



CORN EARWORM IN SWEET CORN RESEARCH UPDATE

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Moving to Colorado: What You Need to Know





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Agricultural Biology

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No matter who you are, or where you come from, we invite you to take a seat at our table. Let's grow a better future together.

Olathe sweet corn harvest is in trouble because of an invasive insect

The destructive corn earworm is an annual pest that has become resistant to insecticides and devours tomato and cotton fields, too.



Author: Kim Christiansen, Melissa Reeves (9NEWS)

Guides: We're not robocalling you How to remove PFAS from your water Renewing Medicaid coverage Why it's so hard to cut Colorado ozone Why Lake Powell is important

ALL STARS AMERICAN ARTISTS FROM THE PHILLIPS COLLECTION THROUGH MARCH 3, 2024 BUY TICKETS DENVER ART MUSEUM

BUSINESS

Tiny worms have infested up to 40% of Colorado's Olathe Sweet corn crop

Tuxedo, the state's largest sweet corn producer, is only packing about 3,000 crates per day for shipment to stores compared with three times that in a normal year

Nancy Lofholm 3:50 AM MDT on Jul 27, 2023

Credibility: Original Reporting Sources Cited

CPR NEWS CLASSICAL INDIE 102.3 KRCC LISTEN LIVE

CPR News

We are incredibly grateful for all who chose to support CPR during Giving Tuesday. You, our members, made a difference. Thank you.

The future of Olathe sweet corn is being endangered by a tiny, fearsome foe: worms

By Stina Sieg · Aug. 7, 2023, 6:00 am

LISTEN NOW 7min 35sec

SHARE: f t x





OUTBREAK
REDUCED
MARKETABLE
HARVESTS BY UP
TO 50% AND
DOUBLED
CONTROL COSTS



CORN EARWORMS ARE SUPER PESTS

CORN EARWORM (*Helicoverpa zea*)

- Key pest of sweet corn in many states
- CEW will also attack field corn, pepper, tomato, cotton, and the fruits of many more plants (has three “official” common names)
- Tan-brown moth (1.5 inch wingspan), active at dusk
 - Carried on wind currents up to 300 miles
 - Caterpillars vary in color









Fig. 2. Tomato fruitworm feeding hole in developing tomato fruit.



WHY ARE CORN EARWORMS SUPER PESTS???

The background is a dark blue gradient with a starry space pattern. On the right side, there are several technical diagrams, including a circular gauge with numerical markings (160, 170, 180, 190, 200, 210) and arrows, and other circular patterns with dashed lines and arrows. The text is centered in the middle of the image.

**CEW has a huge host range: Feeds on over 100
plant species representing over a dozen plant
families!**



They are concealed feeders!



CORN EARWORM

- Eggs laid on fresh, green silks
 - Up to 1,000 eggs per female
 - Silks grow ~1/2 inch per day
- Eggs hatch in 2 to 10 days (temp. dependent)
- 1st instar larva crawls into ear tip
 - Chews developing kernels, silks & sometimes leaves
 - Tom/Pep fruits: tunnels into fruit, chews leaves
- Mature larva (1.5 inch long caterpillar) feeds in ear 10-14 days
- Pupate in the soil
- Egg to pupae in about 21 days



Corn earworm egg on corn silk



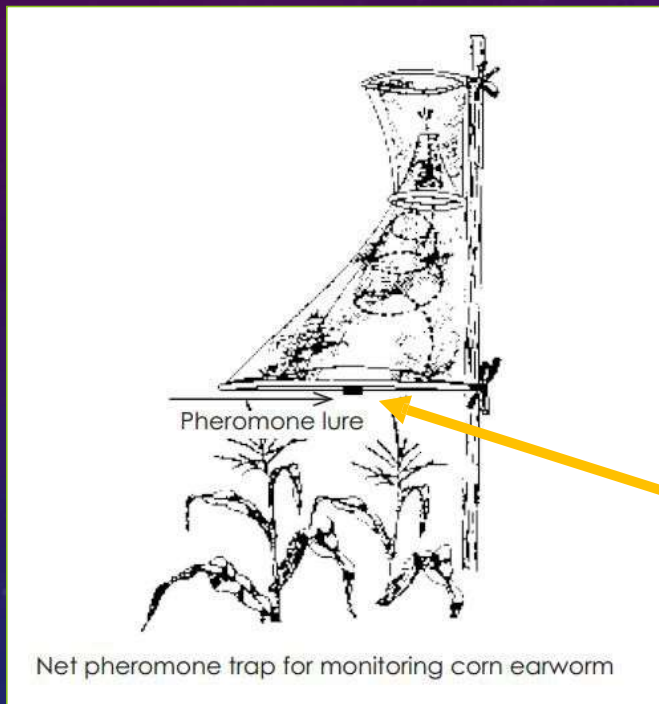
~2 days before
the caterpillars
are concealed



They cause serious damage at very low densities!

