

Economic Impact of Western Bean Cutworm

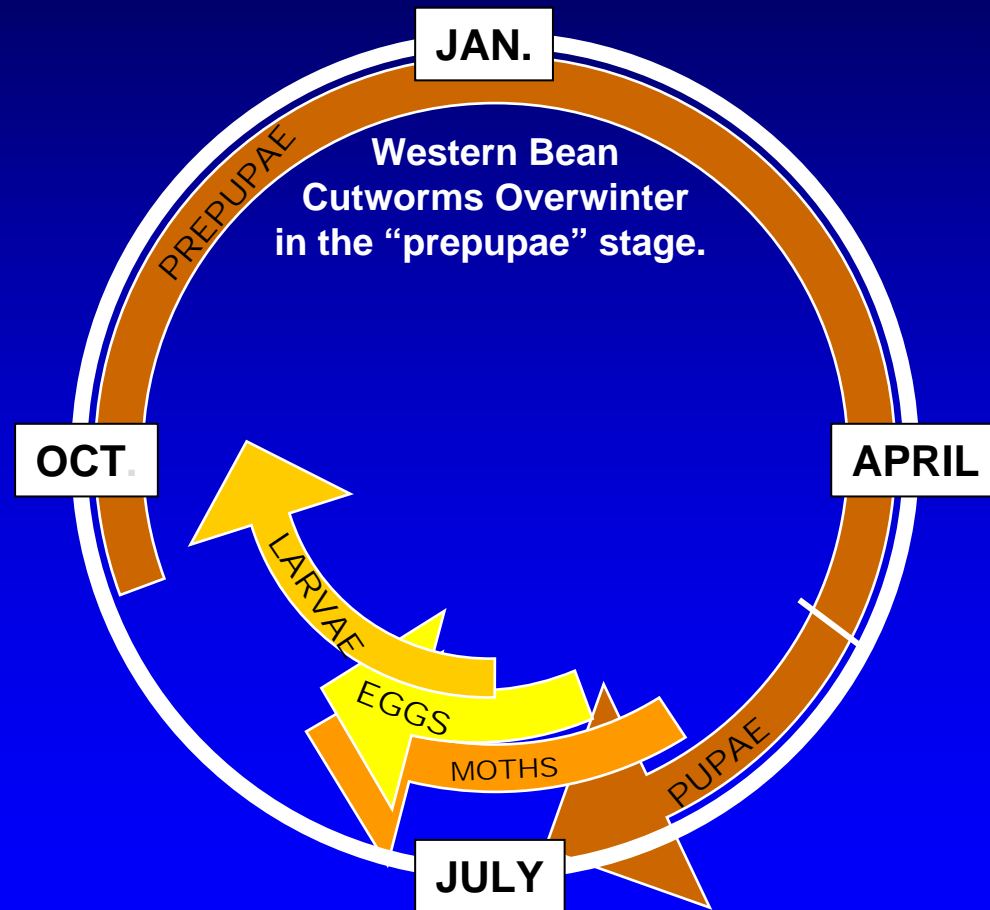
Dr. Paula Davis
Pioneer Hi-Bred

Western Bean Cutworm

- **Scientific Name: *Striacosta albicosta***
 - **Formerly *Loxagrotis albicosta***
- **Order: Lepidoptera - Moths**
- **Damaging Stage: Larvae**
- **Crops Attacked: Corn, Dry Beans**
- **Pest Status:**
 - **Traditional a pest in the western plains and southwest.**
 - **Has expanded its range eastward into Iowa, Illinois, Minnesota, Missouri, & Wisconsin**

Western Bean Cutworm Lifecycle

- One generation per year.
- Moths emerge in late June and early July.
- Eggs are laid on upper surface of top corn leaves.
- Larvae feed on upper leaves, tassels, before moving to silks and the ear.
- 5th instars burrow 5 to 10 inches below soil surface.
- Overwinter as “prepupae”



Identification

- Adults (Moth)

