

Tarnished Plant Bug Sampling Methods and Thresholds

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Existing Situation



- With use of RR cotton, some growers are adding an insecticide to Roundup applications before bloom even when TPB are below threshold
- With use of Bollgard cotton, many sprays after first bloom are targeted for TPB
- Most scouts use a plant count, but there is no standard whole plant sampling procedure
- Mid-season TPB thresholds need to be re-examined
- General lack of confidence in TPB thresholds after first bloom

Objectives

- Identify **efficient** and **accurate** TPB sampling methods in mid-season cotton
- Verify or adjust current TPB thresholds
- Standardize recommended scouting procedures and thresholds in the mid-south



2005 Methods

- 120 commercial fields in TN, MS, LA, AR
- 4 sites in each field
- 5 direct sampling methods (# bugs, time)
- 4 indirect sampling methods (damage, time)



2005 Sampling Efficiency

- Direct Sampling methods
 - Sweep net is most efficient for adults
 - Drop cloth most efficient for nymphs
 - Sweep net and drop cloth about equal for total bug efficiency
- Indirect sampling methods
 - Dirty blooms most efficient

2006 Sampling Methods

- 60 commercial fields in TN, MS, LA, AR
- 4 sites in each field
- 3X per day (6-9 AM, 11 AM-2 PM, 4-7 PM)
- Three direct sampling methods (# bugs, time)
 - Sweep net (25 sweeps)
 - Drop cloth (5 row ft.)
 - Modified whole plant (25 plants)
 - Terminal, 2 squares, 1 bloom, 1 boll



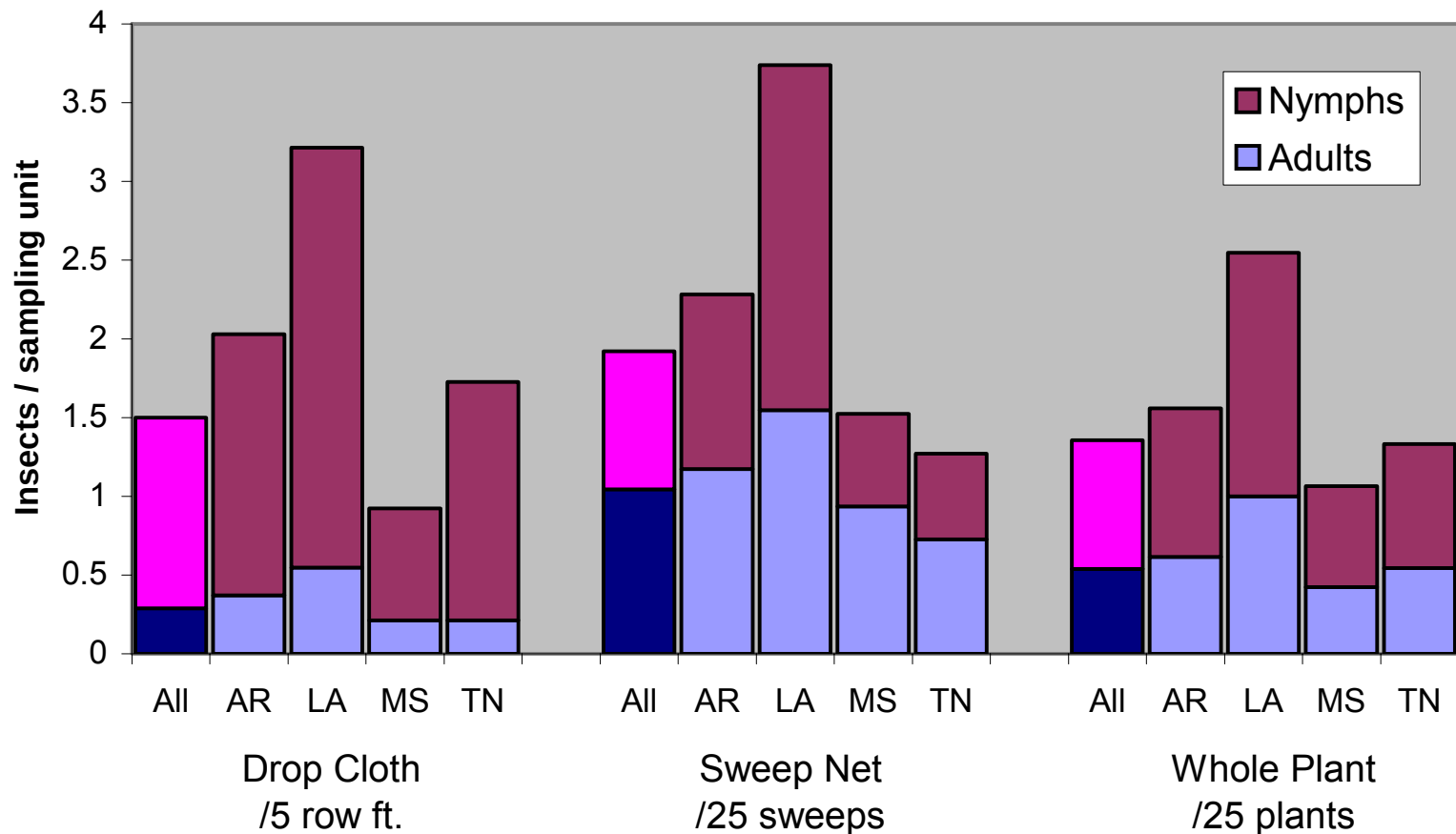
2006 Methods

- Four indirect sampling methods (damage, time)
 - Damaged squares (25 squares)
 - Dirty blooms (25 blooms)
 - Internal boll damage (25 bolls)
 - External boll damaged (25 bolls)