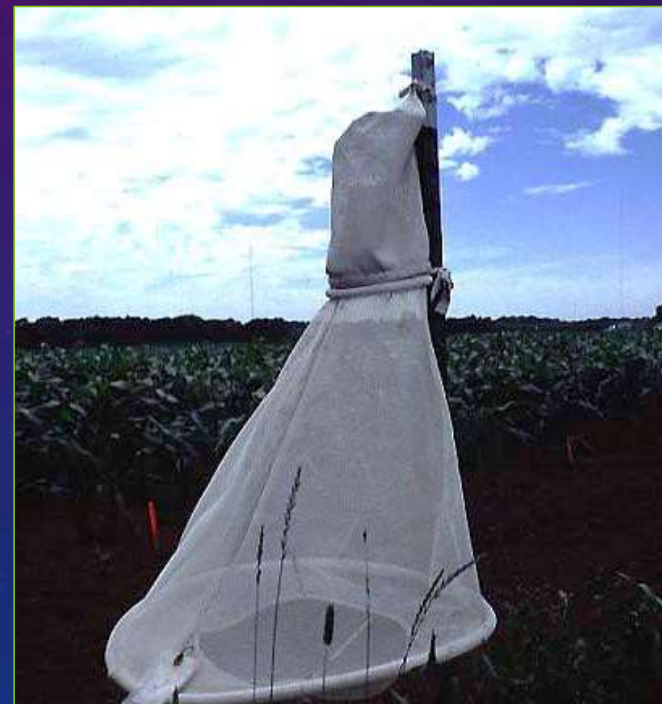
- **Fruit Feeders**
- **Most plants can not compensate for fruit loss**
- **1 caterpillar = loss of one fruit**
- **Traditional action threshold approach not very helpful**