- $\frac{3}{4}$ long X 1.5 inch wingspan

- White stripe on leading edge of wing

- Eggs

- Masses of 5-200, average of 50

- Pearly white at first, tan after two days

- By 5th day dark purple, at this point, hatch 1-2 days away



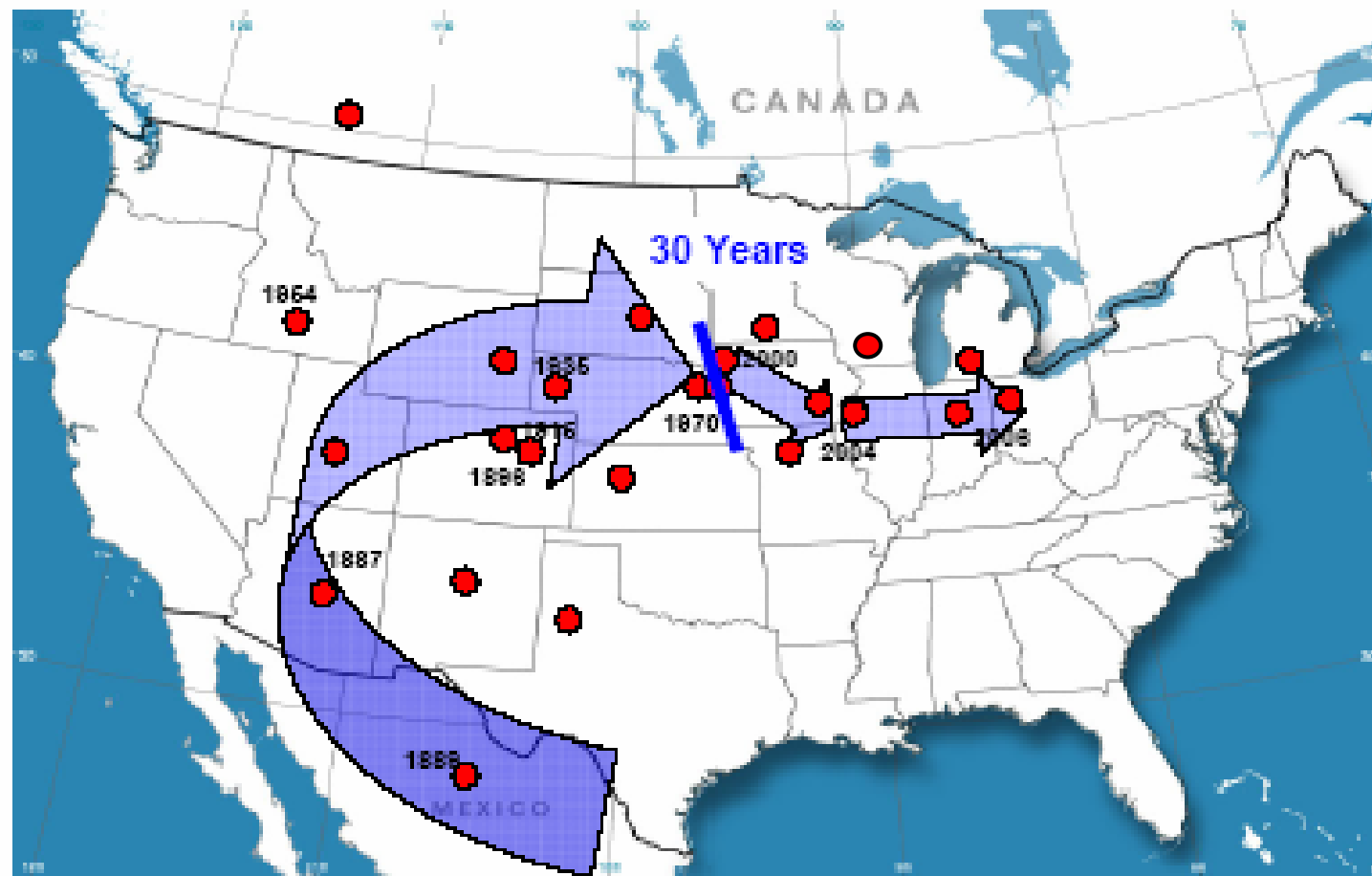
Identification

➤ Larvae

- 1st to 4th instar dark brown with faint cross-hatch marking (diamond pattern) on back
- Older larva has three dark brown stripes behind head and is light tan to pink in color

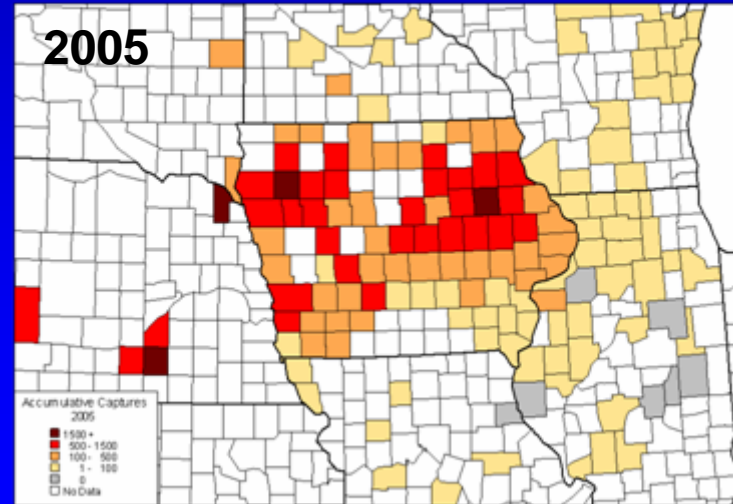
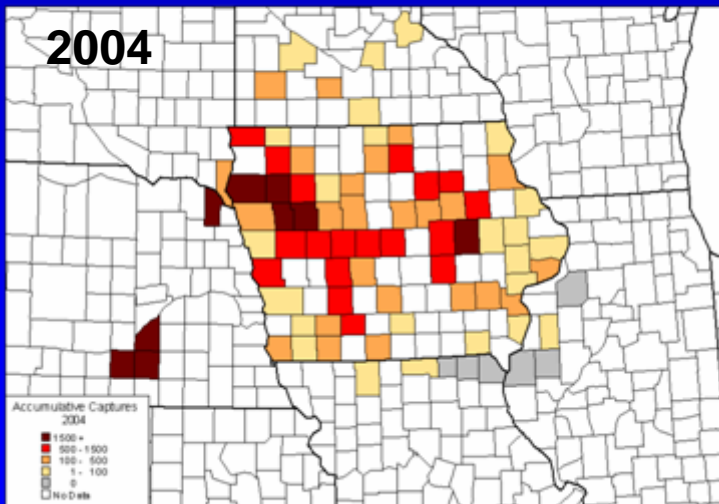
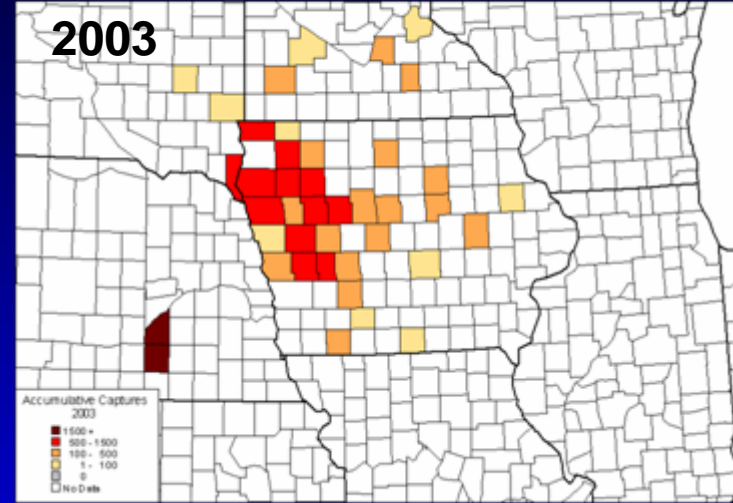
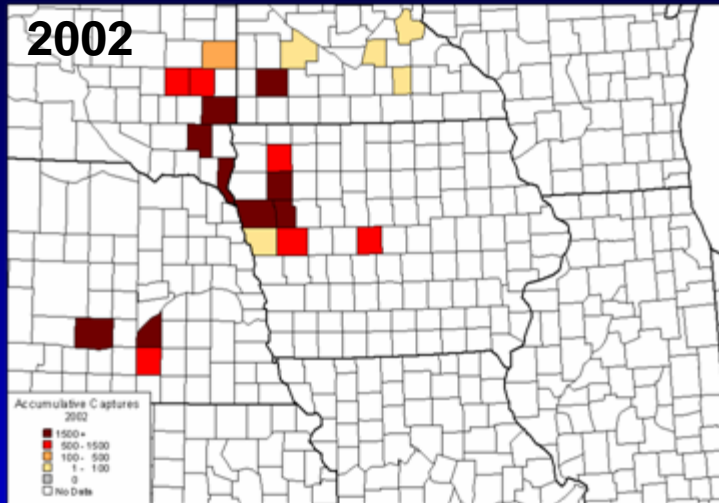


