	Geneva, NY
	Blacksburg, VA
	Eastville, VA

Materials & Methods: Trap types

Modified Hartstack

Scentry® Heliothis

Green bucket

Materials & Methods: Trap dimensions

	 Modified Hartstack		 Scentry® Heliothis	
Location	**Bottom diam.**	**Top diam.**	**Bottom diam.**	**Top diam.**
Delaware	32 cm	2.5 cm	32 cm	5.7 cm
Maryland	30.5 cm	2.5 cm	30.5 cm	5.7 cm
New York	32 cm	2.5 cm	32 cm	5.7 cm
North Carolina	32 cm	2.5 cm	32 cm	5.7 cm
Virginia	28 cm	5 cm	38 cm	5.7 cm

Materials & Methods: Lure vendors

Hercon®
Luretape®

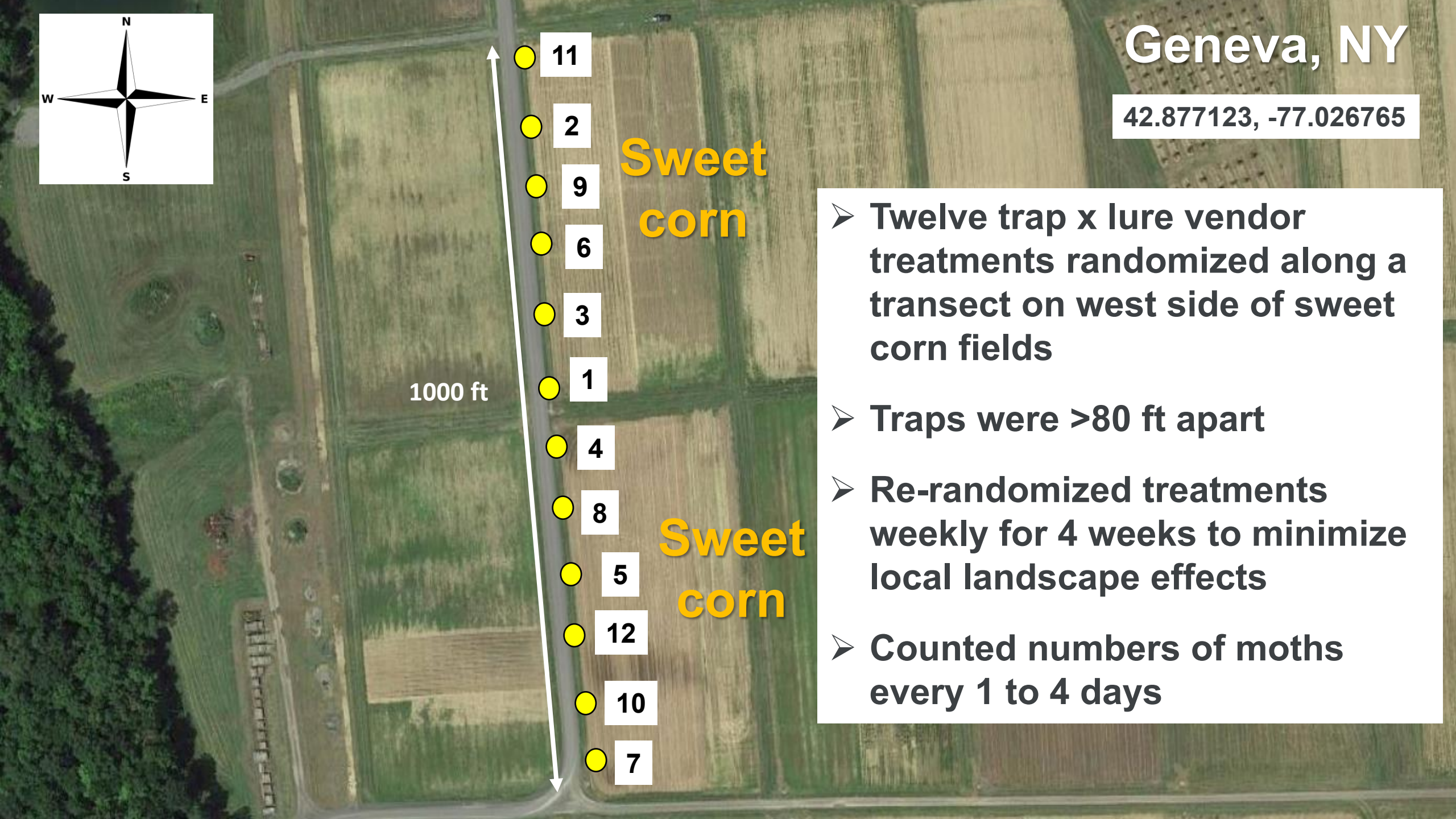
Scentry® Corn Earworm

Trécé® Pherocon Corn Earworm

Alpha Scents Corn Earworm

