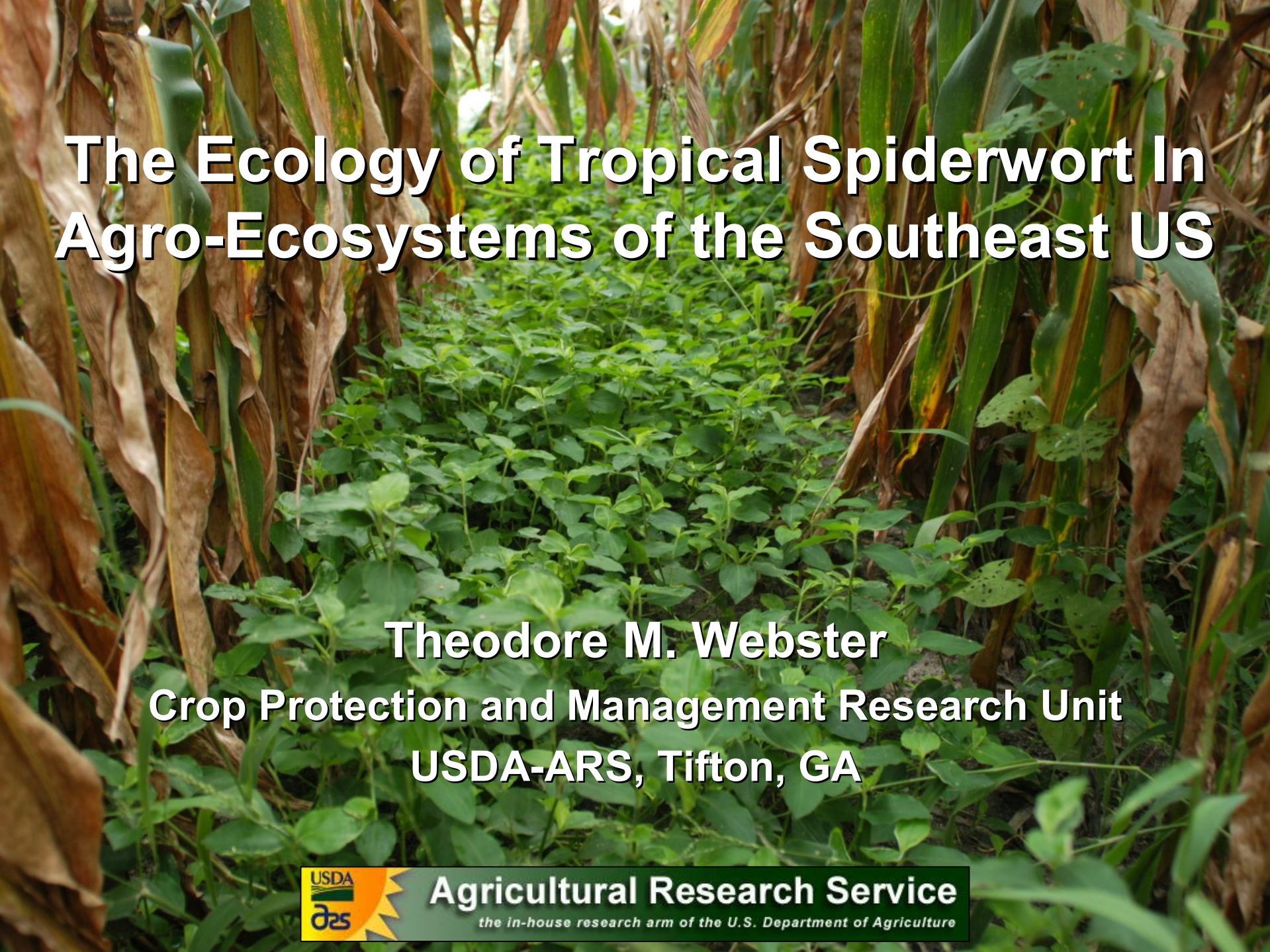

The Ecology of Tropical Spiderwort In Agro-Ecosystems of the Southeast US

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USDA ARS Agricultural Research Service