Western bean cutworm movement



Source: Chart compiled by David Dorhout, ISU

Western Bean Cutworm Cumulative Trap Captures



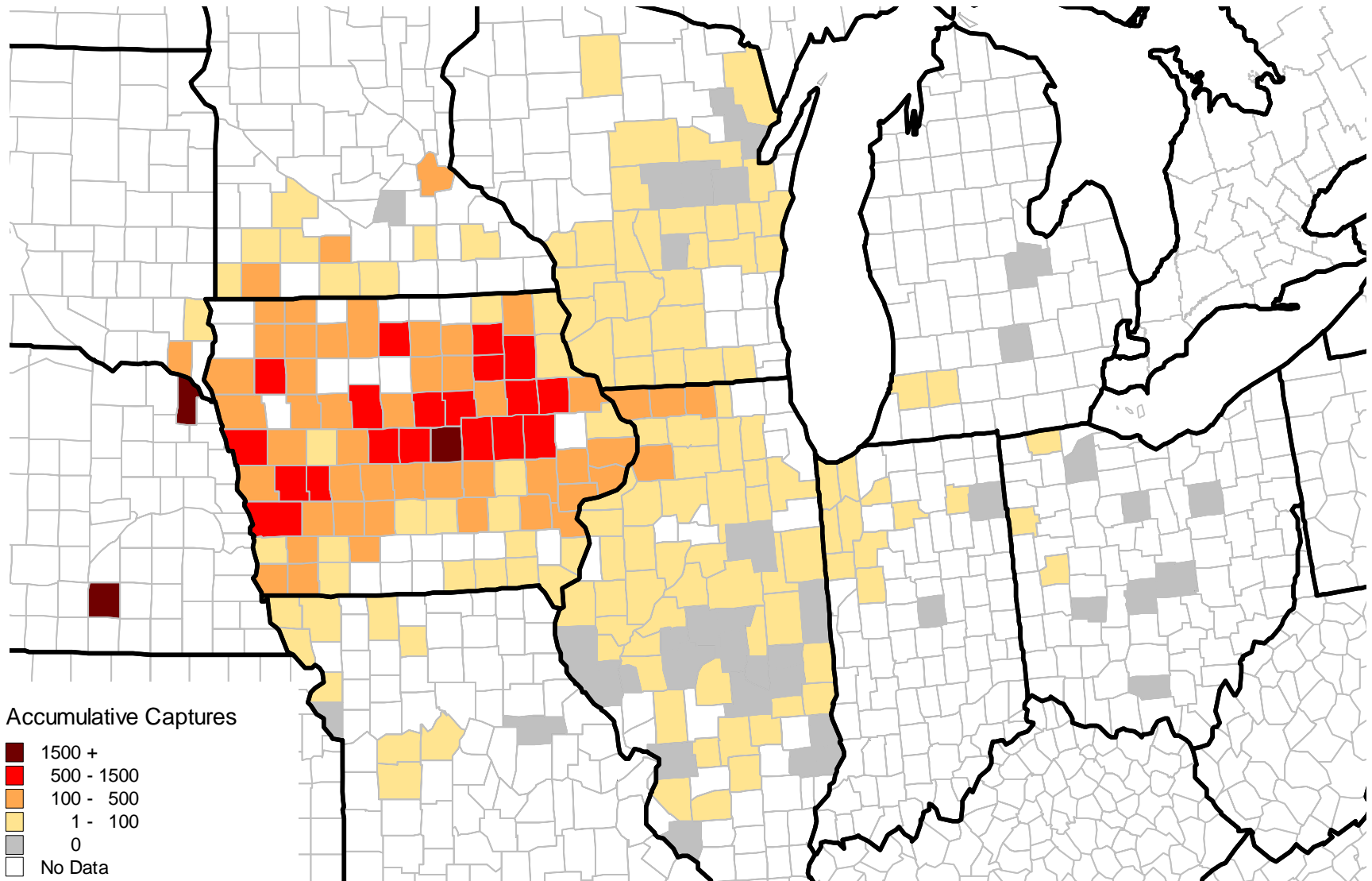
Sources: www.plantmanagementnetwork.org/pub/cm/brief/2004/cutworm, www.ent.iastate.edu/trap/westernbeancutworm, <http://nrec.unl.edu/ipm/lighttrap2005.htm>,

[http://entomology.unl.edu/scal/Lighttrap/\[year\]_lighttrapdata.htm](http://entomology.unl.edu/scal/Lighttrap/[year]_lighttrapdata.htm), [http://hamilton.unl.edu/\[year\].htm](http://hamilton.unl.edu/[year].htm), [http://plantsci.sdstate.edu/ent/entpubs/wbc\[year\]_\[location\].htm](http://plantsci.sdstate.edu/ent/entpubs/wbc[year]_[location].htm),

www.vegedge.umn.edu/2005/wblist.htm, <http://westcentral.unl.edu/entomology/lighttrap/htm>, <http://pestbulletin.wi.gov/issues/45-52>. Compiled by Pioneer Marketing Department.

Western Bean Cutworm Moth Captures

County Average Season Totals - 2006



Sources: www.ent.iastate.edu/trap/westernbeancutworm, <http://nerec.unl.edu/ipm/lighttrap2006.htm>, http://entomology.unl.edu/scal/Lightrap/2006_Light_Trap_Report.shtm,
[http://plantsci.sdstate.edu/ent/entpubs/wbc2006_\[location\].htm](http://plantsci.sdstate.edu/ent/entpubs/wbc2006_[location].htm), www.vegedge.umn.edu/2006/WBC/MNwbc.htm,
http://scal.unl.edu/Research/Insect/2006_Light_Trap_Reports.shtml, <http://pestbulletin.wi.gov/issues/66-71>. Compiled by Pioneer Marketing Department.