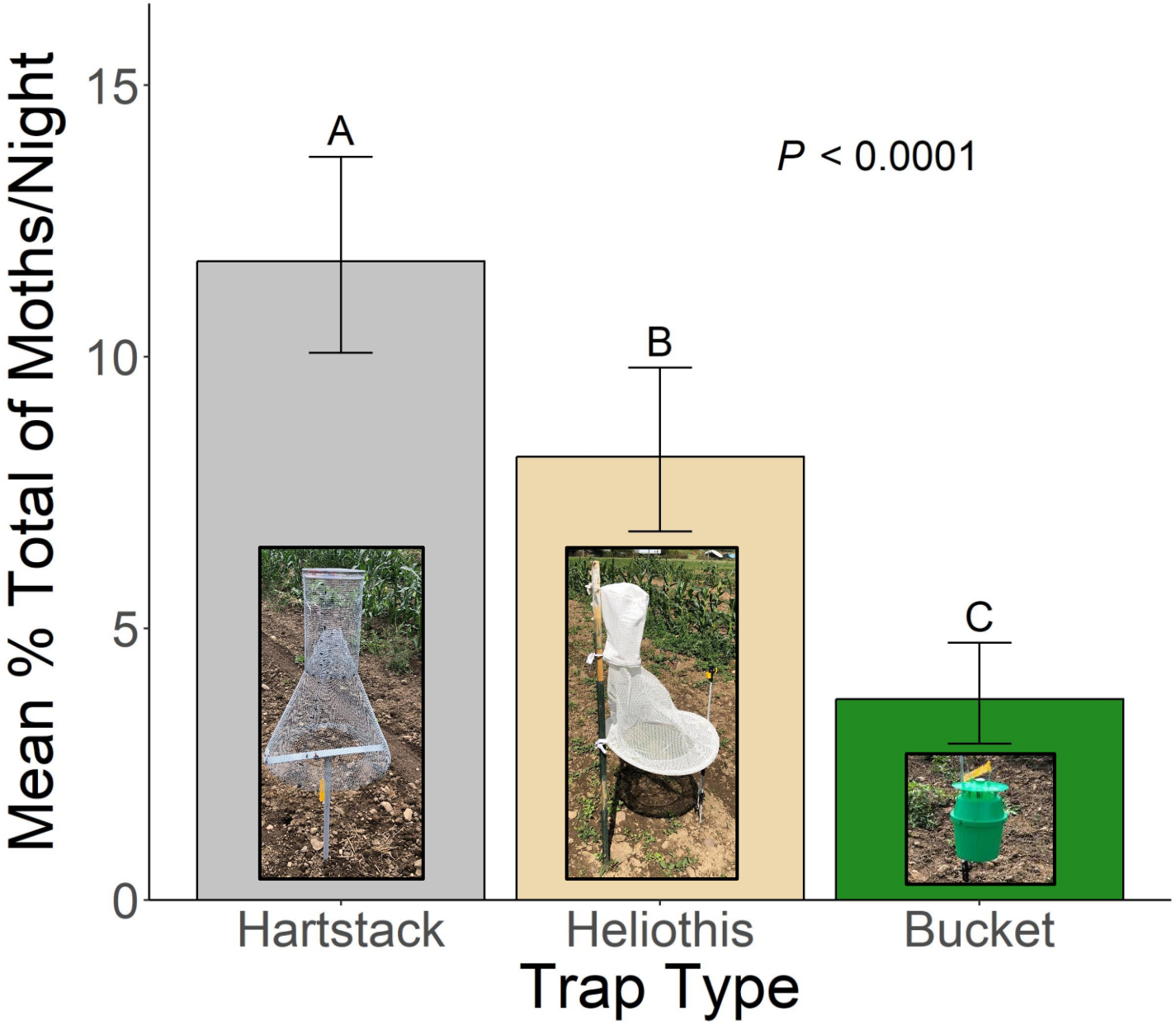
Materials & Methods: Treatments

Trap type	Pheromone lure vendor
Hartstack	Hercon
Hartstack	Scentry
Hartstack	Trécé
Hartstack	Alpha Scents
Scentry Heliothis	Hercon
Scentry Heliothis	Scentry
Scentry Heliothis	Trécé
Scentry Heliothis	Alpha Scents
Green bucket	Hercon
Green bucket	Scentry
Green bucket	Trécé
Green bucket	Alpha Scents



- Twelve trap x lure vendor treatments randomized along a transect on west side of sweet corn fields
- Traps were >80 ft apart
- Re-randomized treatments weekly for 4 weeks to minimize local landscape effects
- Counted numbers of moths every 1 to 4 days

