

Understanding Insect Thresholds In Agronomic Crops

Angus Catchot, Don Cook, Whitney Crow, Jeff Gore, and Fred Musser
Mississippi State University

2019 INSECT CONTROL GUIDE for Agronomic Crops



Green and Southern Green Stink Bugs



| Insecticide | Amount of Formulation per Acre | Pounds Active Ingredient per Acre | Acres 1 Gallon or 1 Pound Dry Will Treat | PHI (days) | Comments |
|--|--------------------------------|-----------------------------------|--|------------|--|
| imidacloprid (CN), β-cyfluthrin (P) Leverage 360 | 2.85 oz | – | 45 | 21 | |
| λ-cyhalothrin (P) Karate Z 2.08CS | 1.6–1.92 oz | 0.025–0.03 | 83–69 | 30 | Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Maximum AI per acre per season: 0.06 lb. |
| thiamethoxam (CN), λ-cyhalothrin (P) Endigo ZC | 3.5–4.5 oz | – | 37–28 | 30 | |
| Z-cypermethrin (P) Mustang Max 0.8EC | 3.2–4 oz | 0.02–0.025 | 40–32 | 21 | Toxic to aquatic invertebrates. Maximum AI per acre per season: 0.125 lb. |

THRESHOLD: If you use a drop cloth, the threshold is one bug per foot of row. If you are using a sweep net, the threshold is nine bugs per 25 sweeps. Count only stink bug nymphs larger than ¼ inch. When soybeans reach the R6 growth stage, treat only populations of 20 stink bugs per 25 sweeps or higher, and terminate stink bug applications at R6+7 days (R6.5). Read label to determine the preharvest interval.

How do we Come
up With
Recommendations



MSSEWNG

Mid-South Entomologist Working Group



Economic Injury Level (EIL)

(EIL) = “The lowest population density of a pest that will cause economic damage; or the amount of pest injury which will justify the cost of control.” $P = C \div (V \times I \times D)$

Economic Injury Level (EIL)

Corn Earworm in Soybeans, Sweep Net Sampling

$$P = C \div (V \times I \times D)$$

$$13.1 = \$20/\text{acre} \div (\$9/\text{bu} \times 1 \text{ larva per 25 sweeps} \times 0.17 \text{ bu lost})$$

No. Larvae / 25 Sweeps

Control Costs (\$/acre)

| Crop Value (\$/bu) | 10 | 15 | 20 | 25 | 30 |
|--------------------|-----|------|------|------|------|
| 6 | 9.8 | 14.7 | 19.6 | 24.5 | 29.4 |
| 7 | 8.4 | 12.6 | 16.8 | 21.0 | 25.2 |
| 8 | 7.4 | 11.0 | 14.7 | 18.4 | 22.1 |
| 9 | 6.5 | 9.8 | 13.1 | 16.3 | 19.6 |
| 10 | 5.9 | 8.8 | 11.8 | 14.7 | 17.6 |
| 12 | 4.9 | 7.4 | 9.8 | 12.3 | 14.7 |

P = Density or intensity of pest population
(for example insects/acre)

C = Pest Management Costs (\$/acre)

V = Market Value of per unit of produce
(for example, \$/acre)

D = Damage per unit injury
(for example, bushels lost/acre/percent defoliation)

I = Injury units per production unit (for example, % defoliation/insect/acre, expressed as a proportion)