Change in Moth Captures Northern Illinois

Illinois County	Ranges of catch/trap	2006 No. Locations	2005 Catch	2005 No. Locations
Jo Daviess	12-179	3	60	1
Stephenson	0-534	22	27	1
Winnebago	31-332	5	21	1
Ogle	3-265	3	3	1
Carroll	8-159	8	9	1
Whiteside	69-766	6	148	1

Western Bean Cutworm Damage

- Larvae feed on tips of developing ear
- May be multiple larvae per ear
- Heavy infestations may result in 50-60% of the kernels with feeding damage
- Several larvae per plant can reduce grain yield by 30-40%



Western Bean Cutworm Control

- Foliar Insecticides: Good to very good control with proper timing
- Herculex I hybrids: Very good control
- Other Bt technologies: Poor control

Western Bean Cutworm Prediction and Scouting

- Regular scouting visits should commence when moths are first detected (late June to early July)
- Degree day models for moth flight (base 50°F from May 1)
 - 25% flight: 1319 degree days,
 - 50% flight: 1422 degree days
 - 75% flight: 1536 degree days
- Spray thresholds:
 - 8% of plants infested with egg masses or small larvae





Herculex[®] I Insect Protection: *The only in-plant trait available that controls* **Western Bean Cutworm**

Conventional Competitor Hybrid

Pioneer[®] hybrid 34P89 (HX1, LL)



Samples taken from two fields north of State Center, Iowa. Both fields were subjected to western bean cutworm pressure. Fields located across the road from each other. Ears harvested 8.22.06



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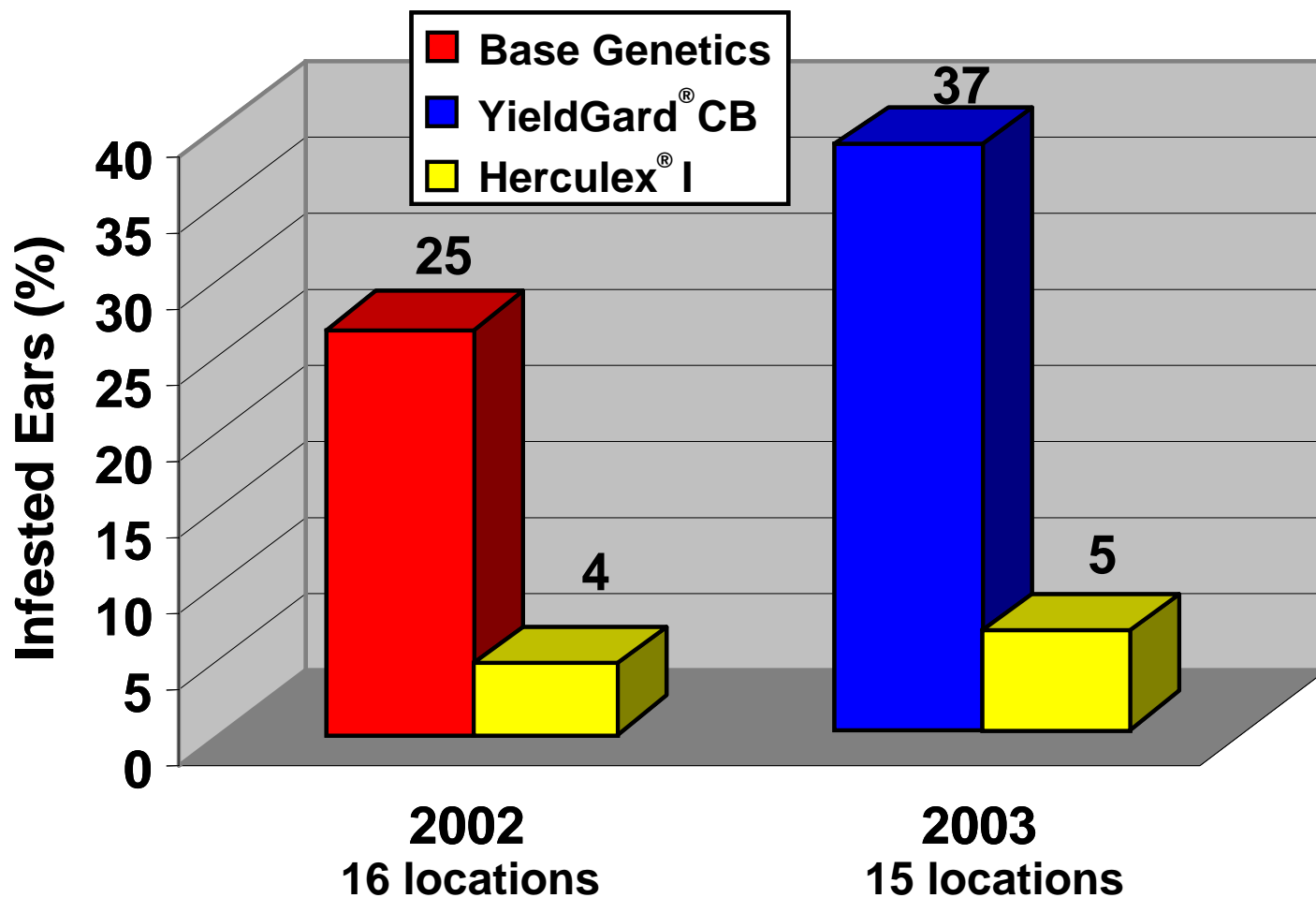


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Herculex I Efficacy Against Western Bean Cutworm



Impact of Western Bean Cutworm on Grain Yield – Iowa, 2006

- Examined yield data from counties where 500 or more WBC moths were captured from at least one or more light traps.
- In this region, it was not uncommon to find fields with 50% or more of ears with WBC damage.
- Across 466 side-by-side comparisons, Pioneer hybrids with the Herculex[®] I trait out-yielded hybrids with YieldGard[®] Corn Borer trait an average of 9 bushels / acre.

Data Source: Pioneer on-farm side-by-side comparisons, 2006.