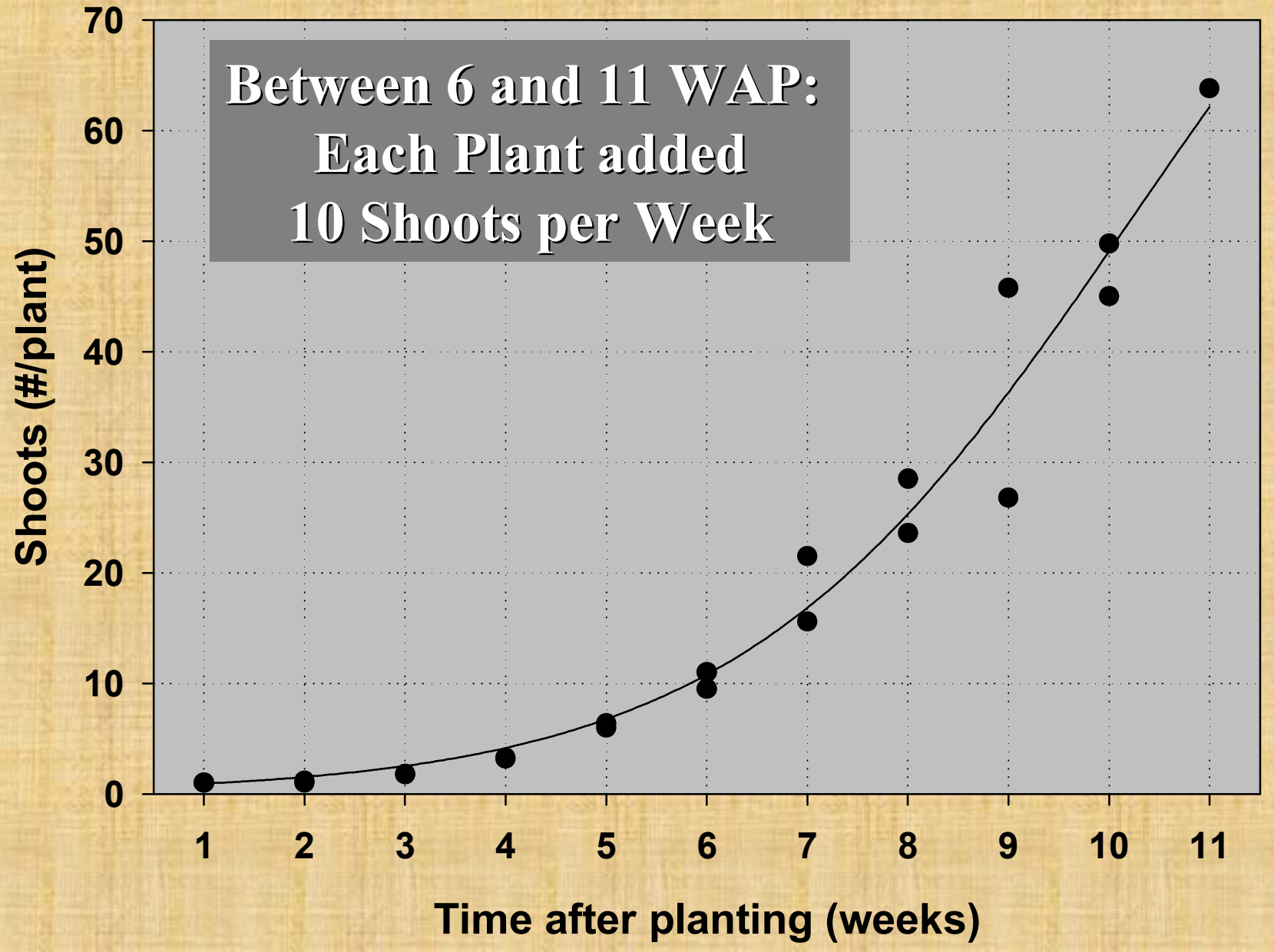
the in-house research arm of the U.S. Department of Agriculture

Why is Tropical Spiderwort a Weed?