Economic Threshold

- The level of pest infestation at which management action is justified

EIL And ET In Relation To Pest Density

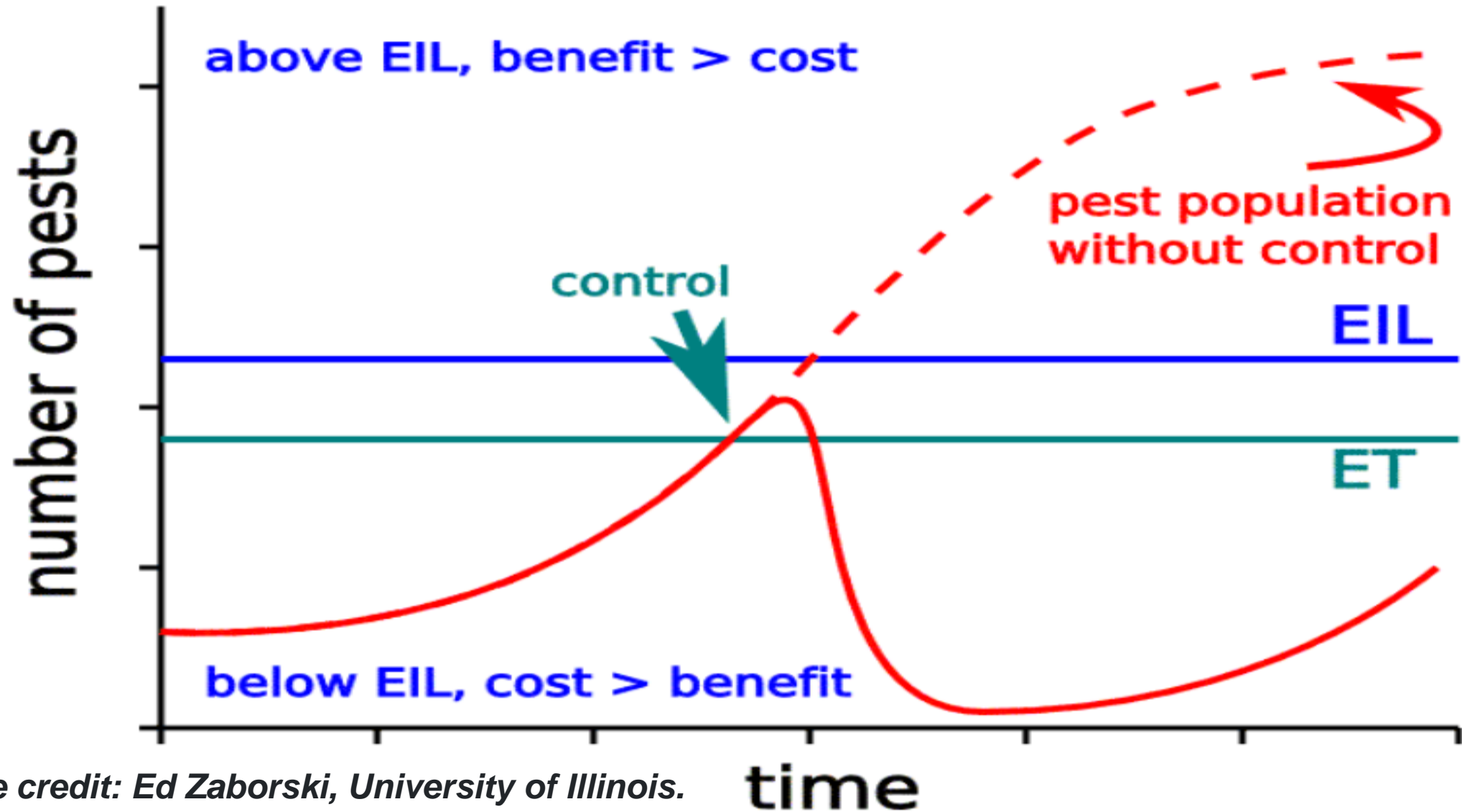