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Factors Impacting Severity of Damage From Western Bean Cutworm

- Size & survival of over-wintering population
- Type of Bt gene
- Synchronization between silking date and timing of moth flight
- Insecticide sprays for 2nd gen ECB &/or CRW
- Competition from other ear feeding insects
 - Corn borers
 - Corn earworm
- Environmental factors influencing ear mold development

Potential Factors Influencing Size of Over-wintering Population

- Previous year's population
- Cultural practices
 - Reduced tillage and no-till reduce mortality
 - Less disturbance of over-wintering pupae
 - Increased residue moderates soil temperature
- Soil types
- Winter temperatures

Iowa State Trials - 2006

Methods

- Data taken from grower strip trial locations in Iowa
 - Iowa State University (Marlin Rice) = 3 locations
- Data recorded on infestation levels and amount of feeding damage
 - **Avg. Damage/ ears (cm)**
 - **Avg. Larvae/10 ears**
- Data averaged across all strip trial locations

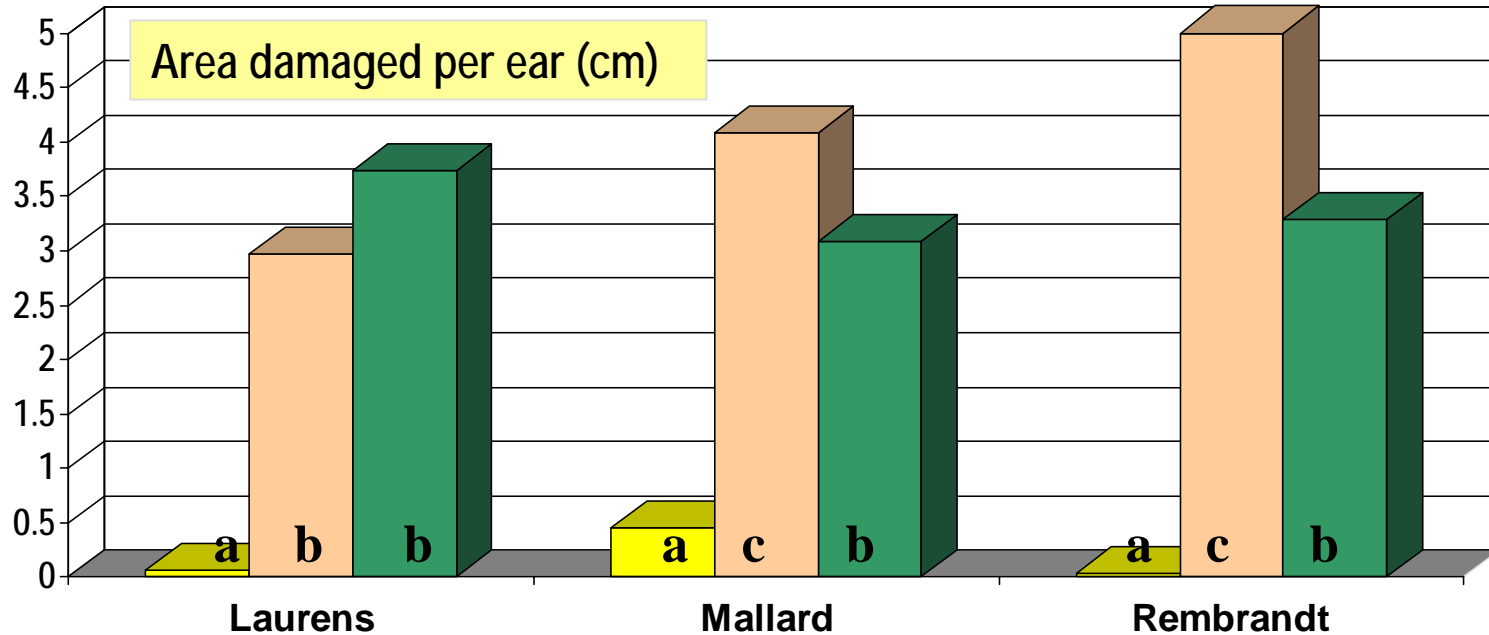


Western Bean Cutworm Trial (2006)

Iowa State University: Herculex® vs. YieldGard®

Average across multiple hybrids at each location

■ Herculex I & XTRA (Combined Data)
 ■ YieldGard CB
 ■ Non-Bt



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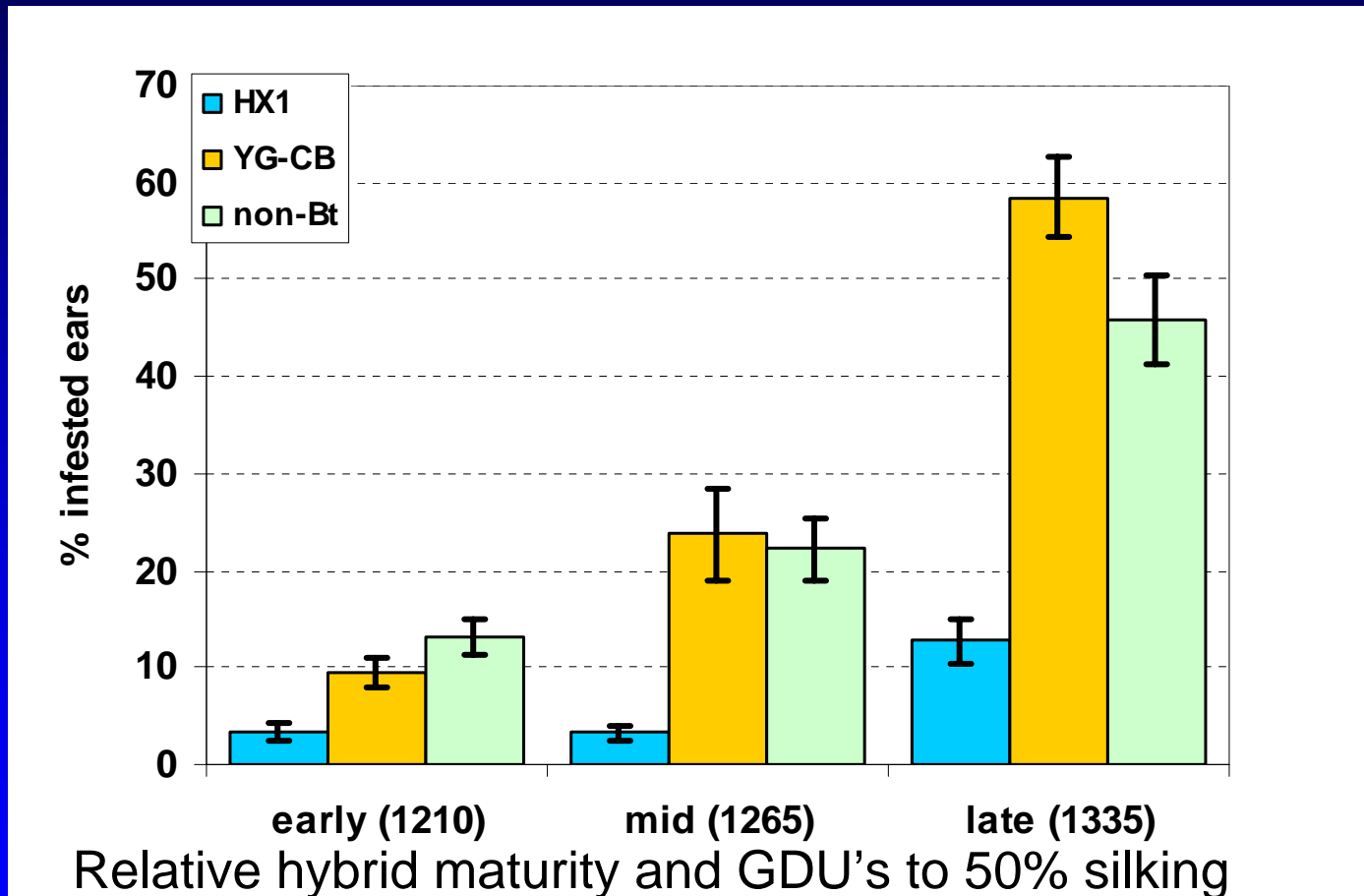
Within each location, means followed by same letter not significantly different (ANOVA, $p = 0.05$)