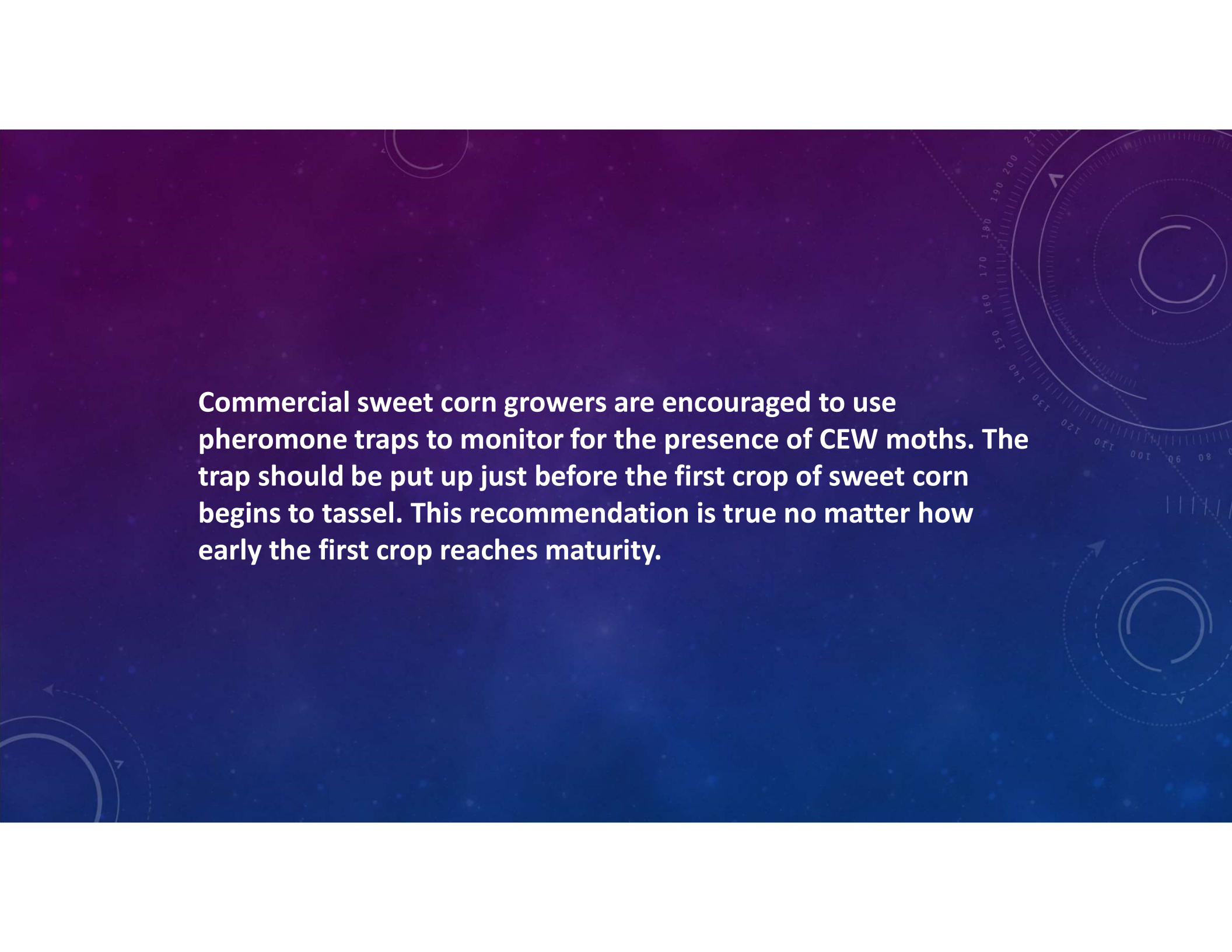
Corn Earworm Trap



Hercon
Pheromone
Lure

Hartstack Trap





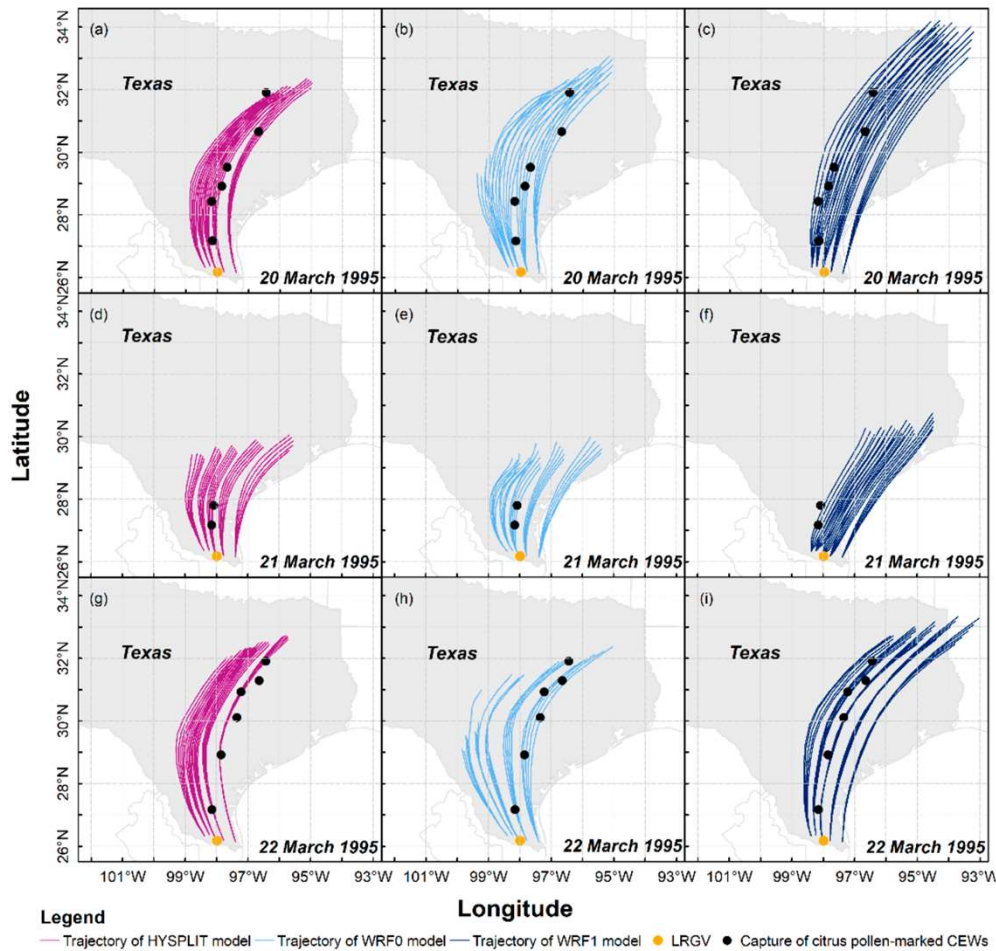
Commercial sweet corn growers are encouraged to use pheromone traps to monitor for the presence of CEW moths. The trap should be put up just before the first crop of sweet corn begins to tassel. This recommendation is true no matter how early the first crop reaches maturity.