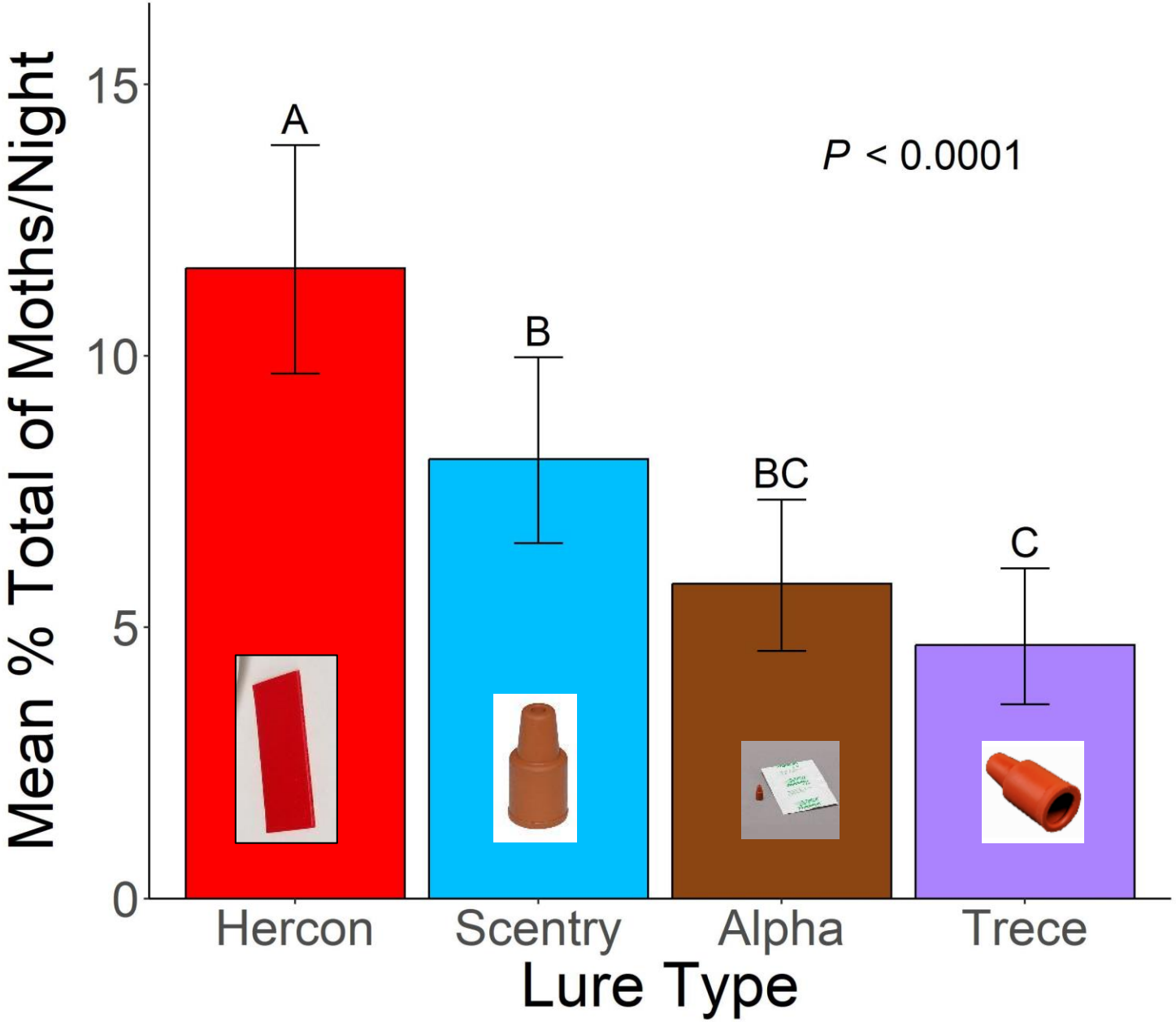
Results: Trap Type x Lure Vendor Study



Hartstack **1.4x more than Heliothis**

Hartstack **3.2x more than Bucket**

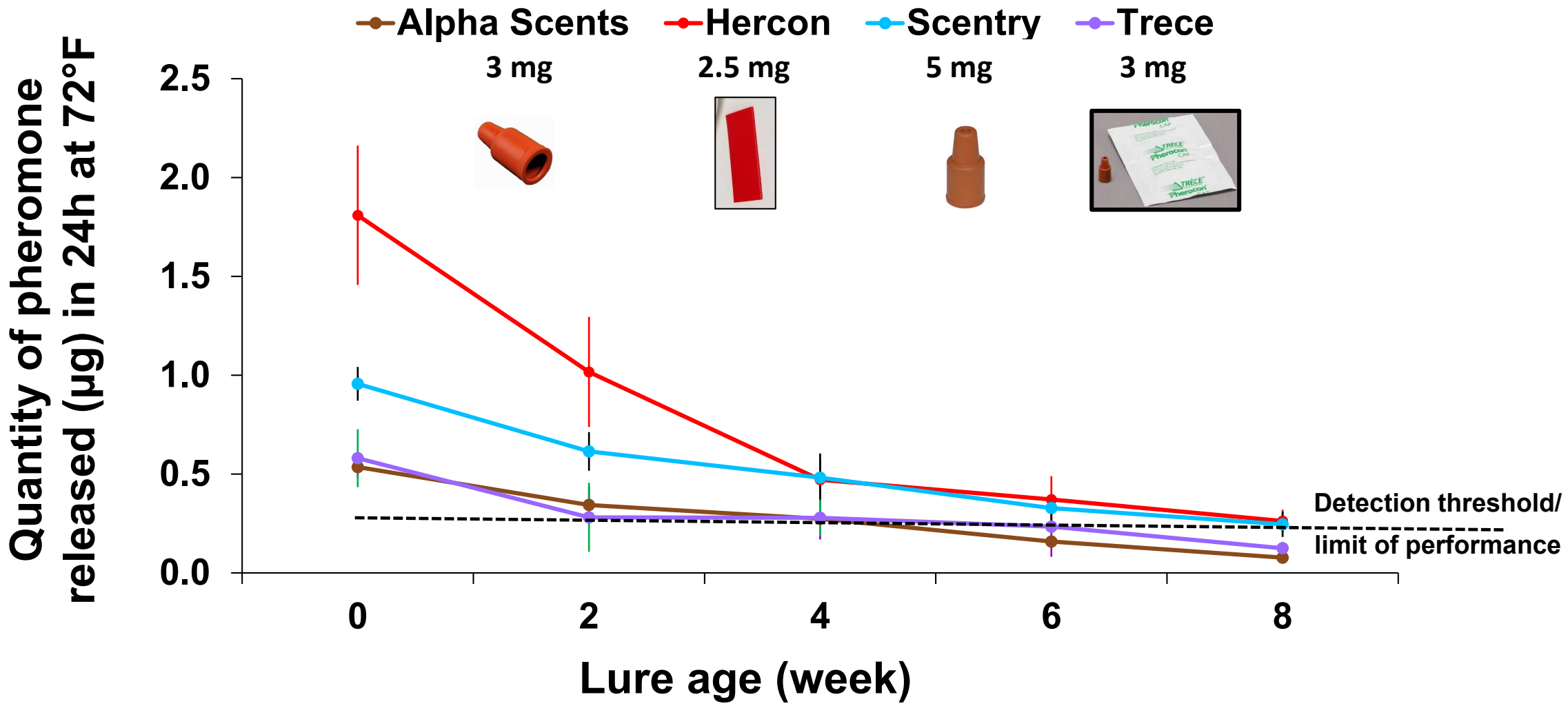
Results: Trap Type x Lure Vendor Study



Hercon 1.4x more than Scentry; 2.0x more than Alpha; 2.5x more than Trece

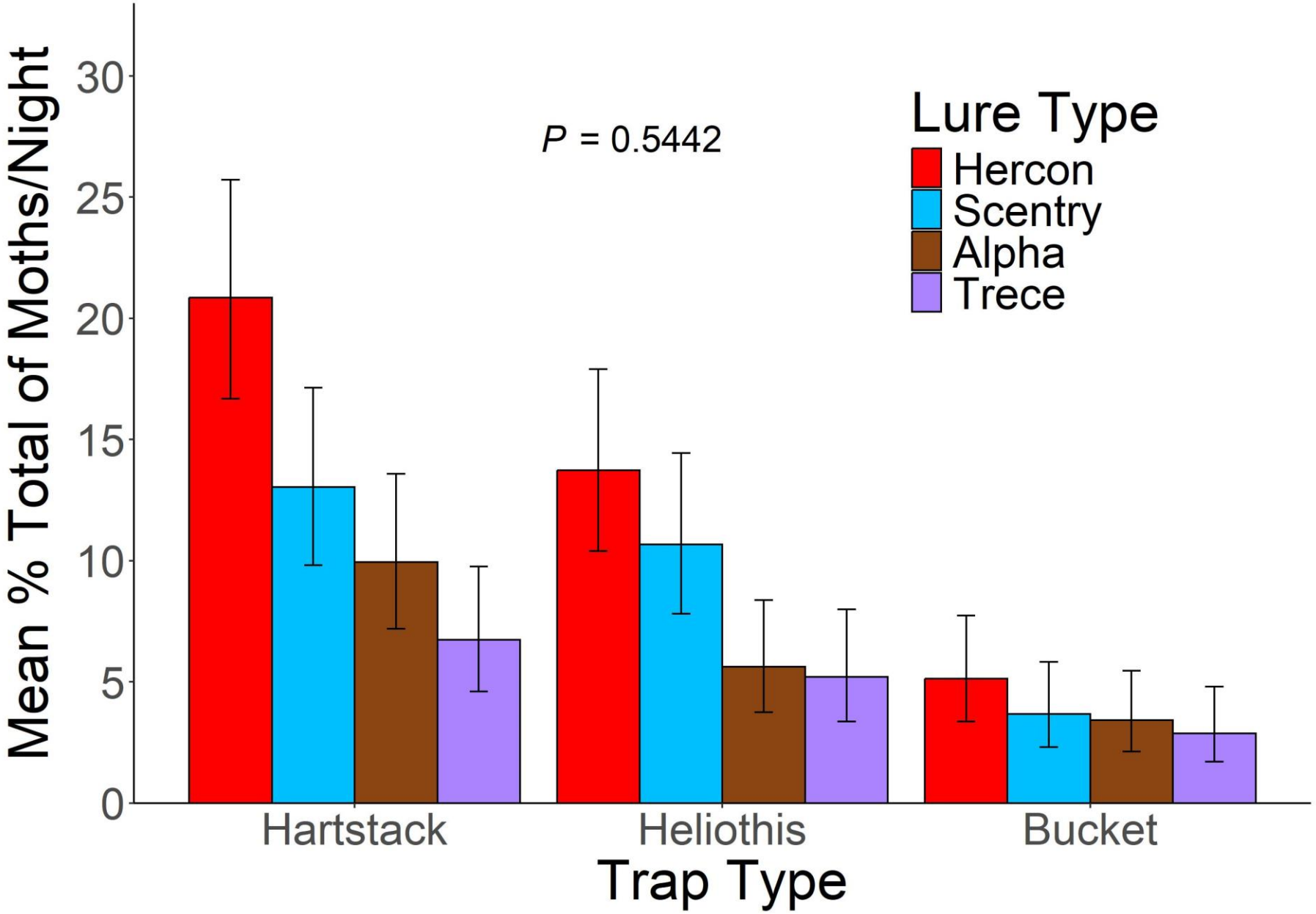
Pheromone emission at 72°F/22°C

2 batches of 3 replicates = 6 replicates per data point



C. Duplais (preliminary data)

Results: Trap Type x Lure Vendor Study



Summary

- Hartstack traps caught more moths than Scentry® Heliothis traps, despite similar bottom openings
- Hercon® Luretape attracted more moths than all other lures

Summary

- **The Modified Hartstack trap baited with Hercon® Luretape is the best combination for capturing the most *H. zea* moths**

- **Other traps and lures can be used, but…**

  - **A weighting factor may be required when developing future action thresholds and spray intervals**