- Herculex hybrids provided significantly less feeding damage than YieldGard hybrids & Non-Bt
- YieldGard CB did not provide significant protection from WBCW

Competition

- Corn earworm
 - Migratory insect
 - Cannibalistic
 - Growth & populations suppressed by Bt (cry1Ab, cry1F)
- Rice & Dorhout 2006 (Iowa State Univ.)
 - Diet bioassays & silk assays
 - Confirmed CEW will attack & kill WBC
 - WBC can increase survival >2 fold if CEW development is slowed by cry1Ab

Influence of Silking Date on Western Bean Cutworm Infestations



Data Source: Pioneer research trials at Sibley and Cherokee, IA. Planted first week of May 2002

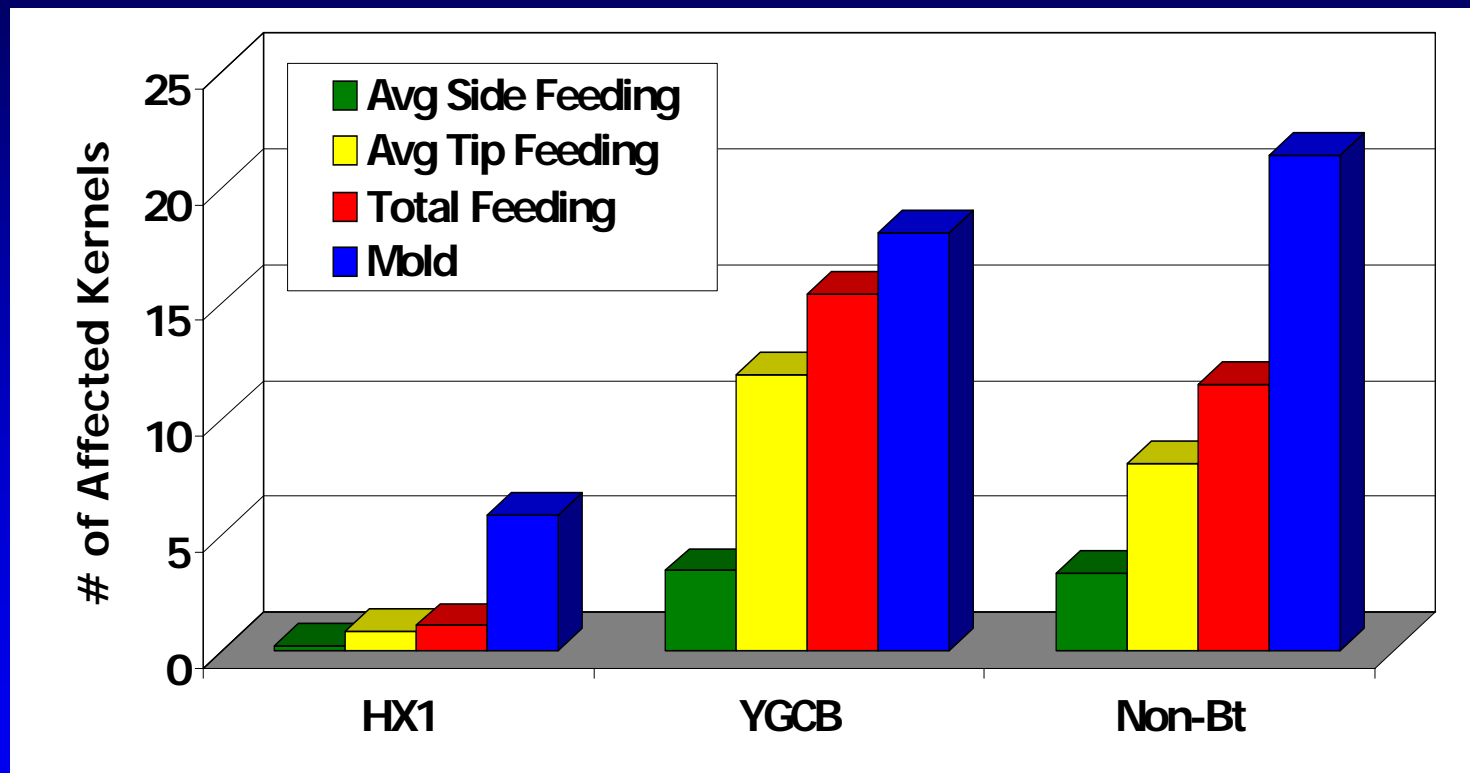
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Western Bean Cutworm Ear Damage



Photo credits: Dow Agrosiences

Impact of Western Bean Cutworm Damage on Ear Mold



Number of kernels affected by WBC feeding and mold on hybrids with HX1 trait, YGCB trait and non-Bt isolines.

Data Source: Pioneer research trials at six locations, 2004.