Table 1: Corn Earworm Spray Thresholds for Pheromone Traps

Moths/Week	Moths/Night	Spray Interval
0.0 - 1.4	0.0 - 0.2	No spray
1.5 - 3.5	0.3 - 0.5	Spray every 6 days
3.6 - 7.0	0.6 - 1.0	Spray every 5 days
7.1 - 91	1.1 - 13.0	Spray every 4 days
More than 91	More than 13	Spray every 3 days

CEW are very migratory!





**Individual moths can fly
300 – 600 miles per night**

Corn Earworm Can Rapidly Evolve Resistance to Insecticides



CEW INSECTICIDE RESISTANCE

- **Organochlorines in 1950s and 1960s**
- **Organophosphates in 1960s**
- **Pyrethroids in 1990s and 2000s**

And then in the last ten years....

Genetically-modified crops
Expressing Bt Cry Proteins
Introduced in 1990s

80 million acres of Bt
Corn in USA

10 million acres of Bt
Cotton in USA

PLOS ONE

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RESEARCH ARTICLE

Field-Evolved Resistance in Corn Earworm to Cry Proteins Expressed by Transgenic Sweet Corn

Galen P. Dively, P. Dilip Venugopal, Chad Finkenbinder

Published: December 30, 2016 • <https://doi.org/10.1371/journal.pone.0183637>

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Correction

Abstract

Introduction

Methods

Results

Discussion

Supporting Information

Acknowledgments

Author Contributions

References

Reader Comments

Figures

Correction

17 Aug 2017: Dively GP, Venugopal PD, Finkenbinder C (2017) Correction: Field-Evolved Resistance in Corn Earworm to Cry Proteins Expressed by Transgenic Sweet Corn. PLOS ONE 12(8): e0183637. <https://doi.org/10.1371/journal.pone.0183637> | [View correction](#)

Abstract

Background

Transgenic corn engineered with genes expressing insecticidal toxins from the bacterium *Bacillus thuringiensis* (Berliner) (Bt) are now a major tool in insect pest management. With its widespread use, insect resistance is a major threat to the sustainability of the Bt transgenic technology. For all Bt corn expressing Cry toxins, the high dose requirement for resistance management is not achieved for corn earworm, *Helicoverpa zea* (Boddie), which is more tolerant to the Bt toxins.



Bt sprays contain Cry proteins

Transgenic crops that express Bt Vip3a proteins introduced in 2000s

The background is a dark blue gradient with faint, light blue circular patterns and a scale on the right side. The scale has numbers from 0 to 240, with major ticks every 10 units and minor ticks every 2 units. There are also some dashed lines and arrows pointing in various directions, suggesting a technical or scientific theme.

OPEN

**First documentation of major
Vip3Aa resistance alleles in field
populations of *Helicoverpa zea*
(Boddie) (Lepidoptera: Noctuidae)
in Texas, USA**

Fei Yang^{1,7*}, José C. Santiago González^{1,7}, Nathan Little², Dominic Reisig³, Gregory Payne⁴,
Rafael Ferreira Dos Santos⁵, Juan Luis Jurat-Fuentes⁵, Ryan Kurtz⁶ & David L. Kerns^{1*}

Collaboration with Melissa Schreiner and Others



The Colorado Sun

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COVID-19 POLITICS MONEY ARTS ENVIRONMENT NEWSLETTER SUPPORT CPR

The future of Olathe sweet corn is being endangered by a tiny, fearsome foe: worms

By SINA SHI Aug 7, 2023 4:00 am

LISTEN NOW 7min 28sec

SHARE: Facebook Twitter Email

A man in a striped shirt and white cap is working in a cornfield, possibly harvesting or inspecting the crop. Other people are visible in the background.