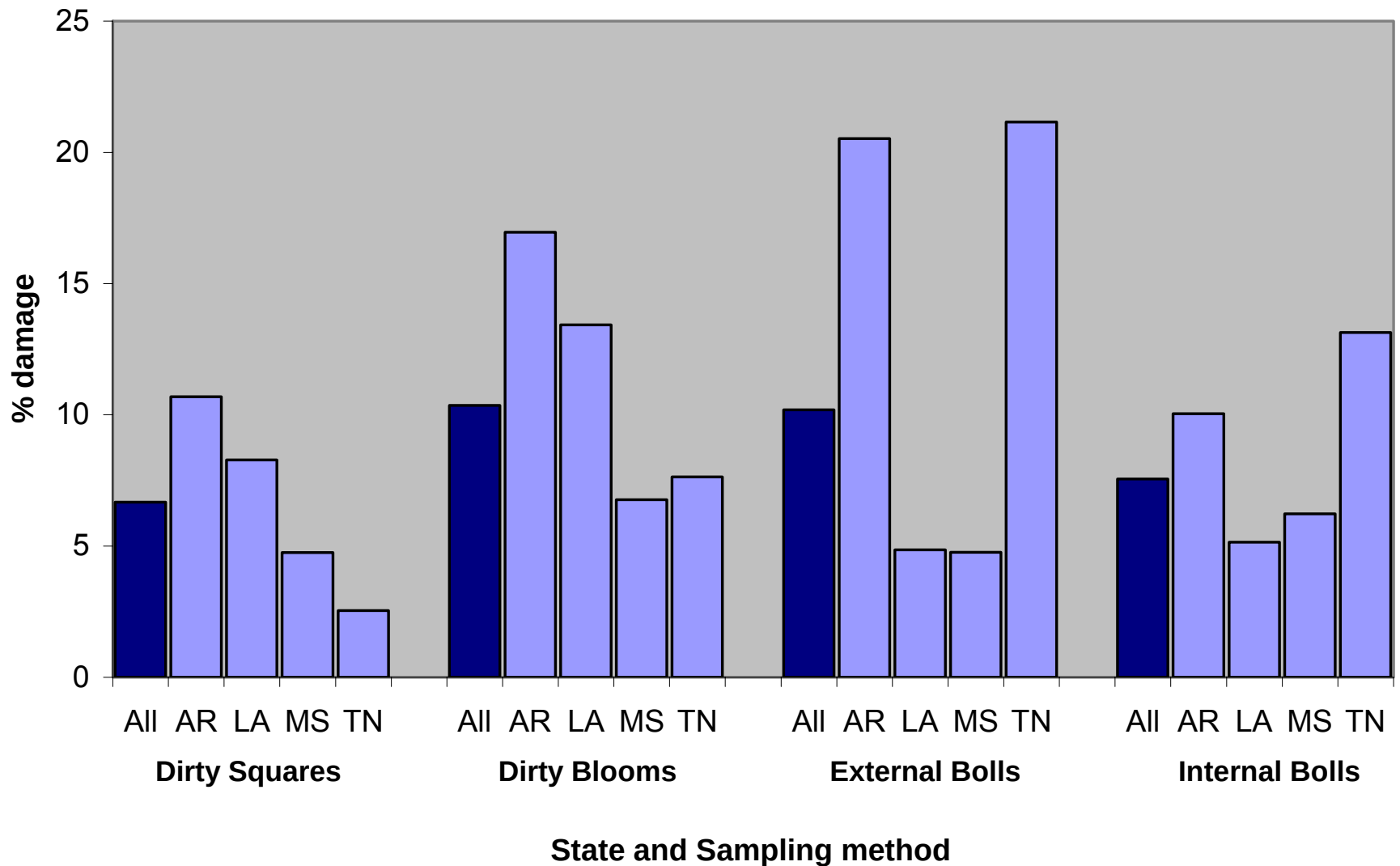


Average Number of Plant Bugs Found per Sample

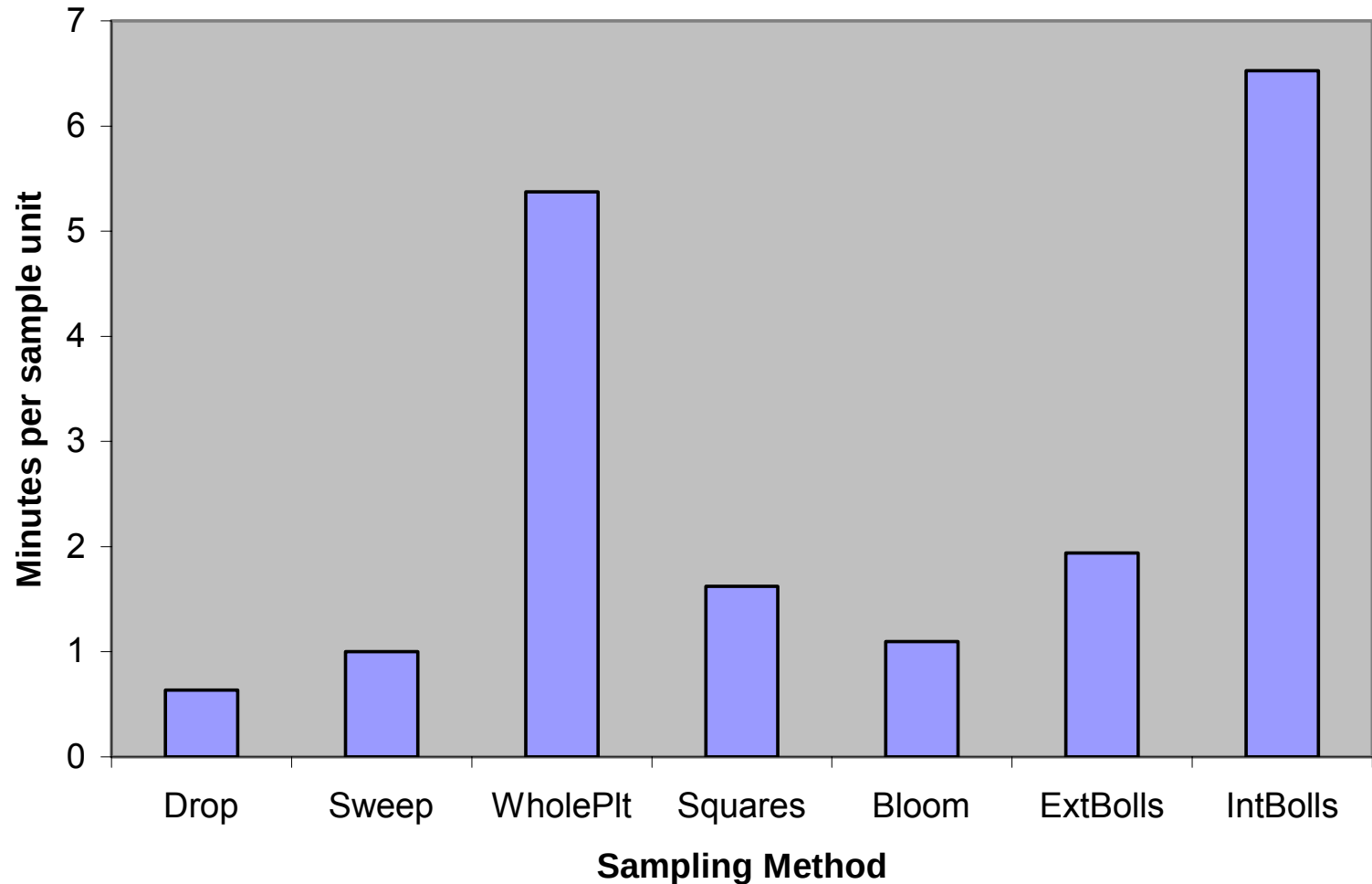
Direct Sampling Counts



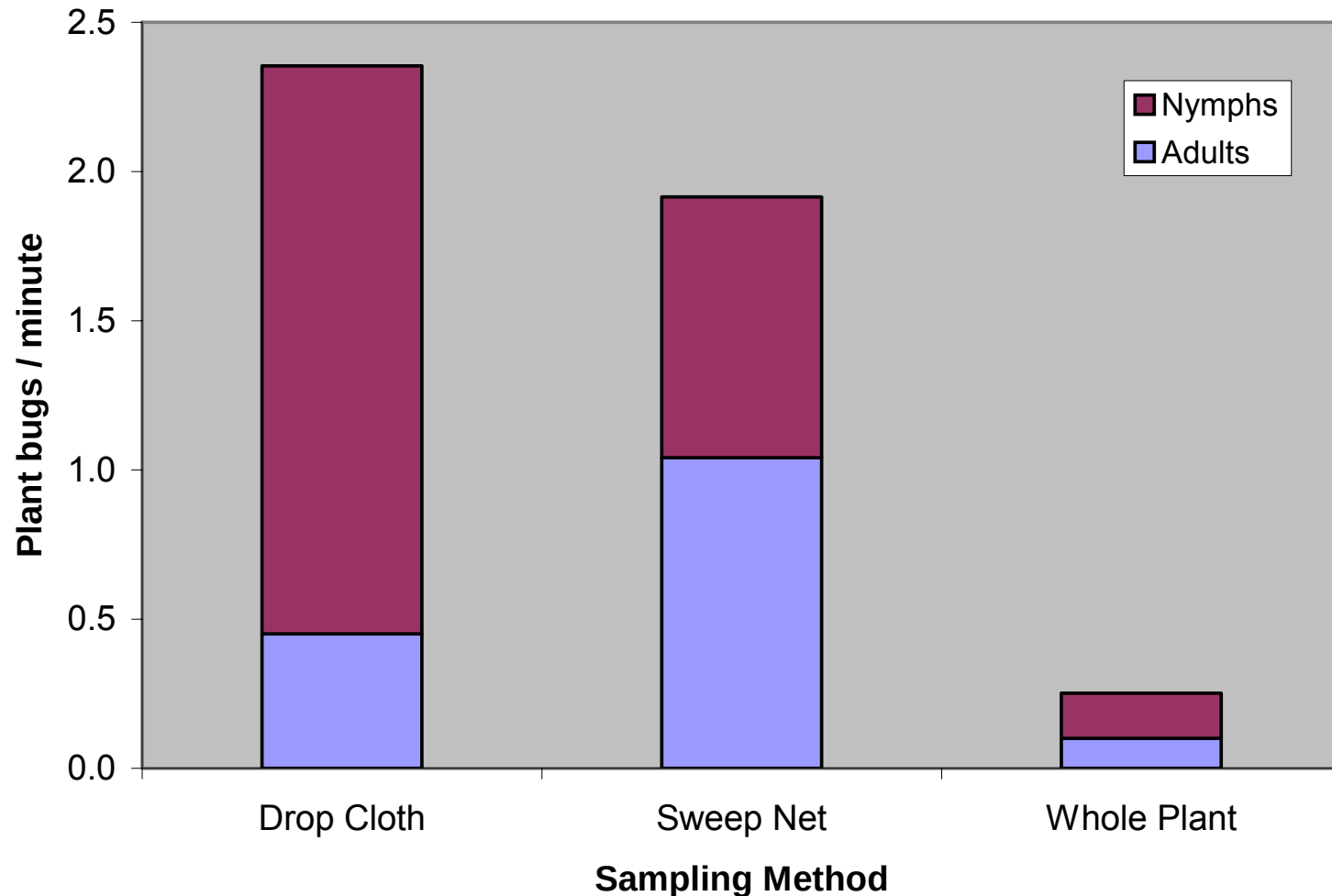
Average % Damage Found per Sample



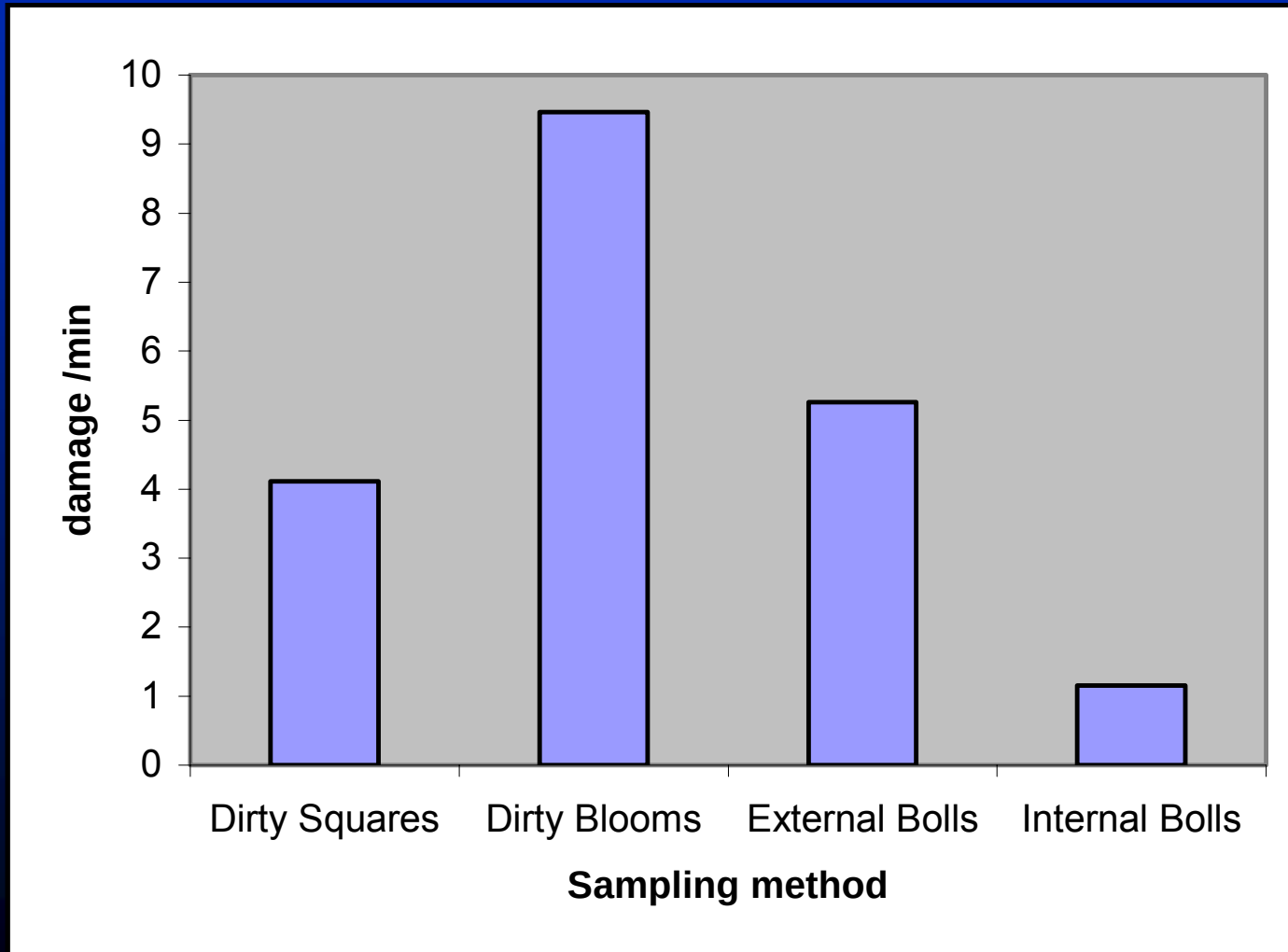
Average Time for One Sample



Average Number of Bugs Found Per Minute



Average Damaged Fruit Observed Per Minute



Correlations of sampling methods

- Created a PB score based on all 7 sampling methods (PB score = 1 at threshold)
- Correlated each sampling method to the composite score

Correlation of sampling methods to each other

Method	Correlation (R^2)	
	2005	2006
Drop Cloth	0.855	0.540
Sweep Net	0.900	0.582
Whole plant	0.926	0.649
Dirty Squares	0.869	0.705
Dirty Blooms	0.783	0.651
External Bolls	0.780	0.511
Internal Bolls	0.661	0.533