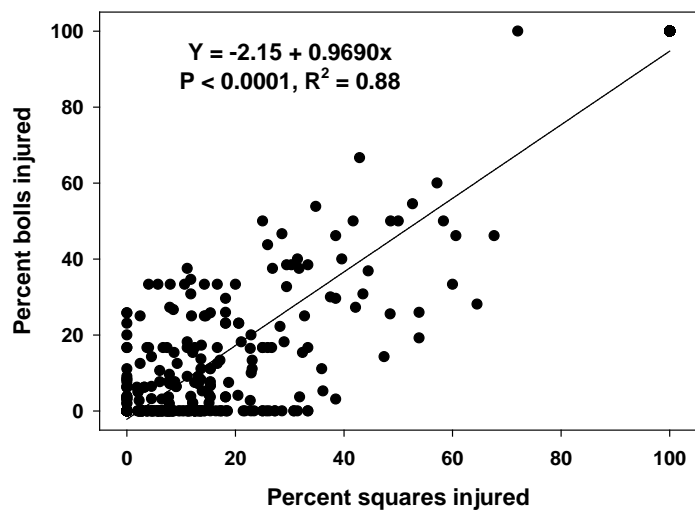
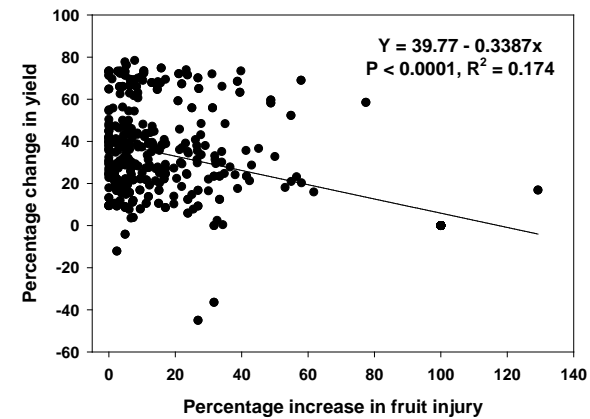
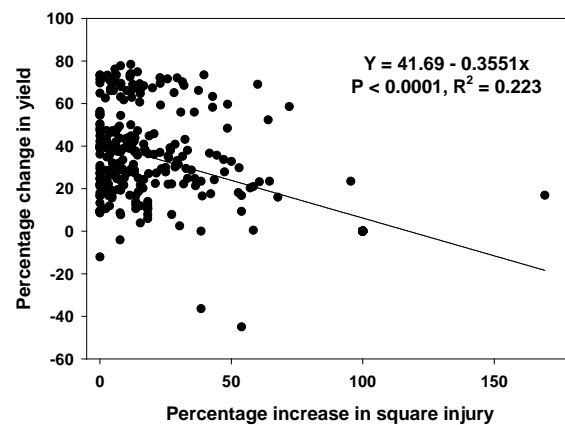
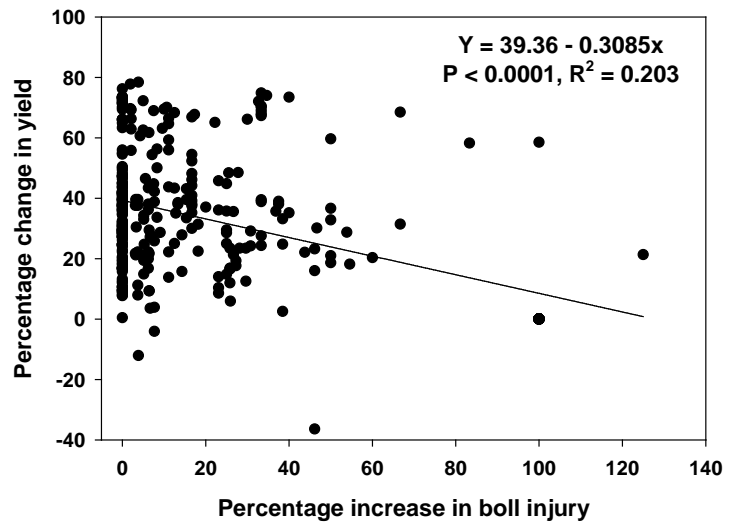