Collaboration with Melissa Schreiner and Others

What happened?

What can we do about this?

Was the outbreak a one-time thing or the new normal?



WHAT HAPPENED?

- **CEW showed up early?**
- **Increased aerial insecticide applications could not control CEW (resistance or just a lot of CEW?)**
- **Susceptible varieties**

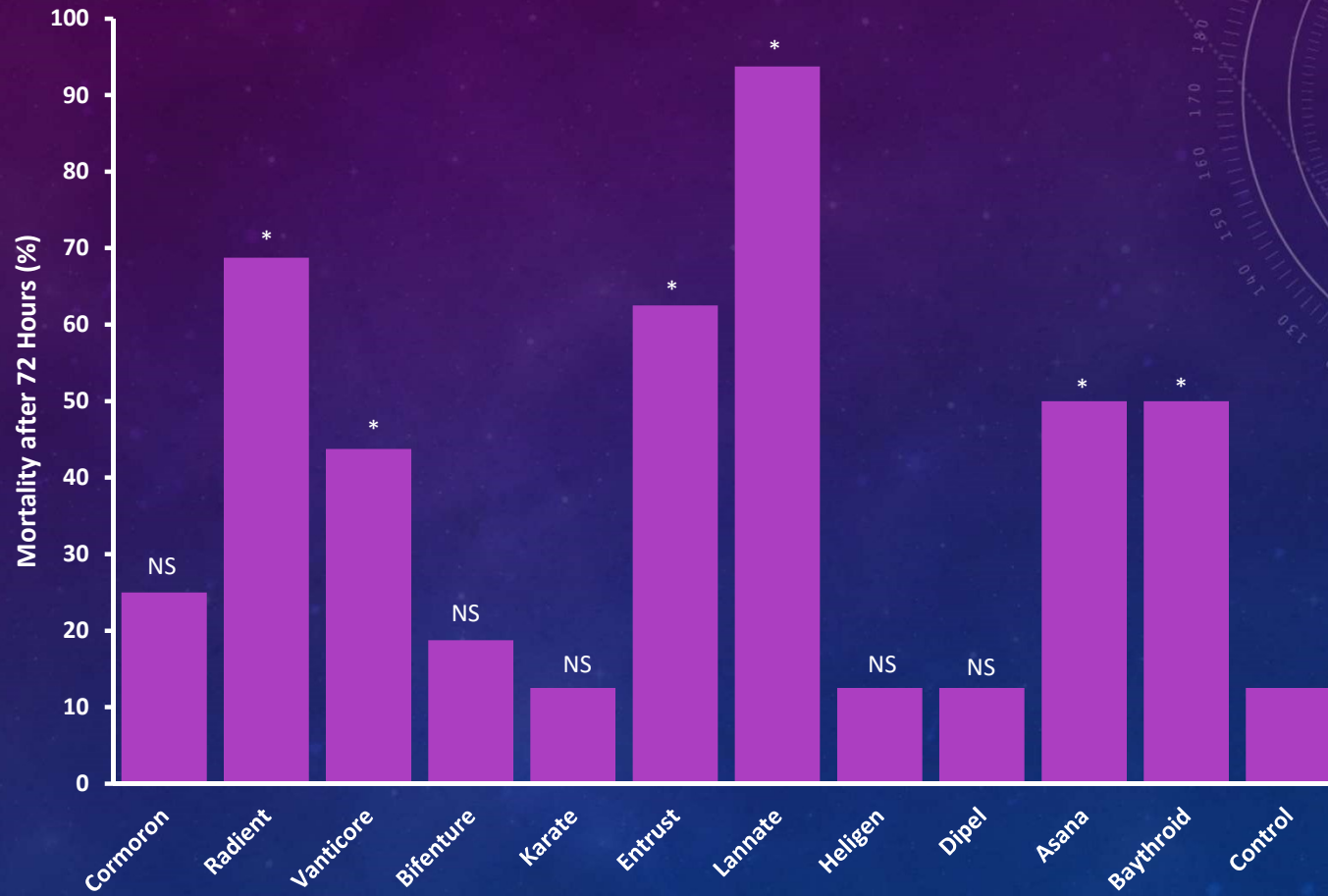
WHAT CAN WE DO ABOUT THIS?