Correlations with Yield

Method

R

Sweep Net (Adults) -0.313

Sweep Net (Nymphs) -0.41

Drop Cloth (Adults) -0.334

Drop Cloth (Nymphs) -0.262

TPB per 25 sweeps -0.4

Drop Cloth -0.31

% Square Retention 0.587

Nymphs per 25 squares -0.432

% Dirty Squares -0.638

% Internal Square Damage -0.489

Method

R

% Boll Damage (Small) -0.365

%Boll Damage (Medium) -0.475

%Boll Damage (Large) -0.404

%Boll Damage (Total) -0.452

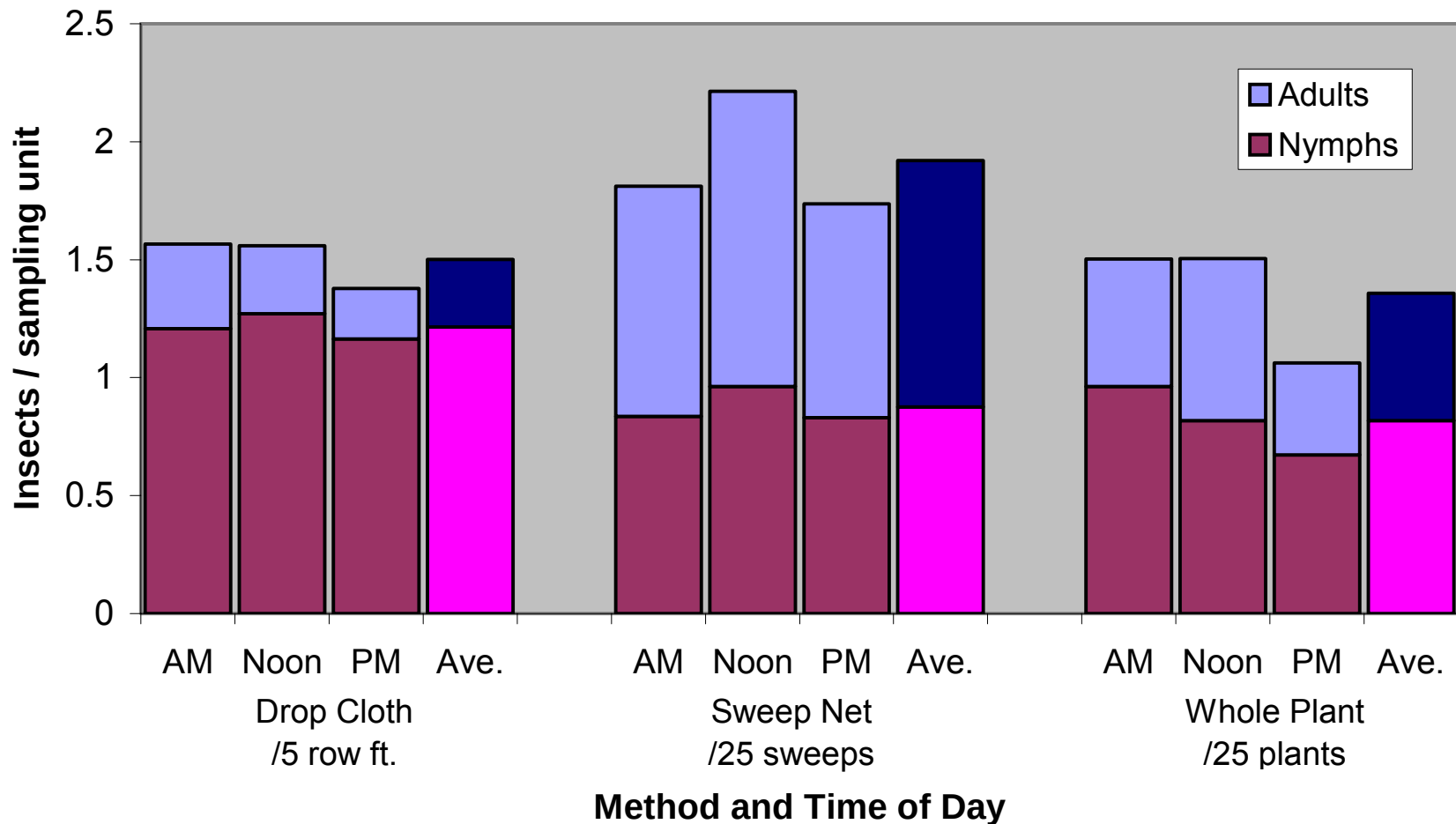
Dirty Blooms per row ft. -0.303

% Dirty Blooms -0.357

Shed Squares 0.031

Shed Bolls -0.057

Time of Day Variation



Factors Altering Bias

Factor	Change
Wind	↓ PB with ↑ wind using whole plant sampling, but no impact with sweep net or drop cloth
Plant height	↓ PB on taller plants using whole plant and drop cloths, but not sweep net

Black vs. White Drop Cloth

TPB Stage	White	Black	% difference
Adults	1.17a	0.98a	-16
Nymphs	7.43a	9.55b	+29
Total	8.60a	10.53b	+22

Sampling Methods Summary

- Overall
 - Sampler variability is great in all sampling methods
 - No method appears to be more or less sensitive to sampler variability
- Direct Sampling methods
 - Sweep net is most efficient for adults
 - Drop cloth most efficient for nymphs, esp. black drop cloth
 - Sweep net and drop cloth about equal for total bug efficiency
 - Counts by all methods decrease during the hottest part of the day (3-6 PM)
 - Sweep nets catch fewer when foliage is wet
- Indirect sampling methods
 - Dirty blooms most efficient
 - Dirty squares have best correlation to other methods