Figure credit: Ed Zaborski, University of Illinois.

Examples Of Thresholds And Threshold Modifications In Recent Years

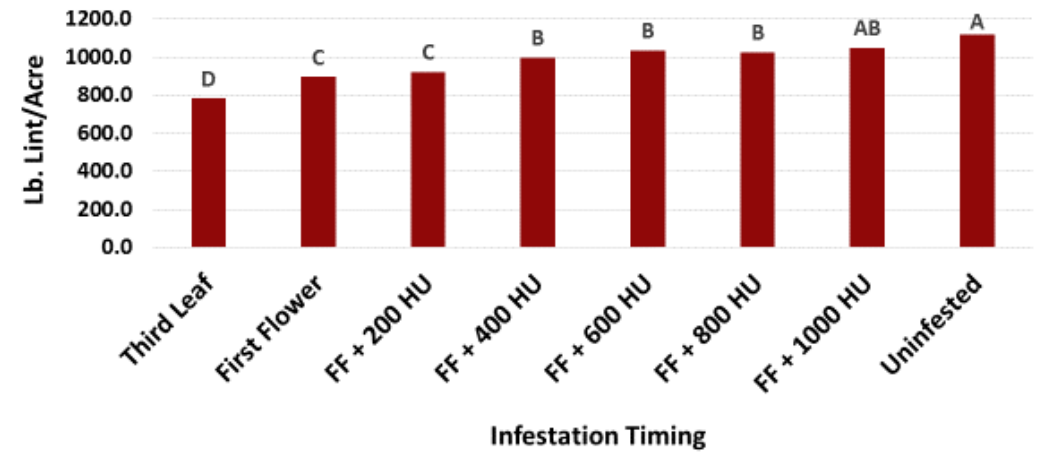


Relationship Between Fruit Injury And Yield

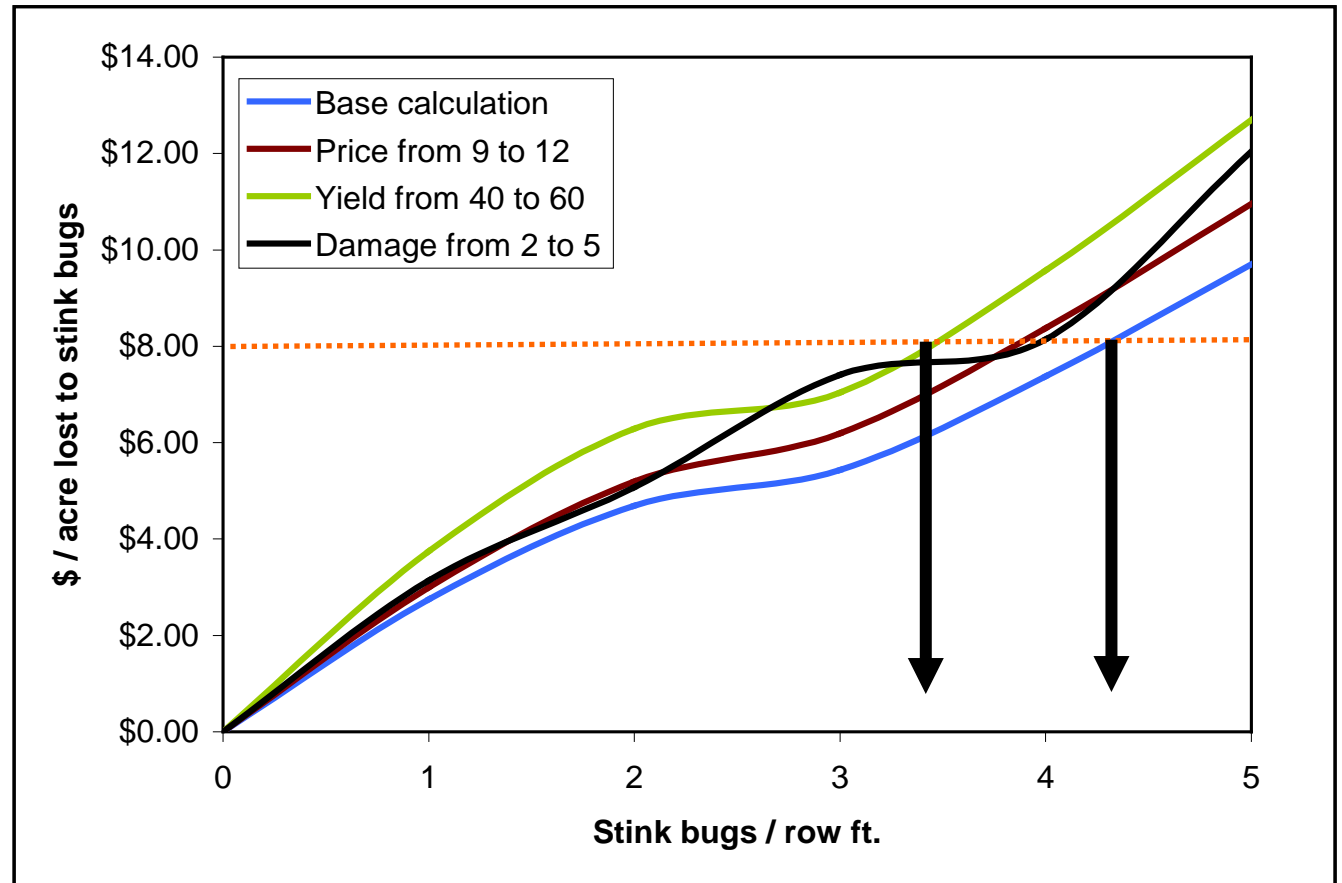
Data Indicated We Were Spraying Too Late



Evaluation of Yield Losses by Spider Mites In Cotton
2009-2011



Threshold Adjustments For Quality Problems With Stink Bugs



Base Assumptions:

40 bu/ac yield potential

2.0% and 0.3% total and heat damage, respectively, without stink bugs

\$9 / bu value before discounts

Sometimes Circumstances Dictate Changes to Thresholds

Pre-bloom

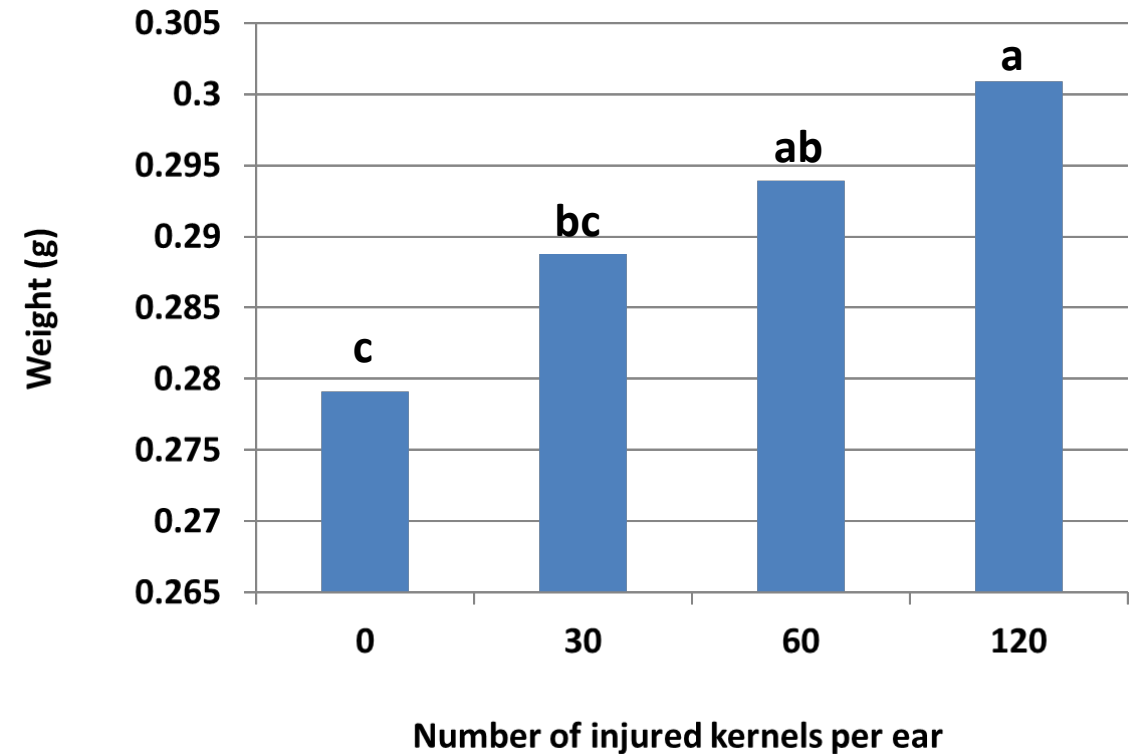
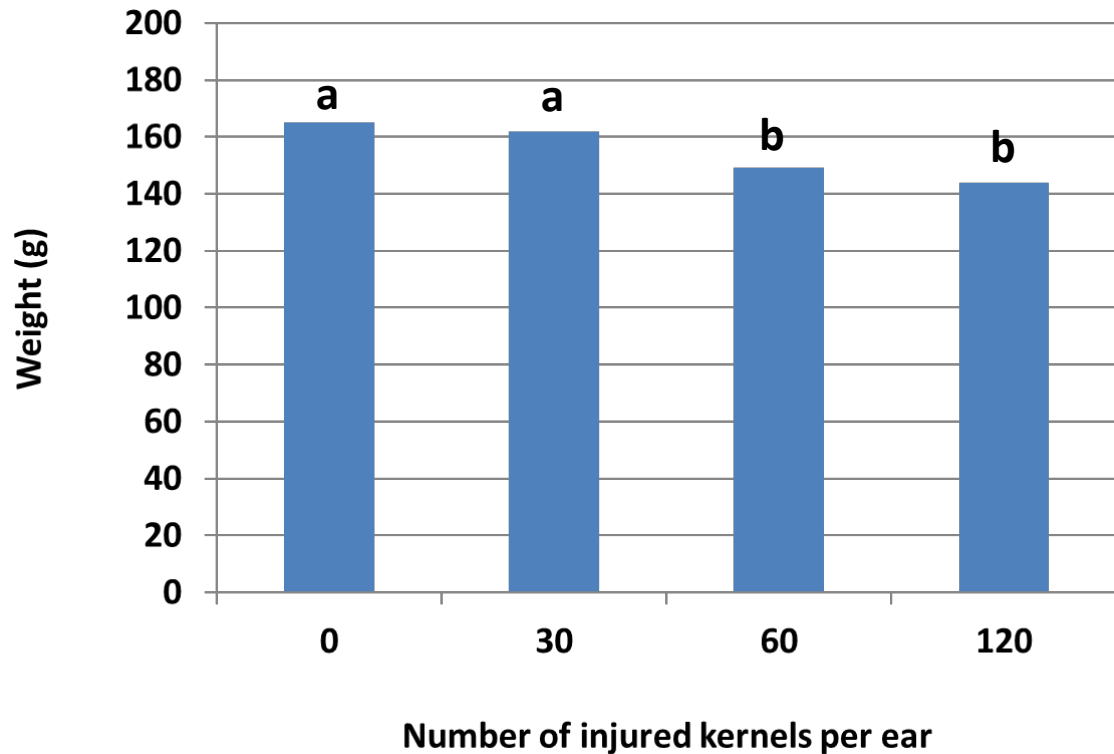
- **Foliage feeding- 35% prior to bloom**