- Amazing growth
- Emergence characteristics, implications for management
- Thrives in wet areas, but…
- Wanted: Spiderwort and its accomplice cotton
- How corn fits into the picture
- What do we still need to learn about tropical spiderwort

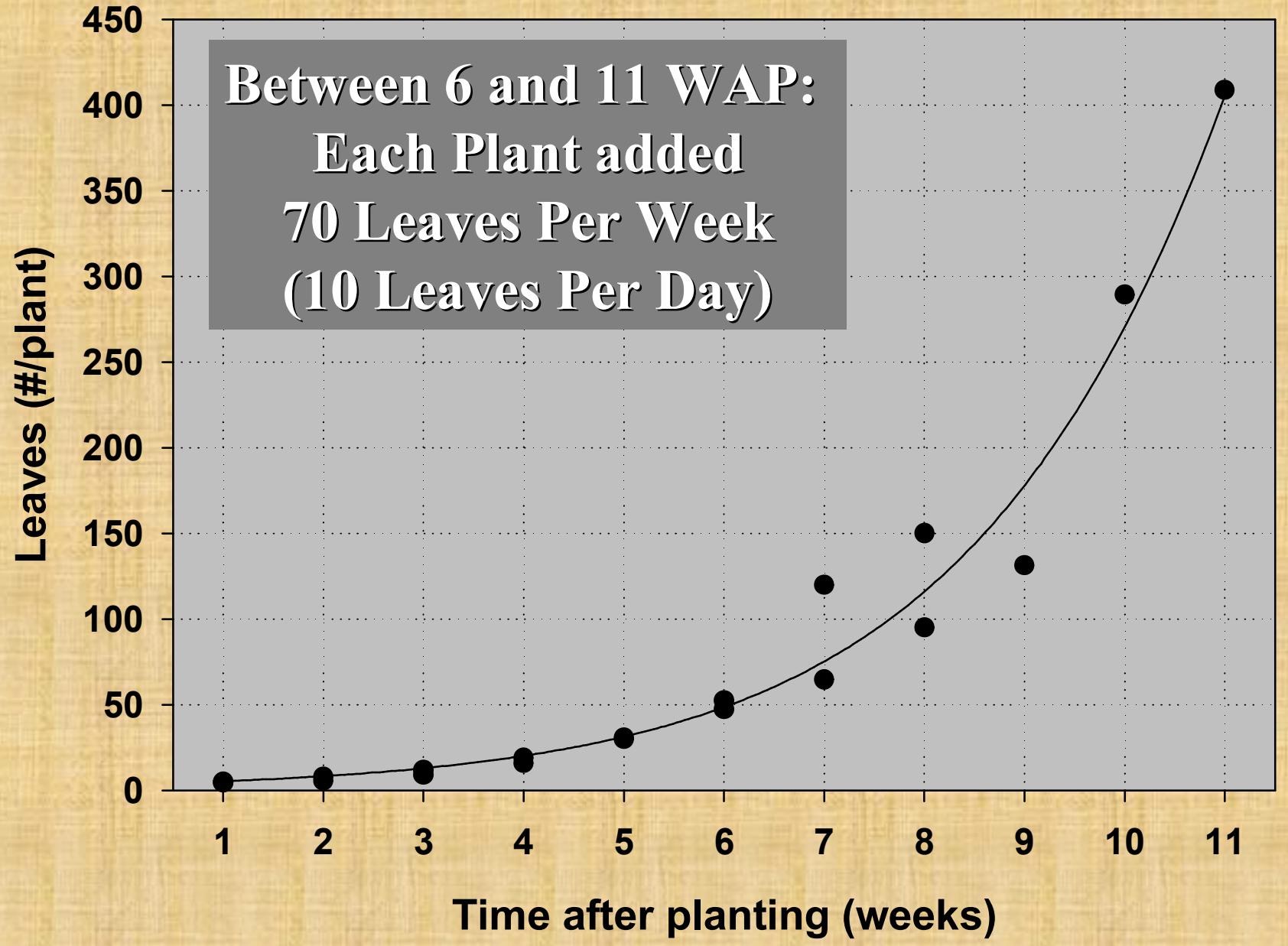
Amazing growth

Greenhouse Study

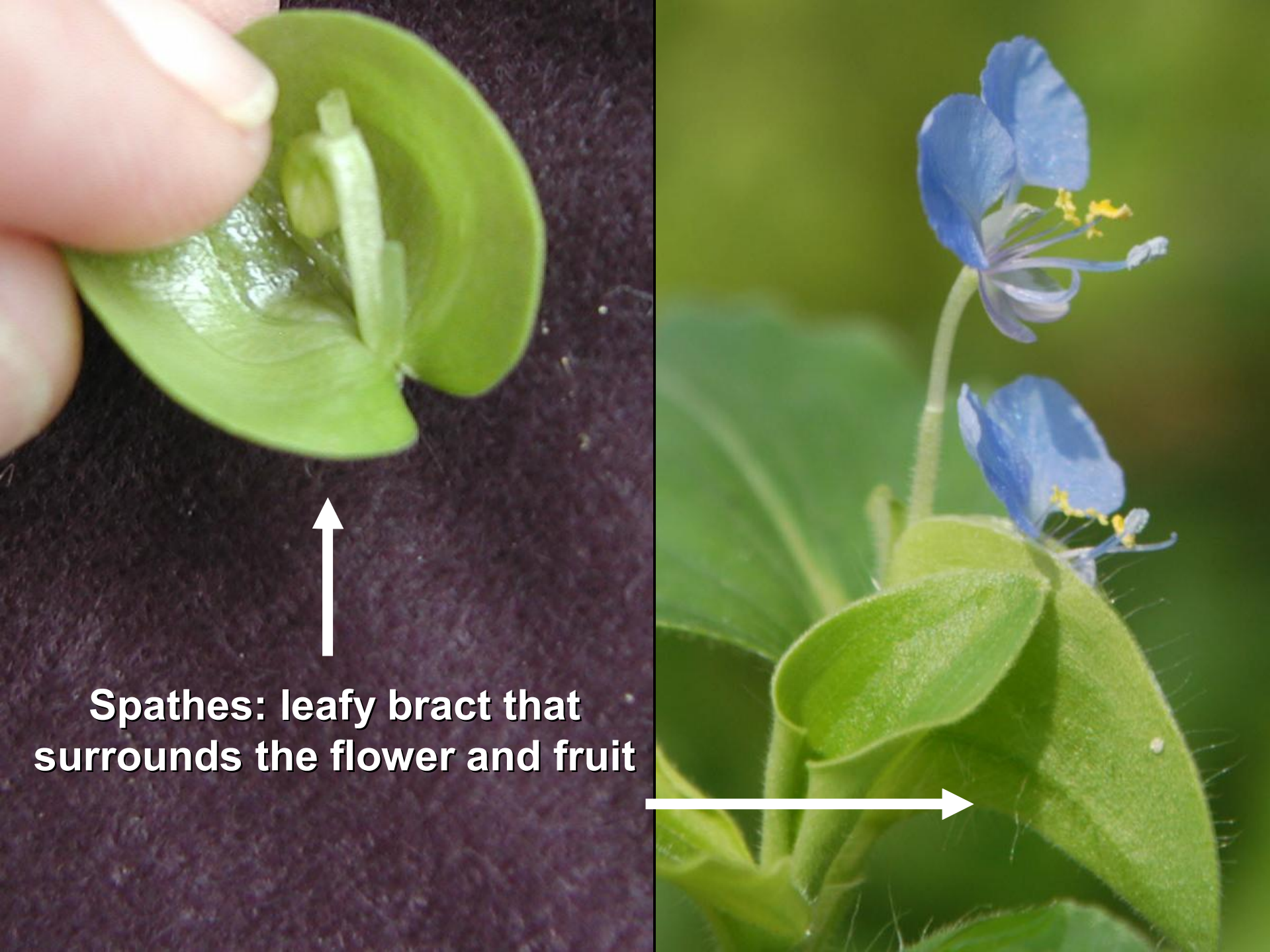