TPB Thresholds- Early Season

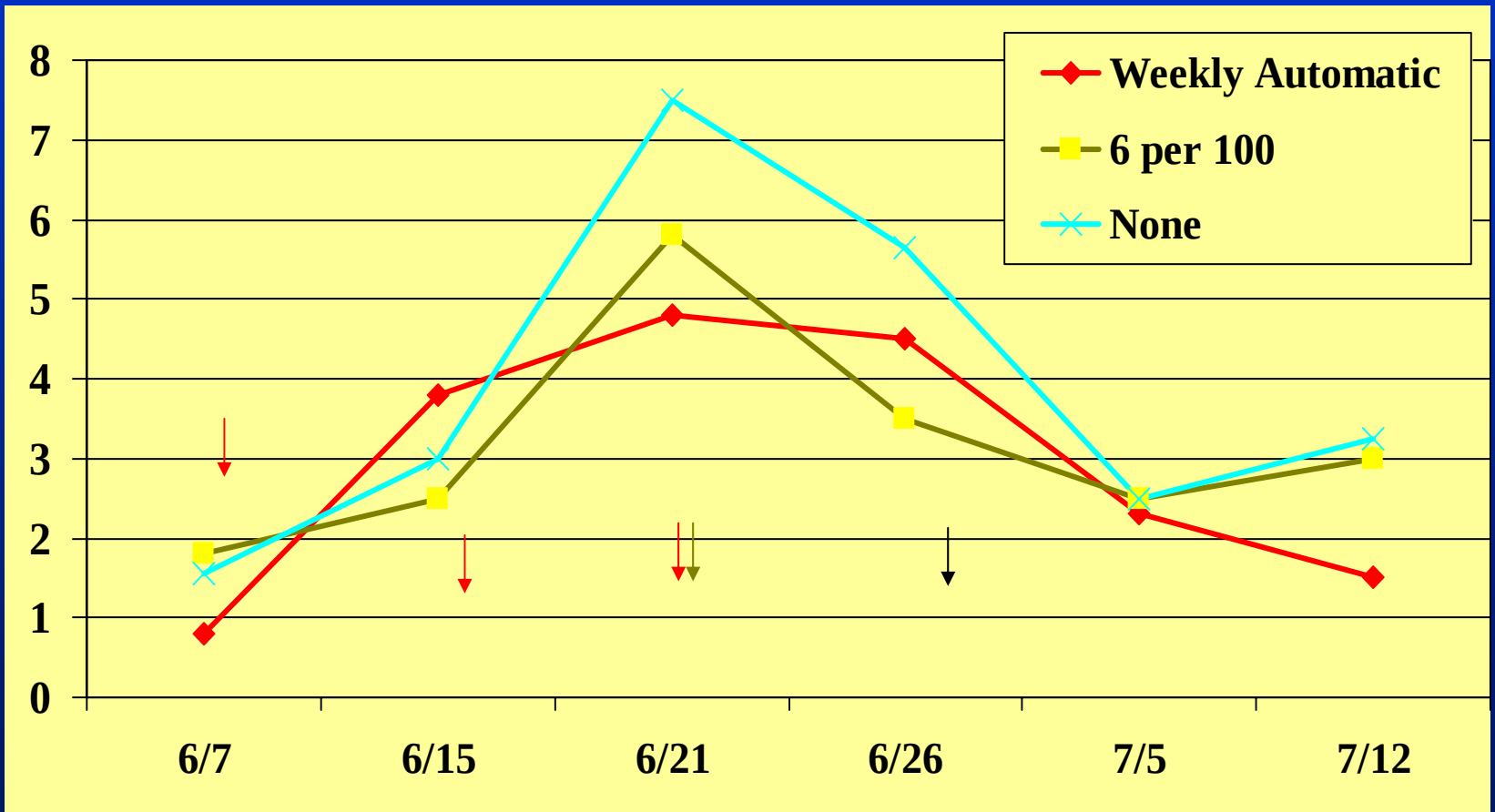
Trial Treatments

- Auto: Automatic insecticide application at pinhead square and 7 and 14 days later
- Low: Threshold of 8 PB / 100 sweeps or square retention below 80%
- High: Threshold of 16 PB / 100 sweeps or square retention below 60%
- UTC: No insecticide prior to first bloom