Post-bloom

- **Foliage feeding- 20% when plants are blooming through filling pods**
- **Two beetles per sweep after pod set**



Sometimes the Data Supports NO THRESHOLD



No Matter How Accurate Your Threshold is, If Folks Don't Adopt it....It's Worthless

Pearson Correlation Coefficients (r) to Percent Stalks Tunneled at Harvest

| | Vegetative | Early Reproductive | Late Reproductive | Total |
|----------------|------------|--------------------|-------------------|-------|
| Eggs Sampled | 0.10 | 0.36 | 0.65 | 0.48 |
| Pheromone Trap | 0.30 | 0.31 | 0.64 | 0.38 |

Relationships to Tunneling

| | Needed for 25% Tunneling | |
|--------------------|--------------------------|---------------------|
| | % Egg Infestation | Moths / Trap / Week |
| Vegetative | 33 | 91 |
| Early Reproductive | 19 | 918 |
| Late Reproductive | 8 | 248 |

Former MS Recommendation

Treat when larvae or egg masses are present on **25% of more of the plants.**

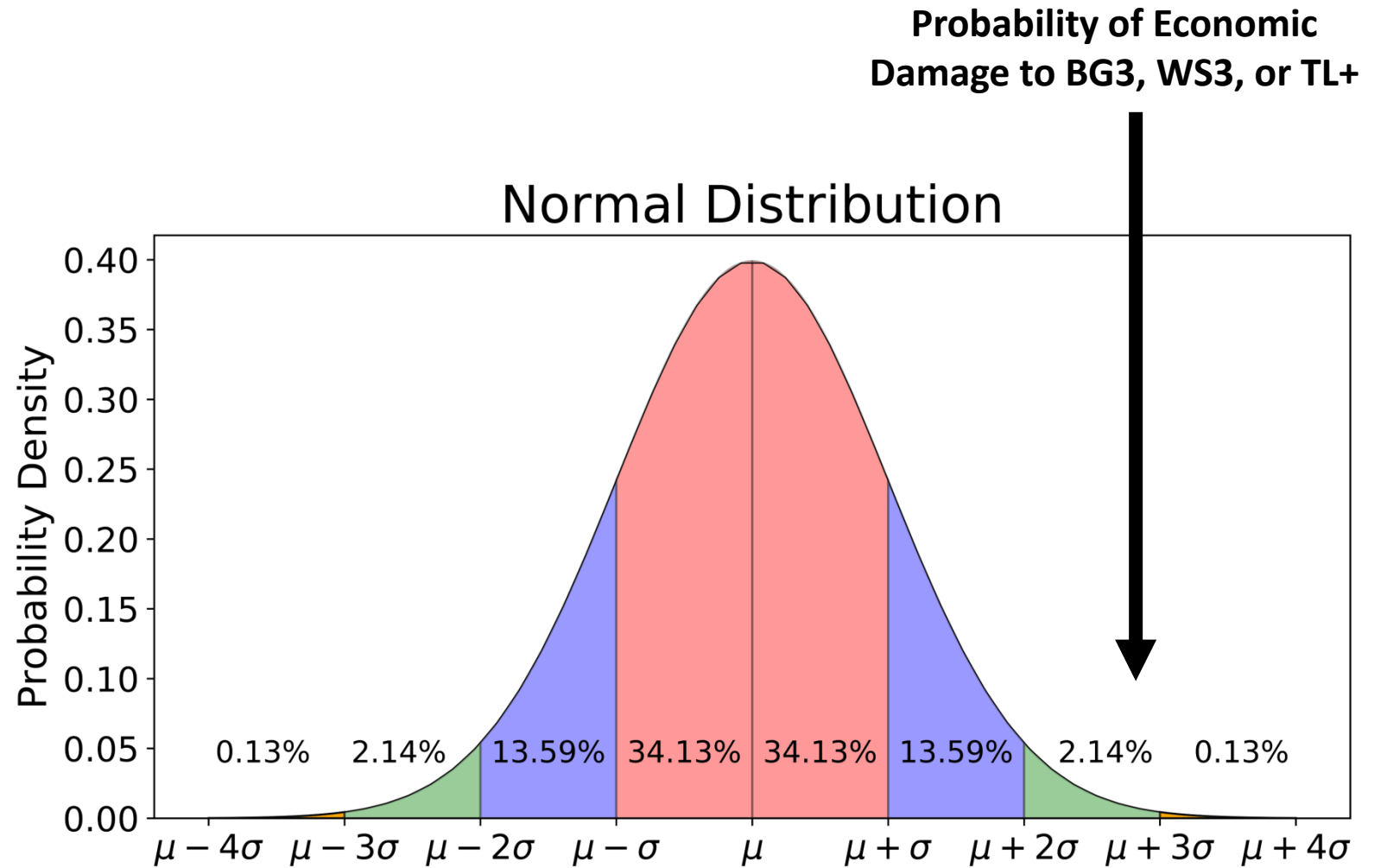
New MS Recommendation

| V1 | V2 | Vnth | VT | R1 | R2 | R3 | R4 | R5 | R6 |
|--|--------|----------|--------|--|---------|------|---------------------|------|-------------|
| One Leaf | 2 Leaf | Nth Leaf | Tassel | Silk | Blister | Milk | Dough | Dent | Black Layer |
| Treat 7-10 days after moth traps average 50 per trap on a 7 day catch from V1-Vnth or when plants average 5% corn borer egg masses or larval infestations per plant. | | | | Treat 7-10 days after moth traps average 100 per trap on a 7 day catch from R1-R3 or when plants average 10% corn borer egg masses or larval infestations per plant. | | | Do Not Treat | | |