Transplanted 5-Leaf Tropical Spiderwort at Day=0

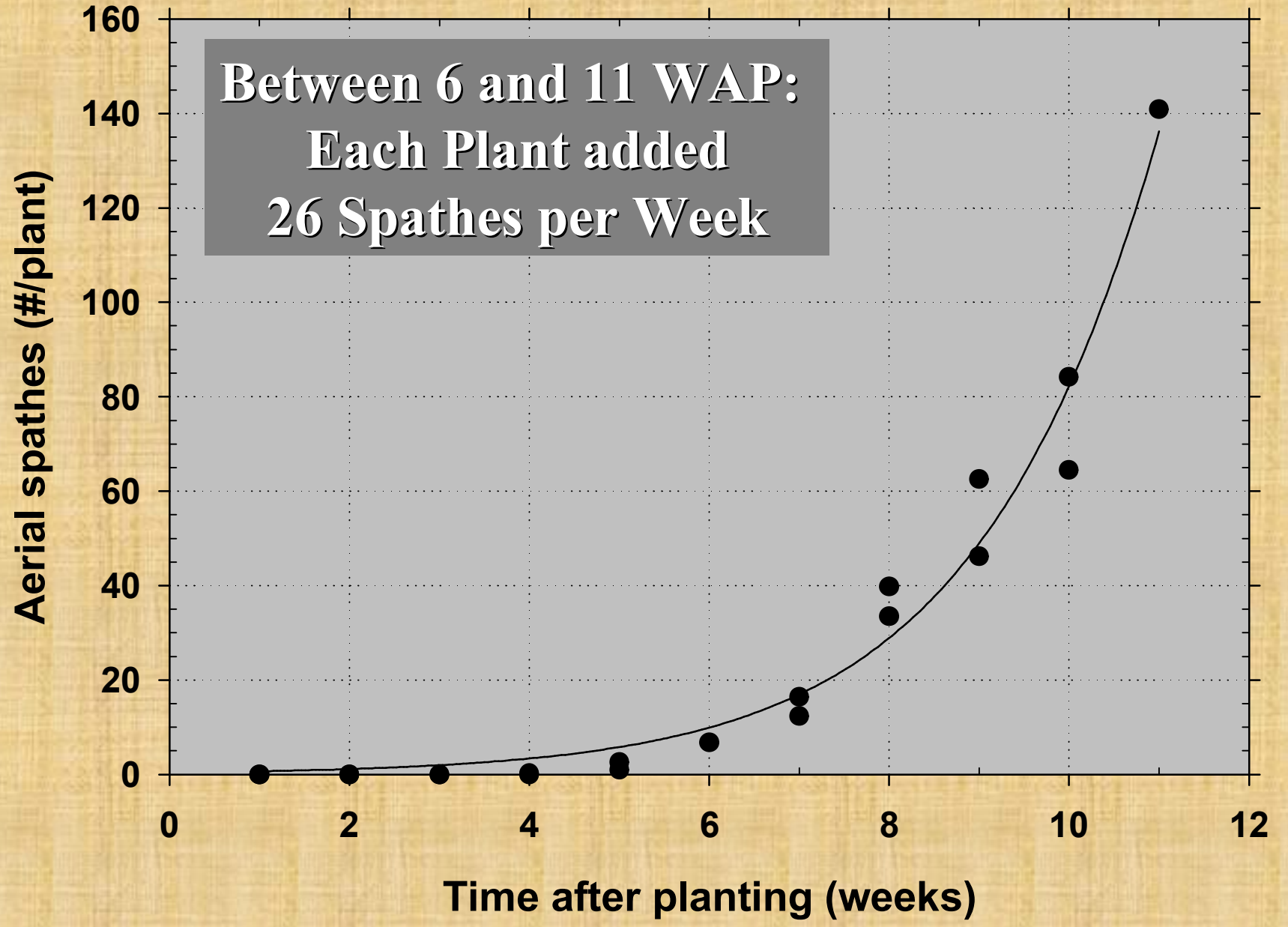
Greenhouse Study



Transplanted 5-Leaf Tropical Spiderwort at Day=0