Western Bean Cutworm & the Ethanol Process

- Recent research by Catangui and Berg (2006) supports increased risk of ear mold with WBC damage
- Potential to also increase the risk of mycotoxins that are associated with these ear molds
- Ethanol process
 - Mycotoxins like fumonisin and aflatoxin are not broken down
 - Distillers grain by-product concentrates any mycotoxins by 3-fold compared with original grain source
 - Bothast et al. 1991
 - Lillehoj et al. 1979

Summary

- WBC – emerging threat to corn yield and quality
 - Established itself as significant pest in western corn belt
 - Increasing concern in eastern corn belt
- Important to monitor flight status
 - <http://www.ent.iastate.edu/trap/westernbeancutworm/>

Thank You!

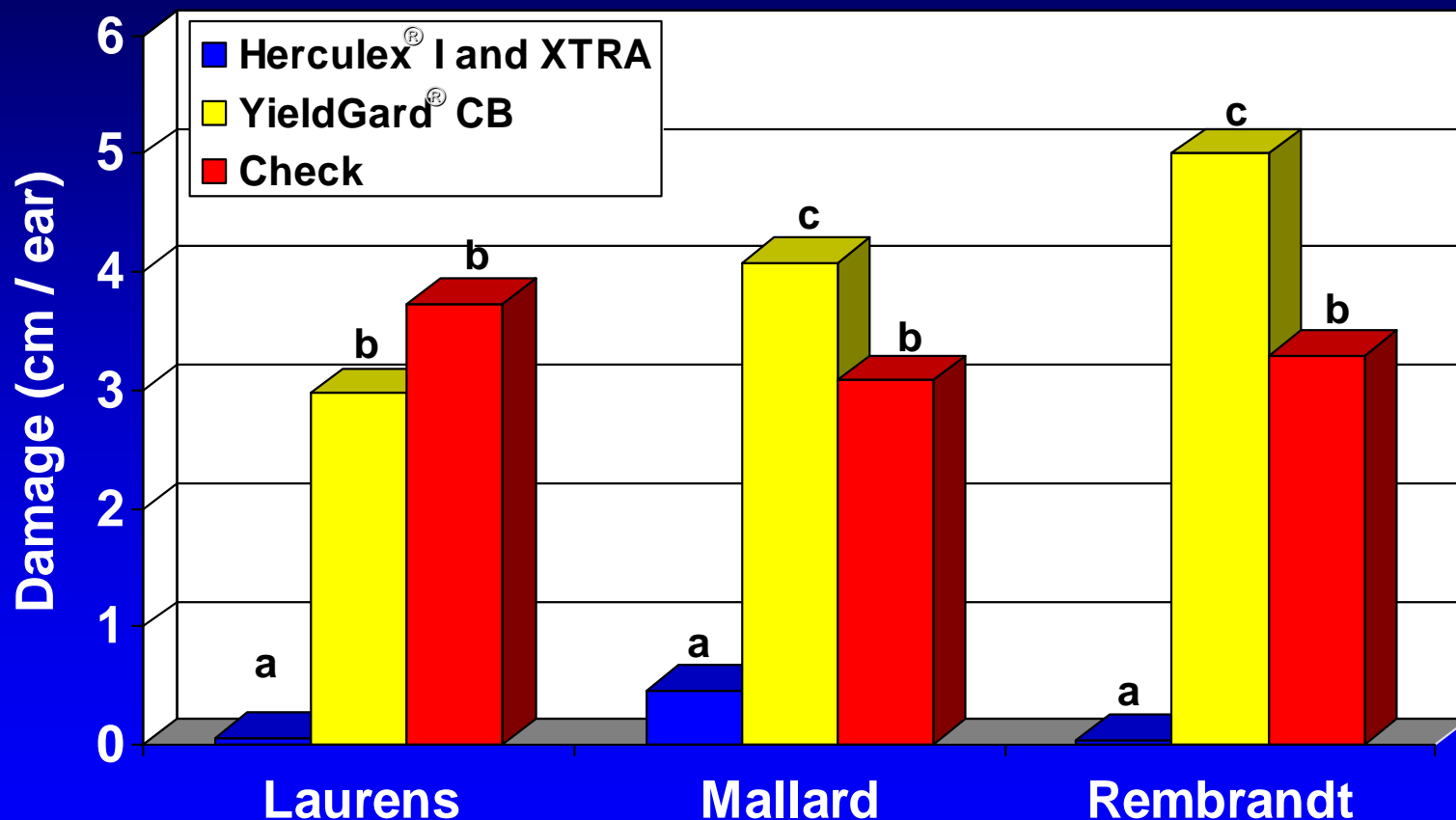
WBCW = Western bean cutworm

HX1=Herculex® I insect protection

LL=LibertyLink® gene ® LibertyLink is a registered trademark of Bayer AG.

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Western Bean Cutworm Ear Damage, Iowa State University trials, 2006



Means at the same location and followed by the same letter are not statistically significant by ANOVA, $P=0.05$

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Scout & Spray Method

- Sample size = 100 plants
 - 20 plants in 5 areas of field or ten plants at 10 locations
 - If 8% of the plants have egg masses or young larvae, spray
- Spraying timing is critical...
 - If 90-95% of the tassels are not emerged, wait
 - If tassels emerged, spray when 70-90% eggs hatched
 - Time from hatch to larva movement into ear shoot, if present, is three days

Scout & Spray Method

- Insecticide application needs to be made prior to larva entering ear
- Use light or pheromone trap to monitor moth flights
- Begin to scout when moths first appear
- Look for eggs on upper leaf surface in upper part of canopy