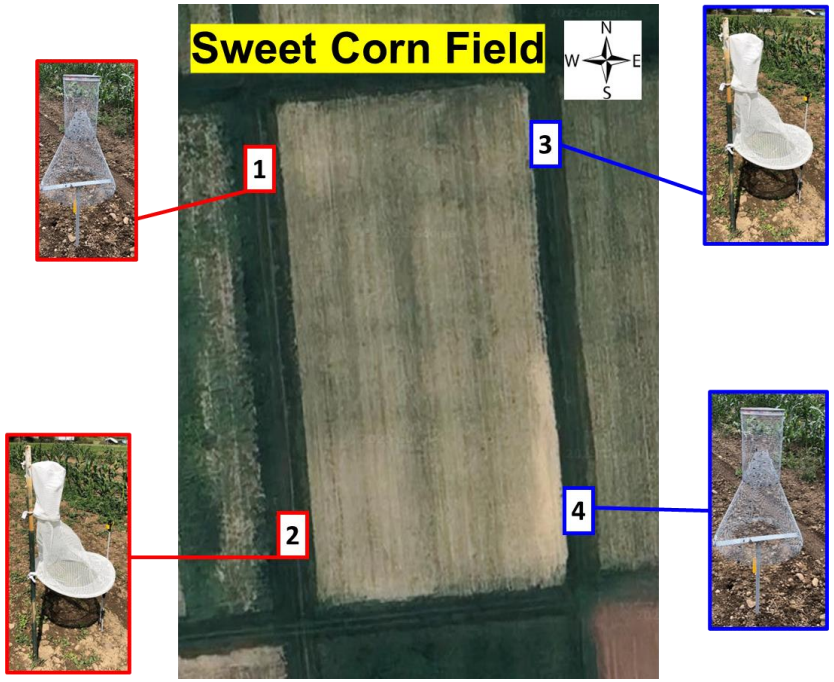
Future Research

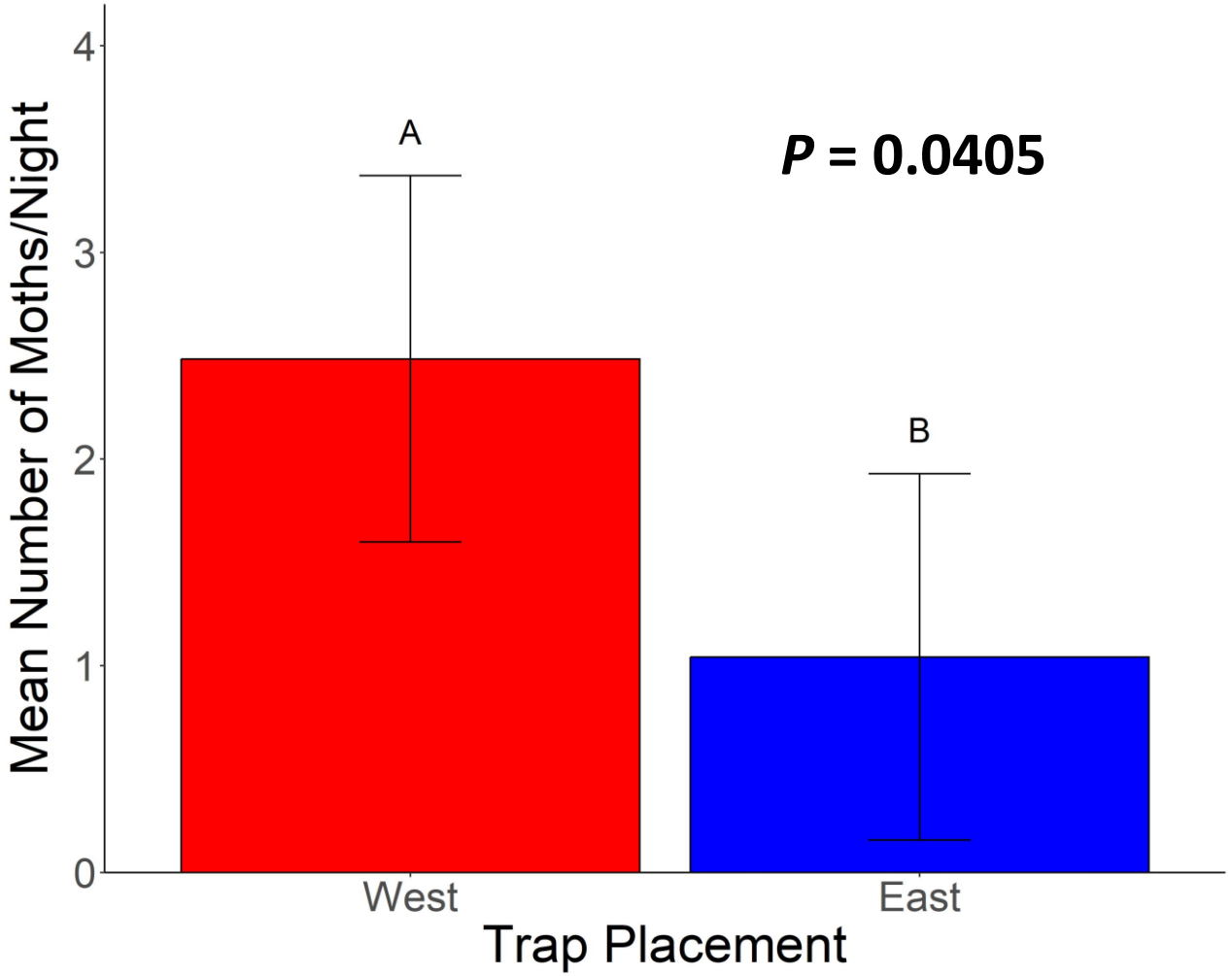
- Investigate lure placement within the trap

C. Duplais

Future Research

- Investigate trap placement adjacent to sweet corn





Acknowledgements

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Corn Earworm Integrated Pest Management