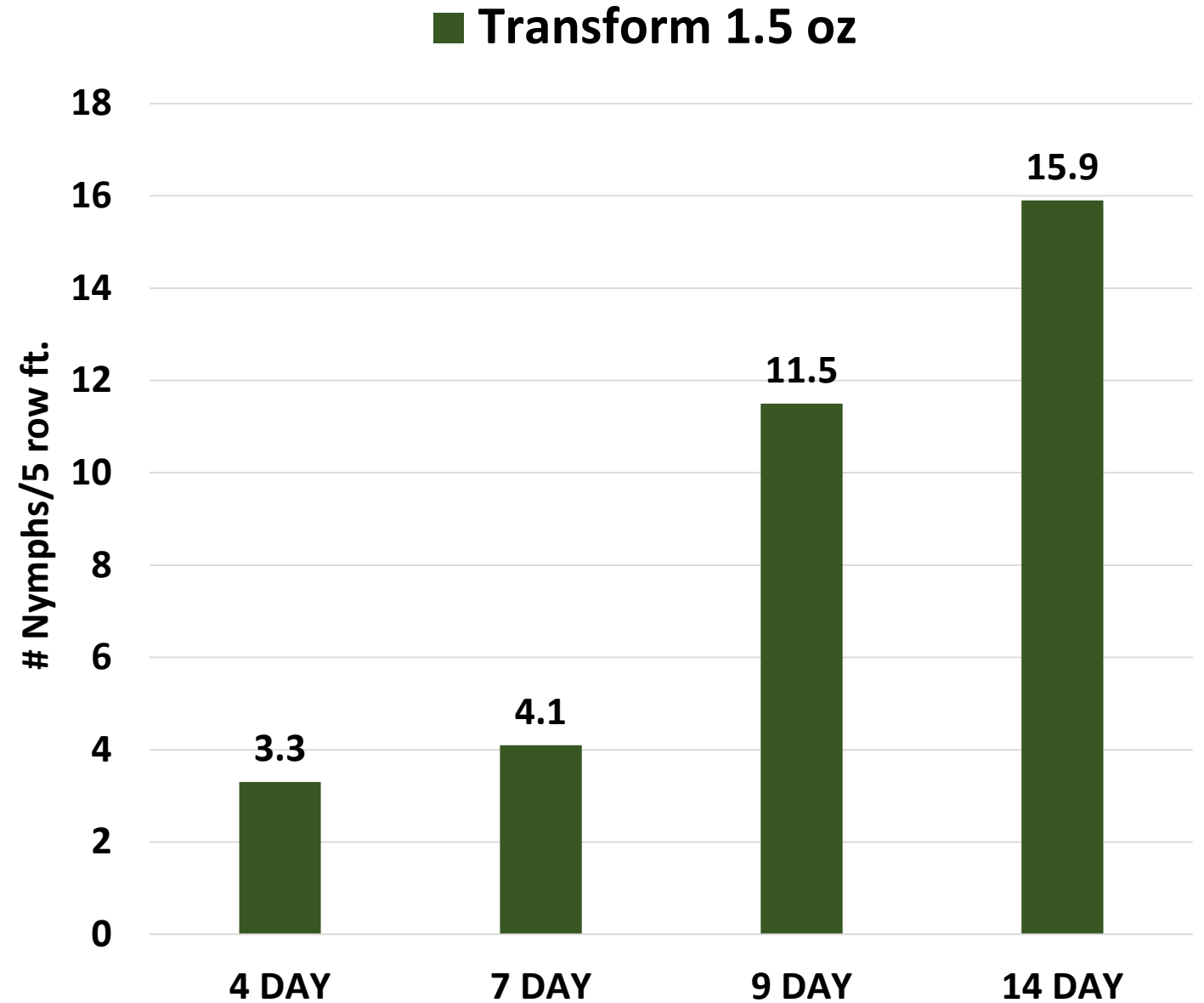
Food For Thought



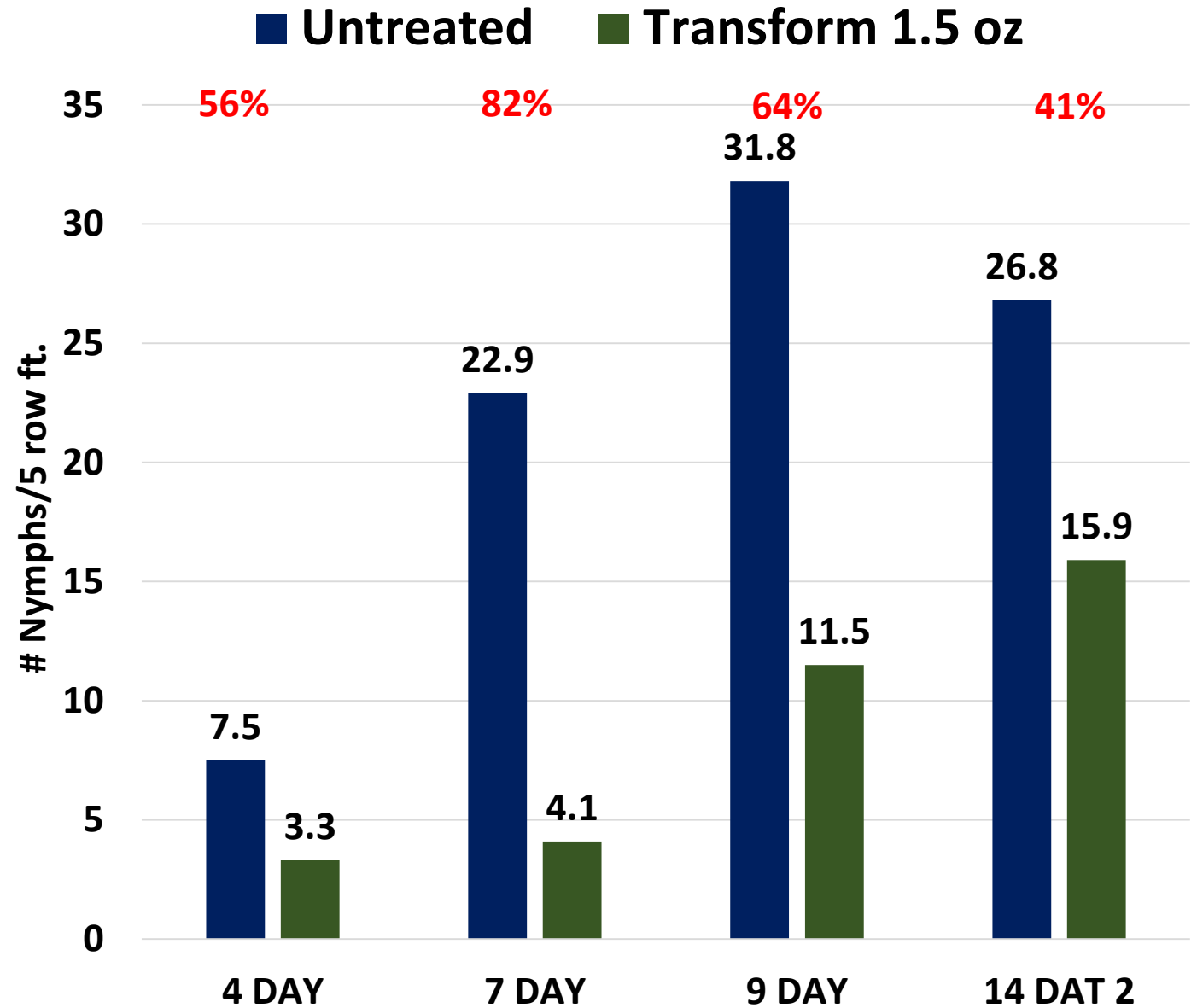
Cannot
Manage for
The
Exceptions



It's Not Always
As It Seems



It's Not Always
As It Seems





You Absolutely Have To Take
Counts....

Cannot Have
Zero
Tolerance



**There Are Limitations To Thresholds,
But We Can Do Much Better With
Zero Yield Penalties**

**Our End Goal Is For Our Producers
to Remain Profitable**



Thank You