All applications made with Centric at 2 oz/ac

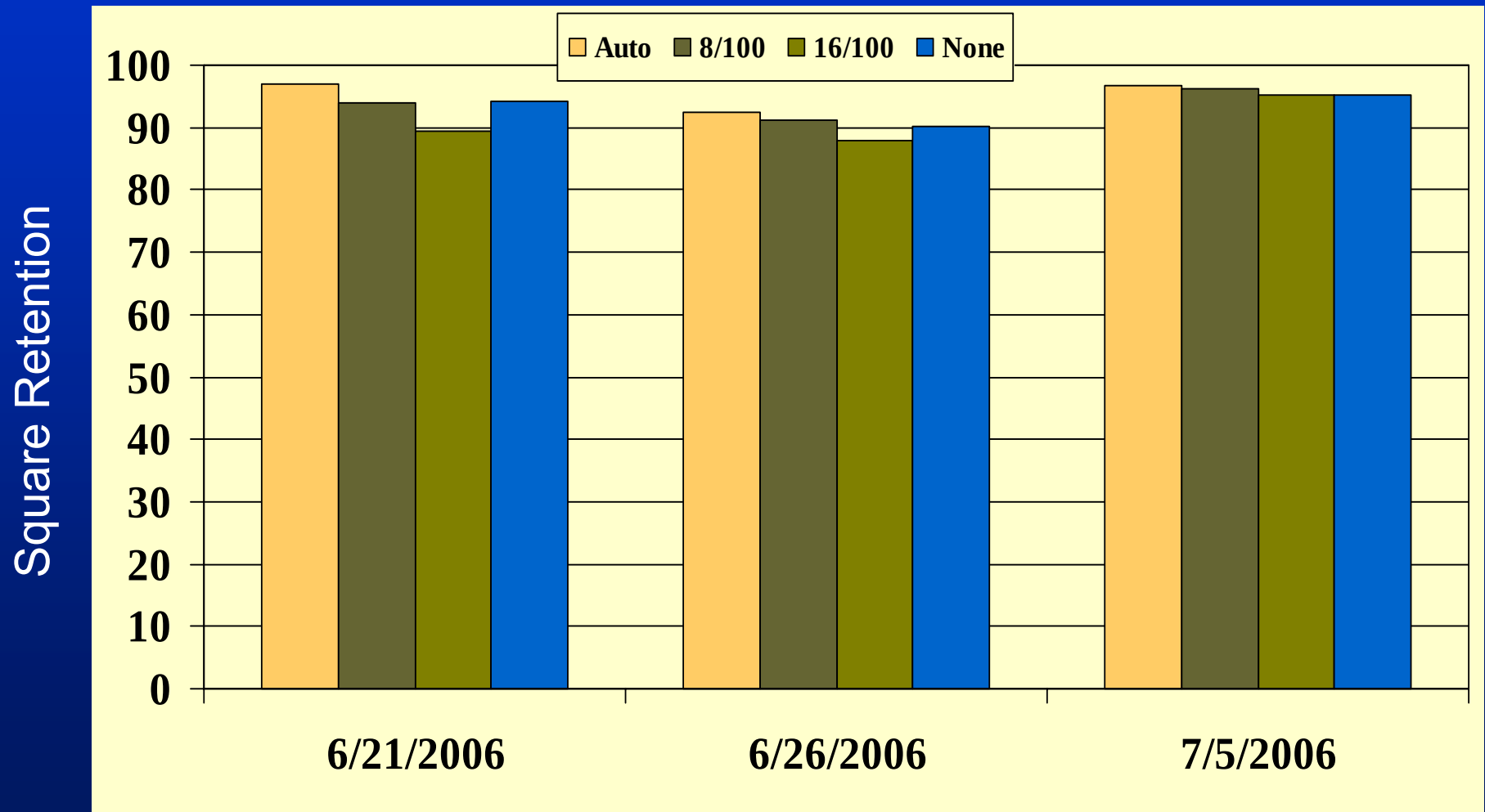
MS Early Season TPB Threshold Trial

TPB per 100 sweeps



MS Early Season TPB

Threshold Trial



MS Early Season TPB Threshold Trial



Early Season TPB Thresholds

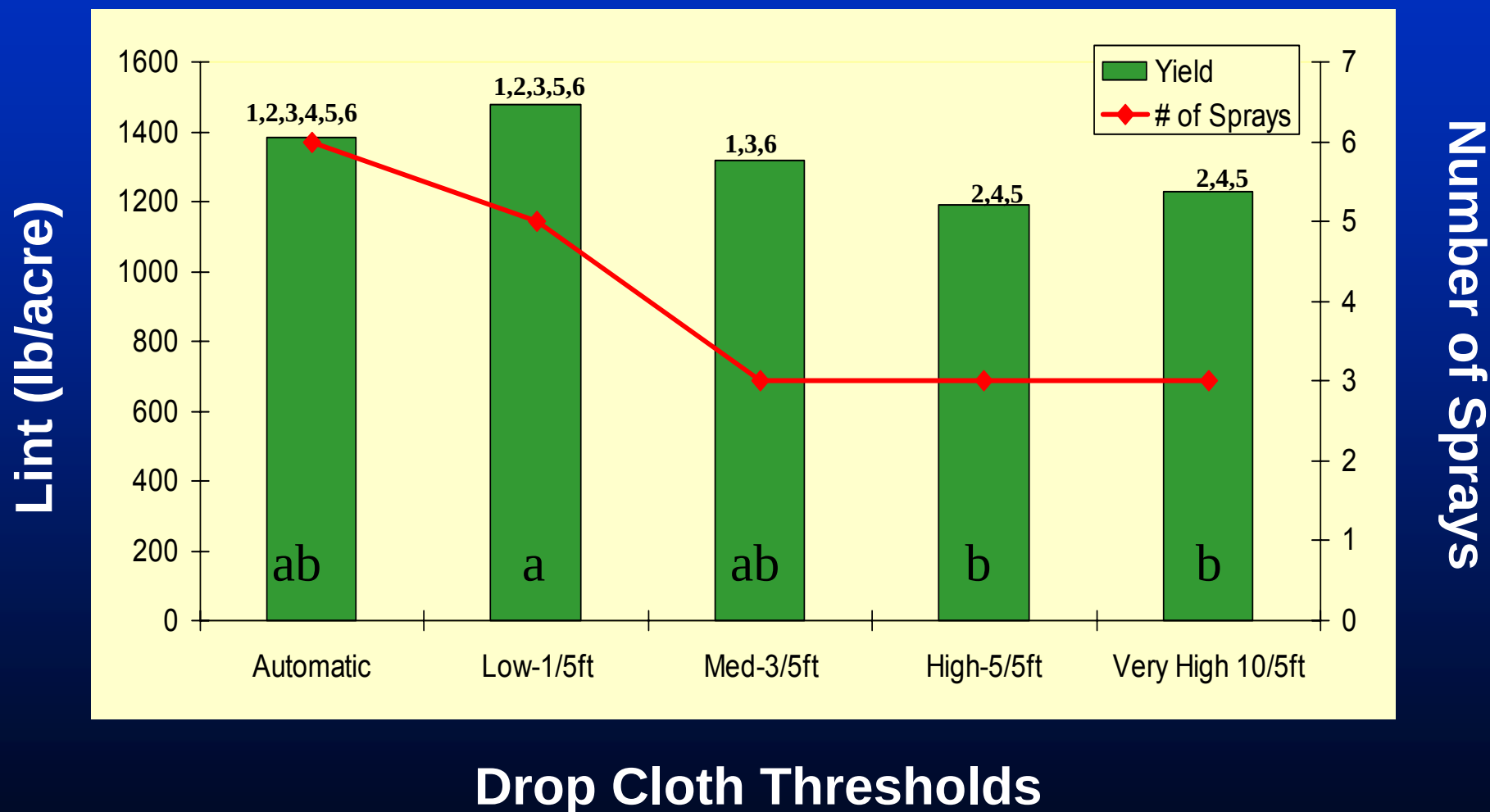
TPB Thresholds- Mid Season

Trial Treatments

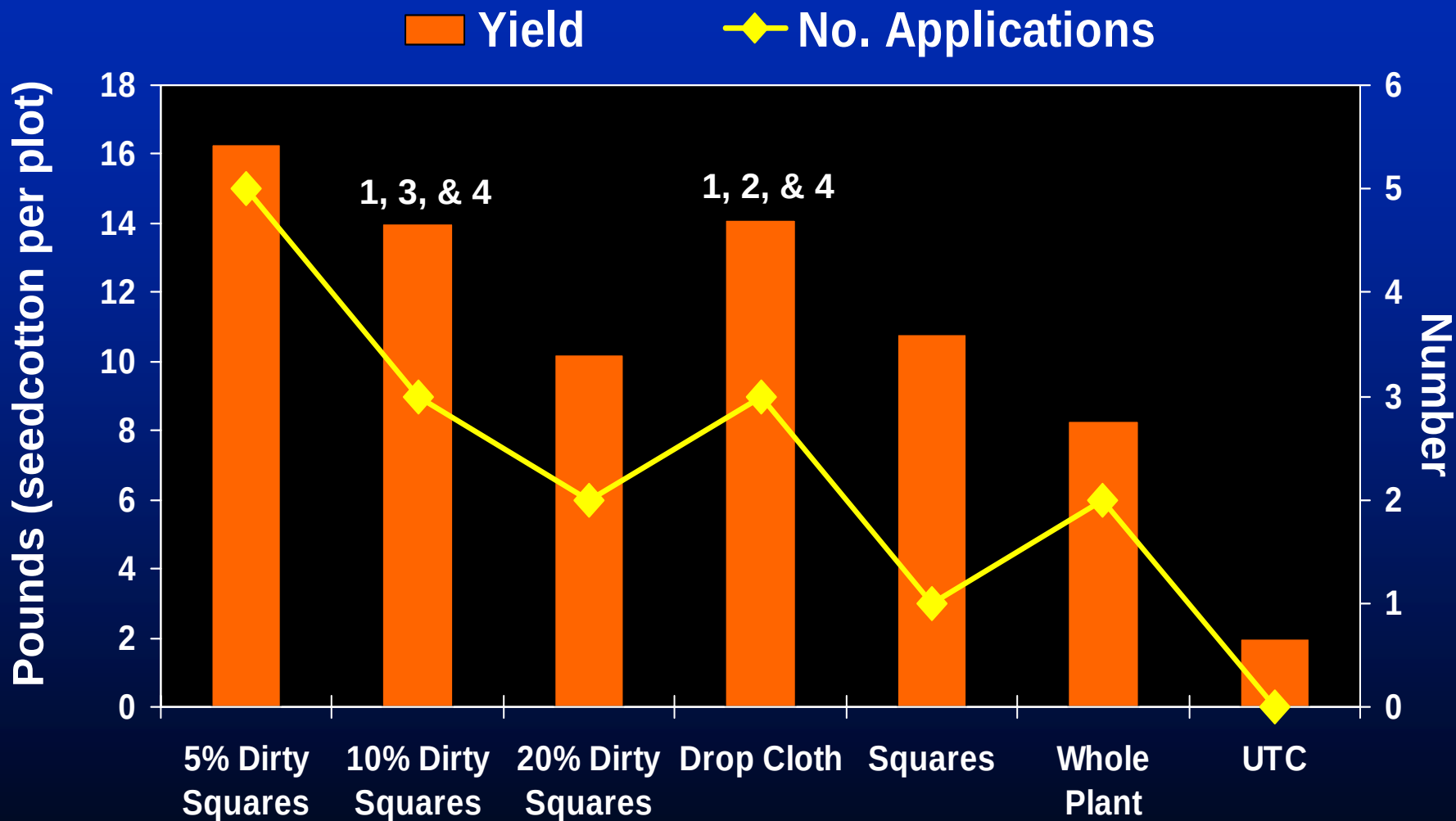
- Auto: Insecticide application every 7 days from first bloom to cutout
- Low: Threshold of 1 PB / 5 row ft.
- Med: Threshold of 3 PB / 5 row ft.
- High: Threshold of 5 PB / 5 row ft.
- VHigh: Threshold of 10 PB / 5 row ft.

All applications made using an organophosphate insecticide (acephate, Bidrin)