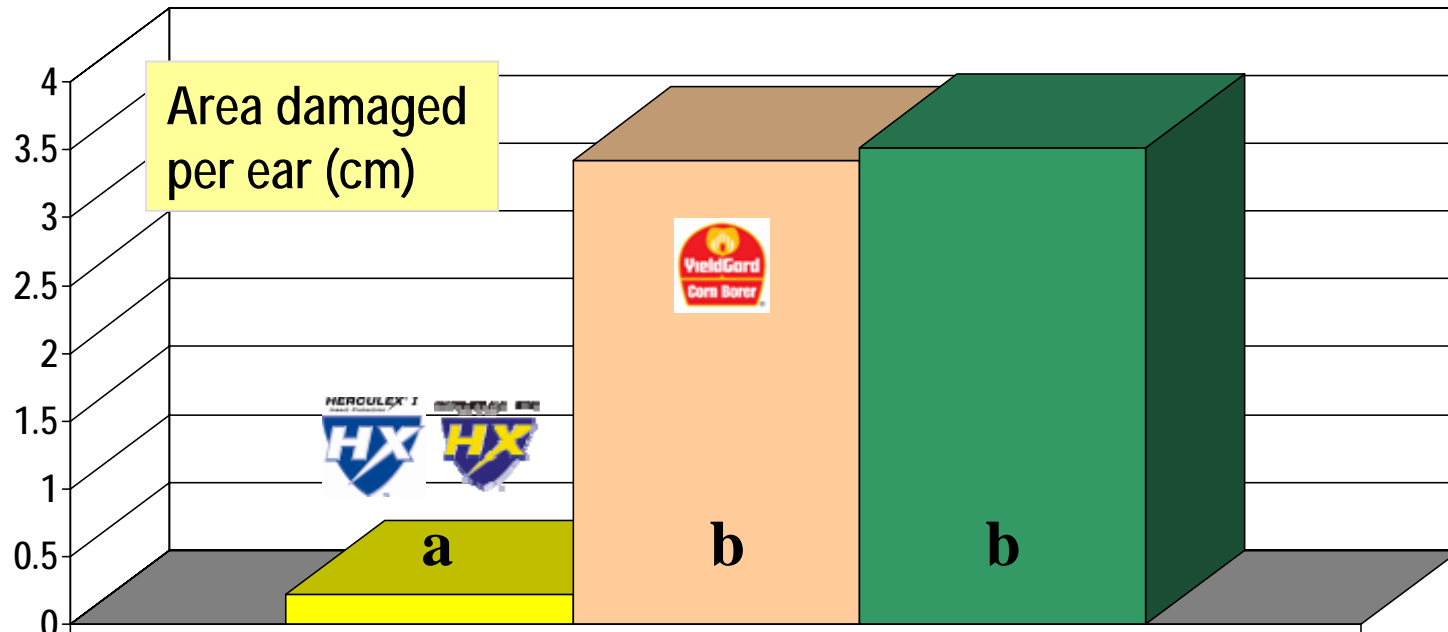


Western Bean Cutworm Trials (2006)

Iowa State University: Herculex® vs. YieldGard®

Averaged across multiple hybrids & 3 locations

■ Herculex I & XTRA (Combined Data)
 ■ YieldGard CB
 ■ Non-Bt



Means followed by the same letter are not significantly different (ANOVA, $p = 0.05$)

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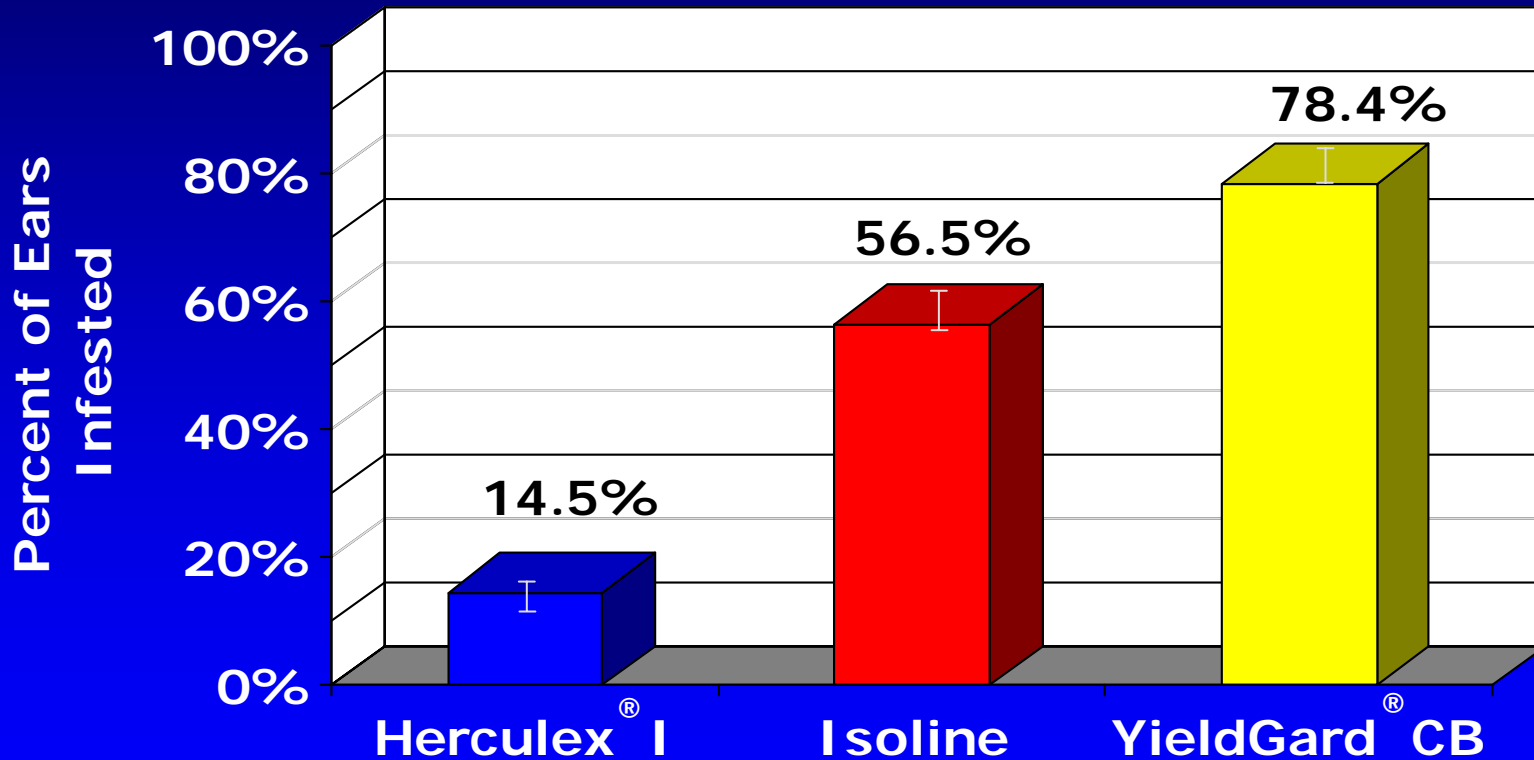
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- Herculex hybrids provided significantly less feeding damage than YieldGard hybrids & Non-Bt
- YieldGard CB did not provide significant protection from WBCW



Western Bean Cutworm Infestations - 2005



Data Source: Iowa State University (Dave Dorhout & Marlin Rice).

4 locations in Hardin & Buchanan counties, Iowa

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