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Virginia Tech

Nault Lab

USDA National Institute of Food and Agriculture
U.S. Department of Agriculture

USDA Specialty Crop Research Initiative

Some Questions for You

Northeastern IPM Center

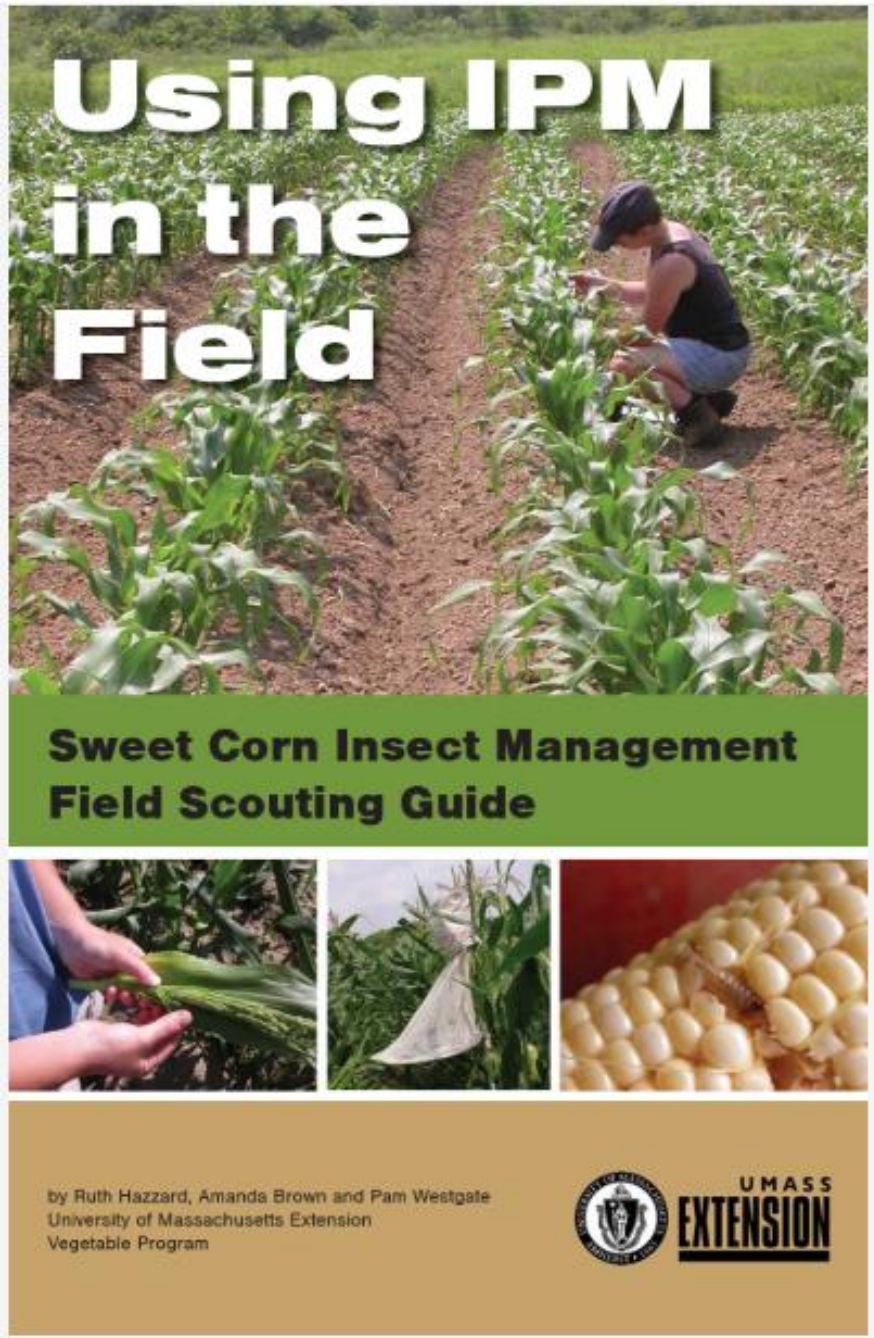
Evaluating an IPM approach in sweet corn in Virginia

Tom Kuhar & Brian Currin

Department of Entomology, Virginia Tech

Pheromone trap for corn earworm; 'Scentry Heliothis' type.

Pheromone lure at bottom of corn earworm trap.



Pheromone trap for corn earworm; 'Scentry Heliothis' type.

Action threshold-based spraying

Average number of corn earworm moths per trap		Spray interval
Moths per day	**Moths per week**	
< 0.2	< 1.4	No spray
0.2 - 0.5	1.4 - 3.5	Every 5 days
0.5 - 1	3.5 - 7	Every 4 days
1 - 13	7 - 91	Every 3 days
>13	>91	Every 2 days

IPM Approach vs. Frequent Sprays in Sweet Corn in Virginia

- 2017 & 2023 Painter, VA and Whitethorne, VA
- Total 7 experiments
- Randomized & replicated small plot trials

IPM Approach vs. Frequent Sprays in Sweet Corn in Virginia

- **Treatments:**
  - **Untreated check**
  - **IPM:** Coragen (3.5 floz/A) initial application rotated with Radiant SC or Warrior II (1.92 floz/A) based on pheromone trap catch threshold
  - **Frequent Sprays:** Warrior II (1.92 fl oz / acre) every 2 to 3 days (in 2017) or alternated with Beseige (2023)

* Both threshold and standard treatments received their first spray at ~10% of ears with silks.