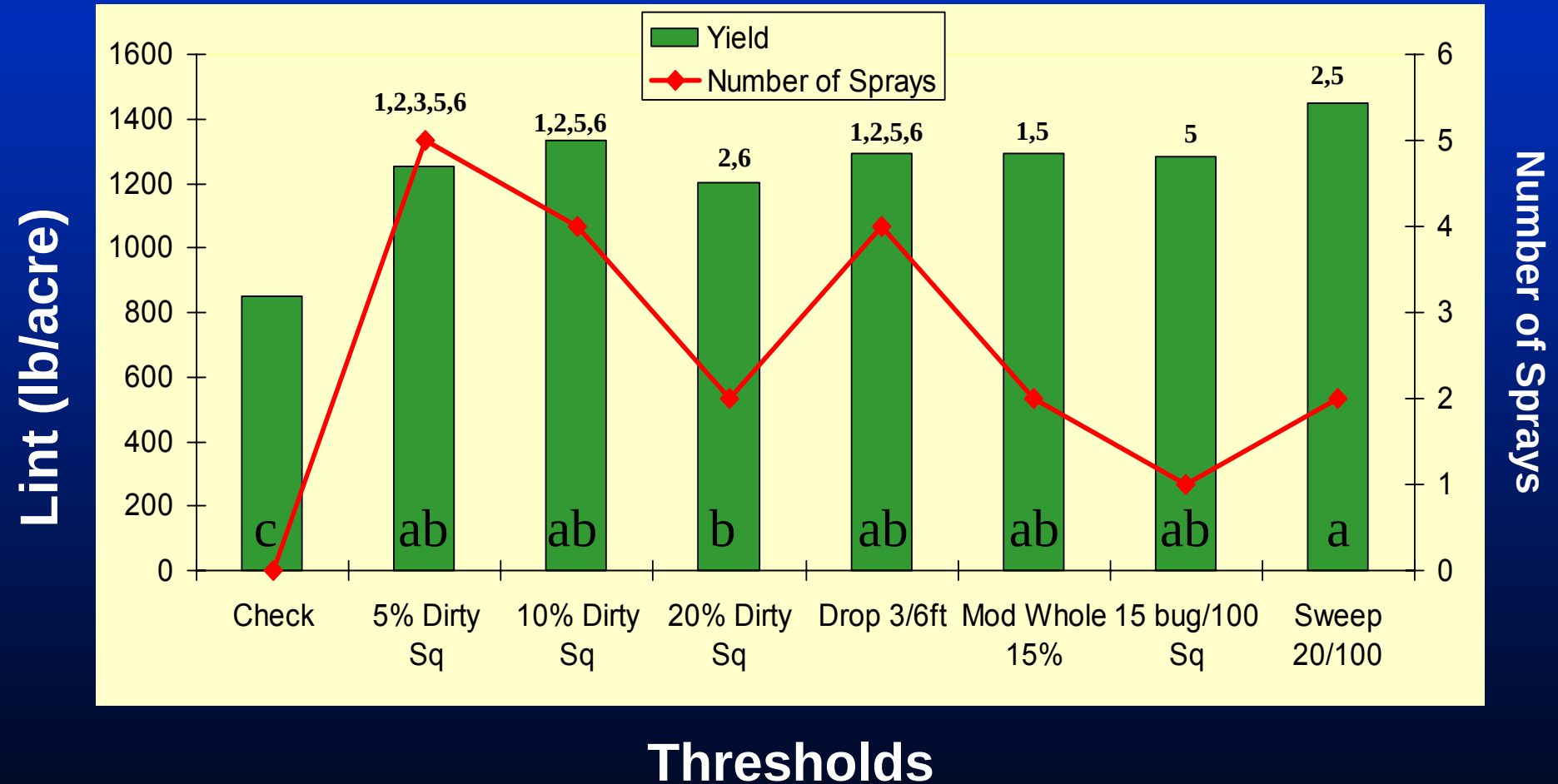
MS Mid-Season TPB Thresholds-2006



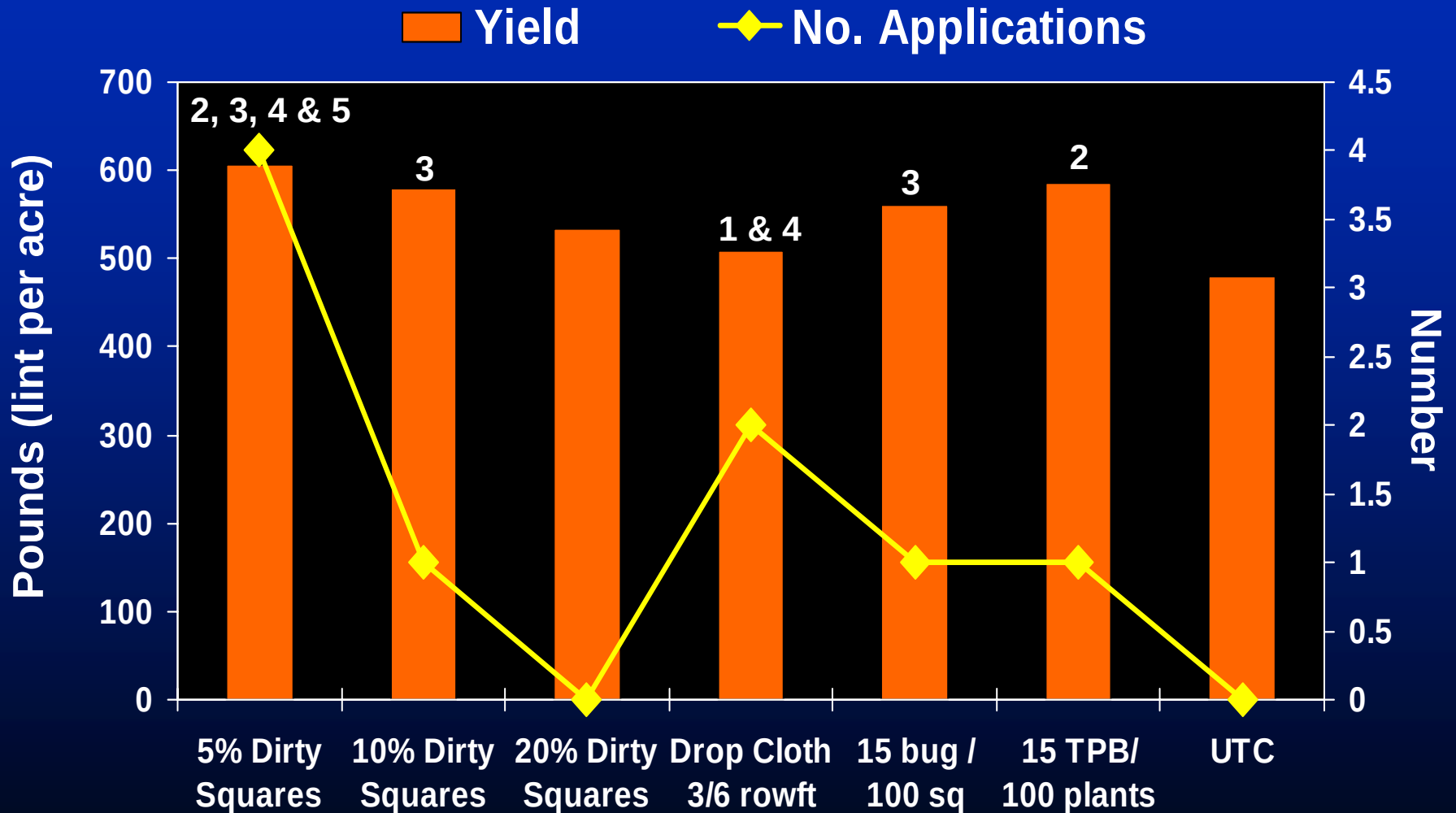
TPB Thresholds-2005



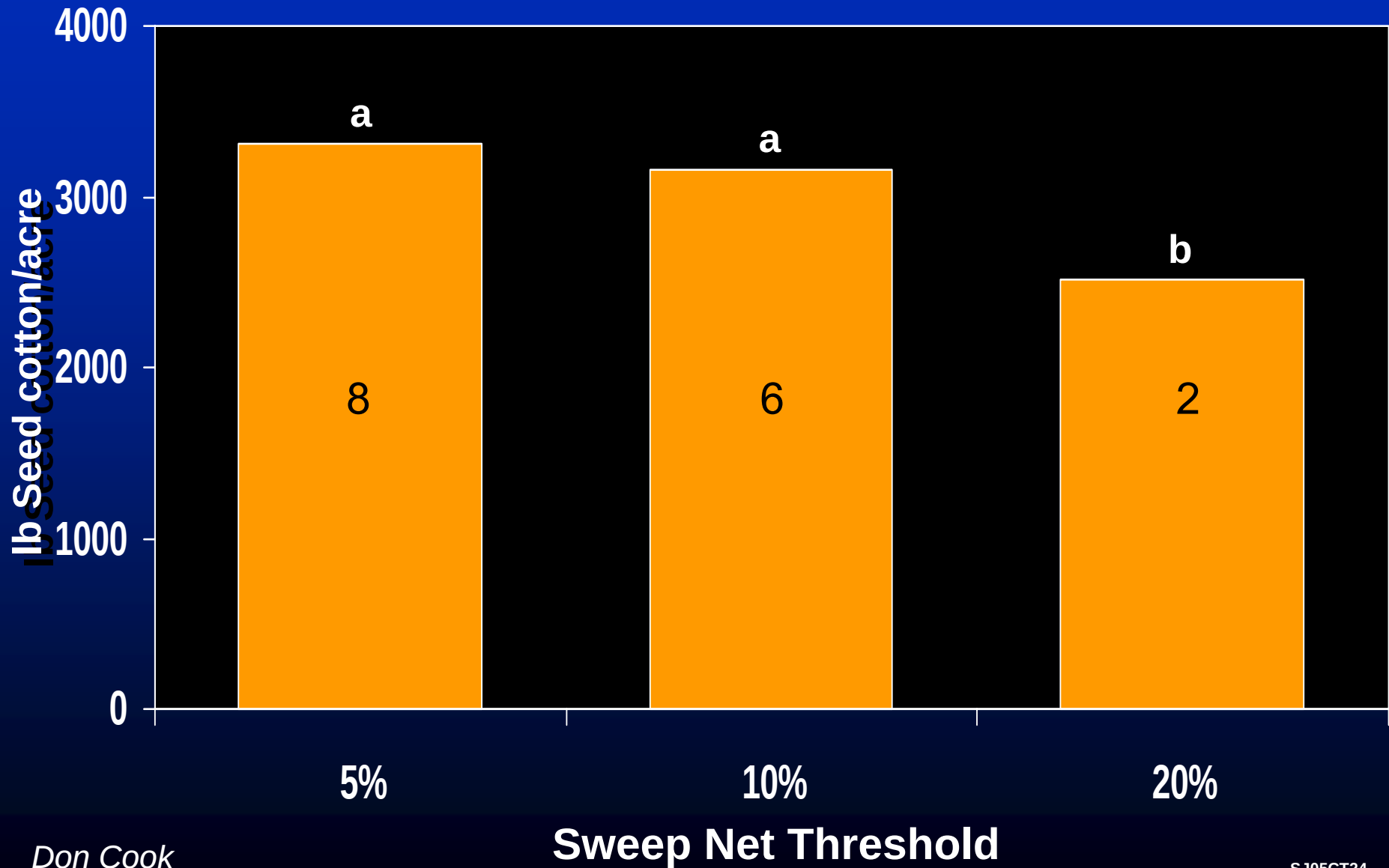
Mid-Season TPB Thresholds, 2006



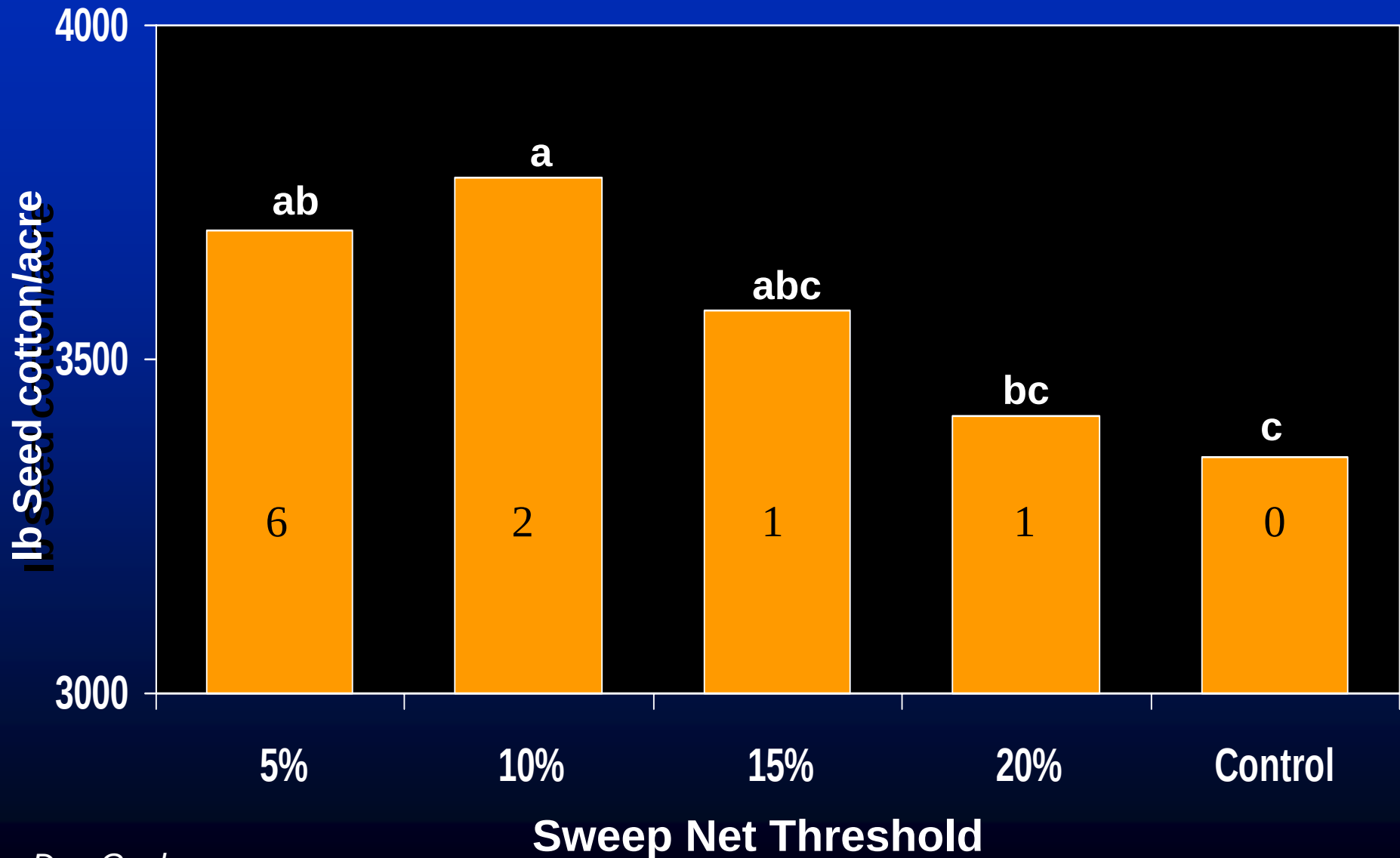
TPB Thresholds-2006



TPB Thresholds-2005



TPB Thresholds-2006



Conclusions

- Early-Season
 - No benefit from automatic applications
 - Risk flaring other insect pests
- Mid-Season
 - Sweep net and whole plant thresholds are too high compared to drop cloth
 - $12 \text{ TPB} / 100 \text{ sweeps} \approx 9 \text{ TPB} / 100 \text{ plants} \approx 3 \text{ TPB} / 6 \text{ row ft}$
 - Threshold of 10% dirty squares, 1 TPB/2 row ft on a drop cloth or 10 TPB/100 sweeps looks to be optimal

Acknowledgements

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