- Quantify Insecticide Resistance of CEW on Western Slope
- Improve monitoring, especially early season monitoring
- Evaluate Resistant Sweet Corn Varieties

**Melissa Schreiner
& Melissa Franklin
Unpublished data**

Lannate =
N-Methyl Carbamate

Radiant = spinetoram



WAS THE OUTBREAK A ONE-TIME THING OR THE NEW NORMAL?

The background is a dark blue gradient with faint, glowing circular patterns and a scale on the right side. The scale is a circular dial with numbers from 80 to 240, and it has several concentric circles around it. There are also some dashed lines and arrows pointing in various directions, suggesting a technical or scientific theme.

WAS THE OUTBREAK A ONE-TIME THING OR THE NEW NORMAL?

A
1950-2021



B
2022-2047



C
2048-2073

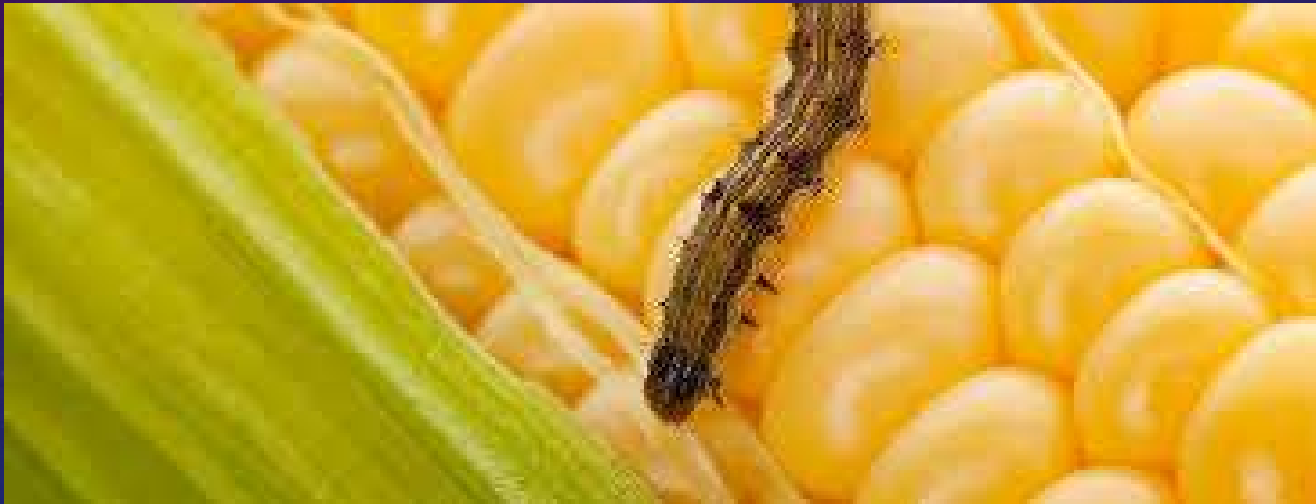


D
2074-2099



■ Northern Limits ■ Transitional Zone ■ Southern Range

Questions?





CEW MANAGEMENT: INSECTICIDES

- Protect silks when present
- Reapply based on trap threshold & insecticide residual
- Follow insecticide label
- Rotate among classes
- Follow pre-harvest interval

Insecticide class	Common name	Brand name
Pyrethroid	bifenthrin cyfluthrin esfenvalerate lambda-cyhalothrin permethrin zeta-cypermethrin	Brigade Baythroid Asana Warrior Ambush Mustang
Carbamate	carbaryl methomyl thiodicarb	Sevin Lannate Larvin
Organo-phosphate	malathion	Malathion
Spinosyn	spinosad	Success, Entrust(Org)

CEW MANAGEMENT: CULTURAL & BIOLOGICAL

- Plant early for silking before major moth flight
- Varietal tolerance or resistance
- Fall tillage to destroy overwintering pupae
- Biological control
 - Trichogramma wasp releases
 - Limited success
 - Natural enemies
 - Predatory & parasitic insects



SOURCES OF TRAPS & PHEROMONE LURES

Hartstack Trap & Hercon CEW Lure

- Great Lakes IPM, Inc., Vestaburg, MI
 - www.greatlakesipm.com
- Scentry Biologicals, Inc., Billings, MT
 - www.scentry.com
- Trece, Inc., Adair, OK
 - www.trece.com