Evaluate
50 ears
per plot at
harvest

Results

			# of sprays		% clean ears		
Year	**Location**	**Avg. CEW moth catch/week during silking**	**Threshold**	**Standard (every 2-3 days)**	**Threshold**	**Standard (every 2-3 days)**	**Untreated Control**
2017	Whiteth. A	1.0	3[a]	7[c]	76	93	2
2017	Whiteth. B	5.4	3[a]	5[c]	99	98	56
2017	Whiteth. C	9.1	4[a]	5[c]	99	96	29
2018	Whitethorne	3.8	5[a]	7[c]	64	88	2.5
2017	Painter A	20.0	6[a]	6[c]	91	53	3
2017	Painter B	34.9	4[a]	5[c]	65	72	2
2018	Painter	138.0	8[a]	8[c]	83	69	2
2023	Painter	9.7	5[b]	7[d]	85	91	23
	Average		4.8	6.3	82.7	82.4	15

IPM Approach vs. Frequent Pyrethroid Sprays in Sweet corn

Summary of 7 experiments conducted in either 2017 or 2023 in both Painter and Whitethorne, VA comparing an IPM strategy against no insecticide applications and routine insecticides applied every 2-3 days through silking. The IPM strategy included a first-silking application of the IPM-compatible insecticide Coragen, then subsequent sprays of that or Radiant (in 2023) only if pheromone trap catches of CEW moths exceeded threshold.

It pays to trap: Virginia Case Studies of Corn Earworm IPM on Sweet Corn

Authored by ***Brian Currin****, Graduate student, Department of Entomology, Virginia Tech;* ***Tom Kuhar****, Professor, Department of Entomology, Virginia Tech;* ***Kaitlyn Catron****, Postdoctoral Research Associate, Department of Entomology, Virginia Tech;* ***Hélène Doughty****, ANR Extension Agent, VCE Northampton County;* ***John Few****, VCE Powhatan County,* ***Daniel Frank****, Associate Professor Department of Entomology, Virginia Tech; and* ***Brian Nault****, Professor, Department of Entomology, Cornell University*

Published: 13 January 2025

Introduction

Corn earworm (CEW), *Helicoverpa zea* (Fig. 1) is the primary pest that drives insecticide applications by sweet corn growers in the mid-Atlantic U.S. Historically sweet corn growers have used multiple (4 to 8) insecticide applications from first silk to harvest and/or Bt transgenic sweet corn hybrids to protect their crop from damage. Managing CEW has become a greater challenge in recent years because of the development of resistance to both pyrethroids and the Bt Cry toxins found in many of the Bt transgenic corn and cotton hybrids.

Fig. 1. Corn earworm larvae in sweet corn.

Moth trapping to guide the number of sprays

CEW pest pressure varies each year. It is driven by moths' dispersal throughout the landscape and prevailing winds from southerly regions carrying moths northward. Monitoring moth activity with traps can help inform the frequency of insecticide sprays required for control (Fig. 2). This threshold-based approach has been well adopted in the northern U.S. However, CEW pest pressure is higher in more southerly locations like Virginia. Therefore, growers have not typically followed scouting guidelines, opting for scheduled sprays every 2-3 days.

AVERAGE # OF CEW MOTHS PER TRAP		Spray Interval
Moths per Day	Moths per Week	
<0.2	<1.4	No Spray
0.2-0.5	1.4-3.5	Every 5 Days
0.5-1	3.5-7	Every 4 Days
1-13	7-91	Every 3 Days
>13	>91	Every 2 Days

Fig. 2. Scentry® Heliothis trap, corn earworm moth, and action thresholds adapted from: Sweet Corn Insect Management Field Scouting Guide. https://www.northeastipm.org/neipm/assets/File/NRCS-Resources/Sweet-Corn-IPM-Field-Scouting-Guide.pdf

Developed by the Corn Earworm Working Group (CEWIPM.org). This material is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 2023-51181-41157. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.

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CEWIPM.org
Corn Earworm Integrated Pest Management

Resources

Online Resources

It pays to trap: Virg

Published: 13 January 2025

Nontarget impacts from insecticide sprays

The adverse impact of insecticides on natural enemies can be mitigated through choice of insecticide, dosage, or timing of insecticide application (Obrycki and Kring 1998).

Obrycki, J. J., and T. J. Kring. 1998. Predaceous Coccinellidae in biological control. Annu. Rev. Entomol. 43: 295-321.

The Insecticide Toolbox: four groups (MOAs)
(Slide from David Owens – Delaware)

Pyrethroid (3A) cheap, broadspectrum and formerly very effective

BAYER
BAYTHROID XL

HERO
INSECTICIDE

Warrior II
with Zeon Technology®

BRIGADE WSB
INSECTICIDE / MITICIDE

Lannate® LV
insecticida agrícola

Carbamate (1A) – ovicidal, no residual activity, high oral and eye tox conerns

Besiege®

ELEVEST
INSECT CONTROL

Diamides (28) Narrow spectrum, effective, longer residual, inconsistent alone under high pressure

CORAGEN

VANTACOR®
INSECTICIDE

Blackhaw
NATURALYTE® INSECT CON

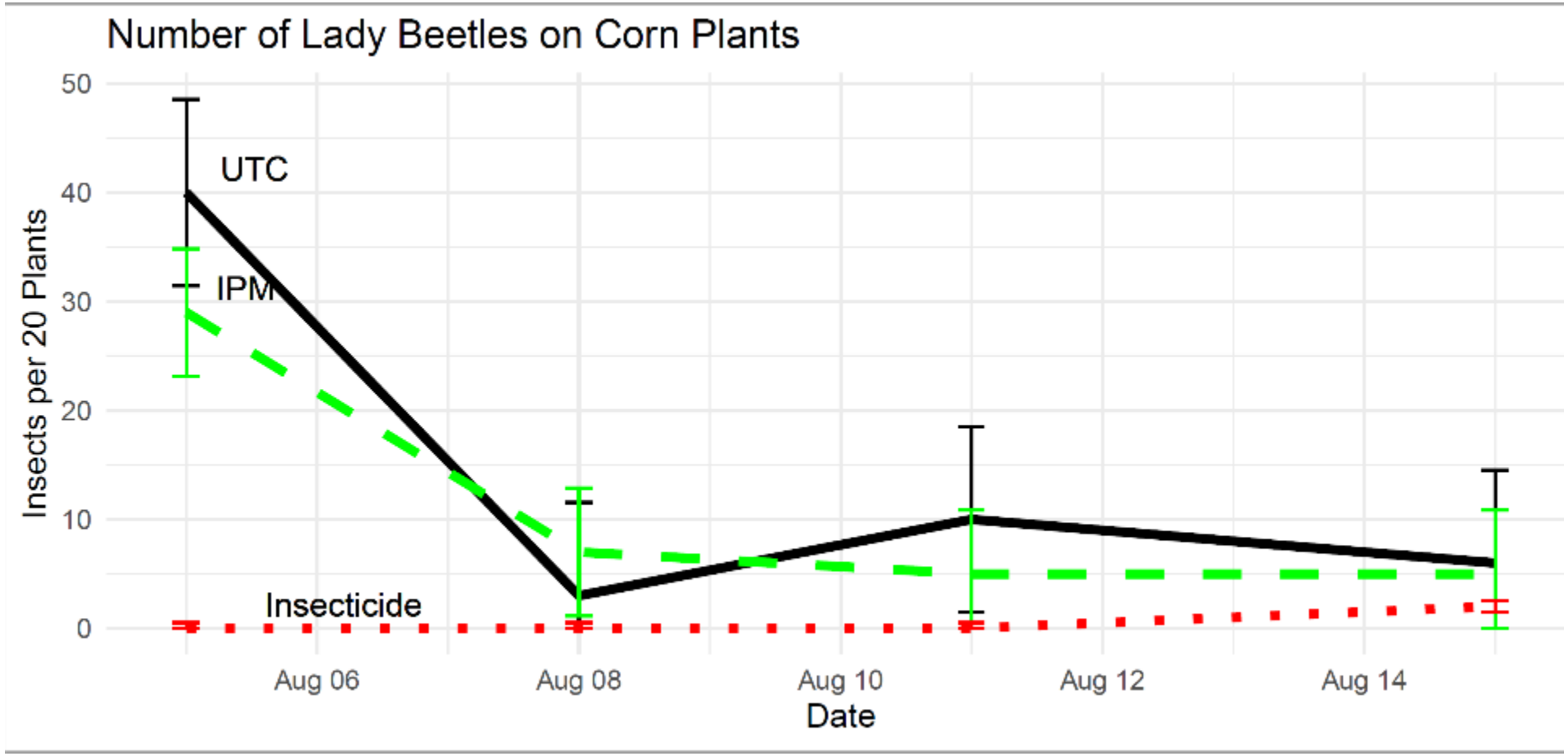
Radiant® SC

Entrust® SC
NATURALYTE INSECT CONTROL

Spinosyns (5) – expensive, will not alone control CEW under high pressure

A good time to use Coragen or Vantacor is during pollen shed

2023 Sweet Corn – Whitethorne, VA



Including at least 1 or 2 pyrethroid sprays in the rotation is sometimes not a bad idea

Thank you

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VIRGINIA TECH™

Some Questions for You

Northeastern IPM Center

Fresh-Market Sweet Corn Economics Survey

Short survey to help understand costs of corn earworm control and help growers assess value of alternative practices in **fresh-market sweet corn**

NIFA Acknowledgement

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Some Questions for You

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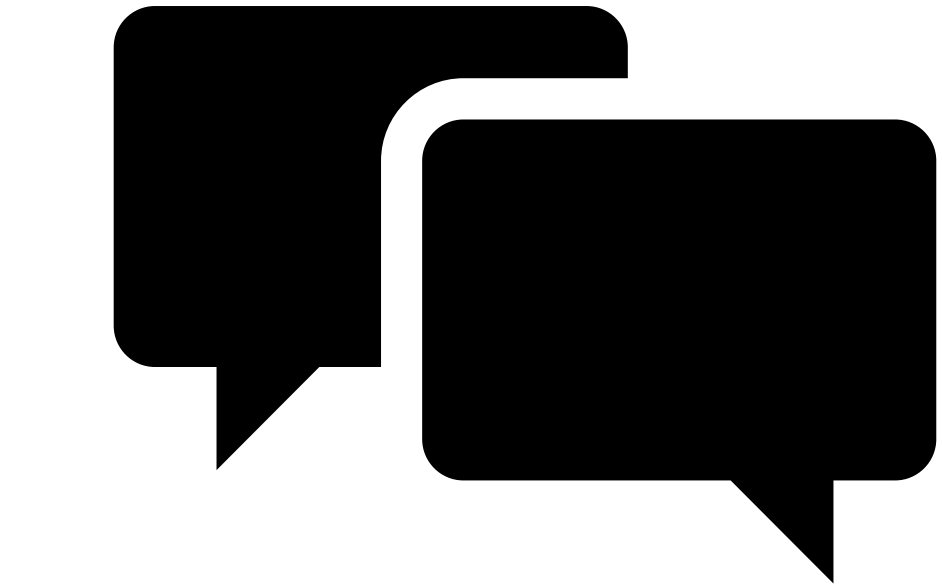

Q&A

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