Spathes: leafy bract that surrounds the flower and fruit

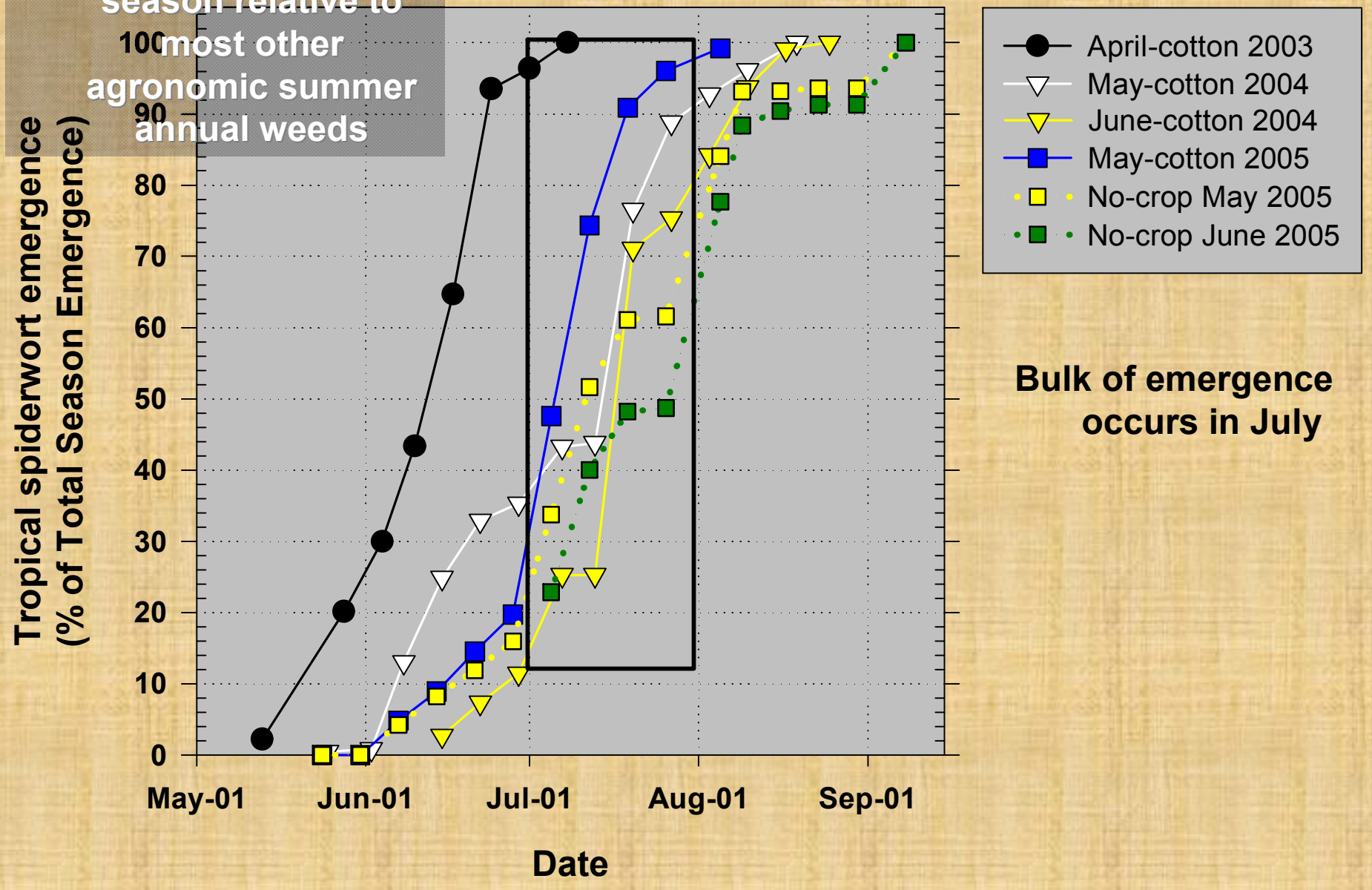
Greenhouse Study



Transplanted 5-Leaf Tropical Spiderwort at Day=0

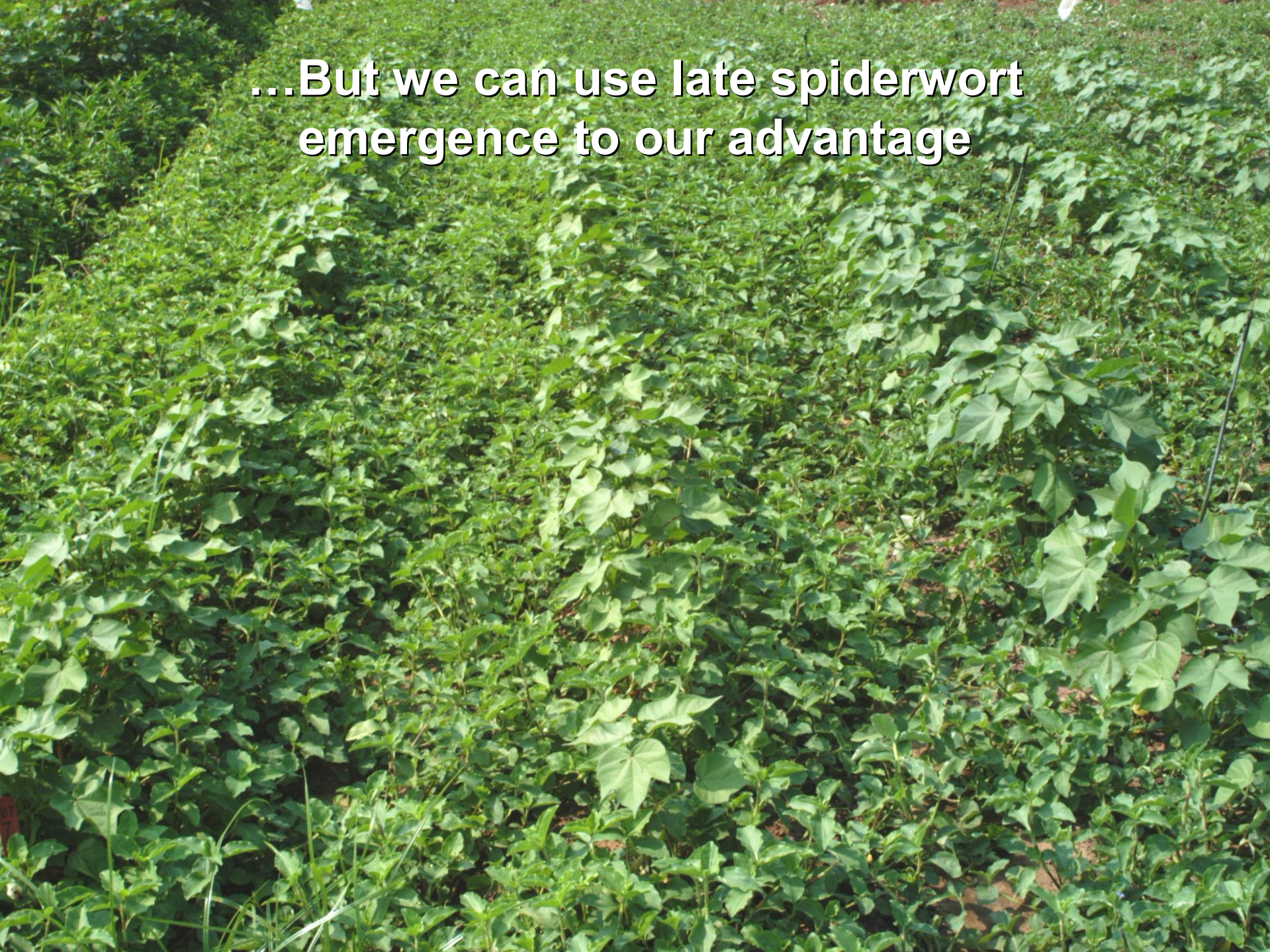

Ability To Predict Tropical Spiderwort Emergence
Is Critical For Optimizing Timing Of Control Tactics
Emergence characteristics, implications for management

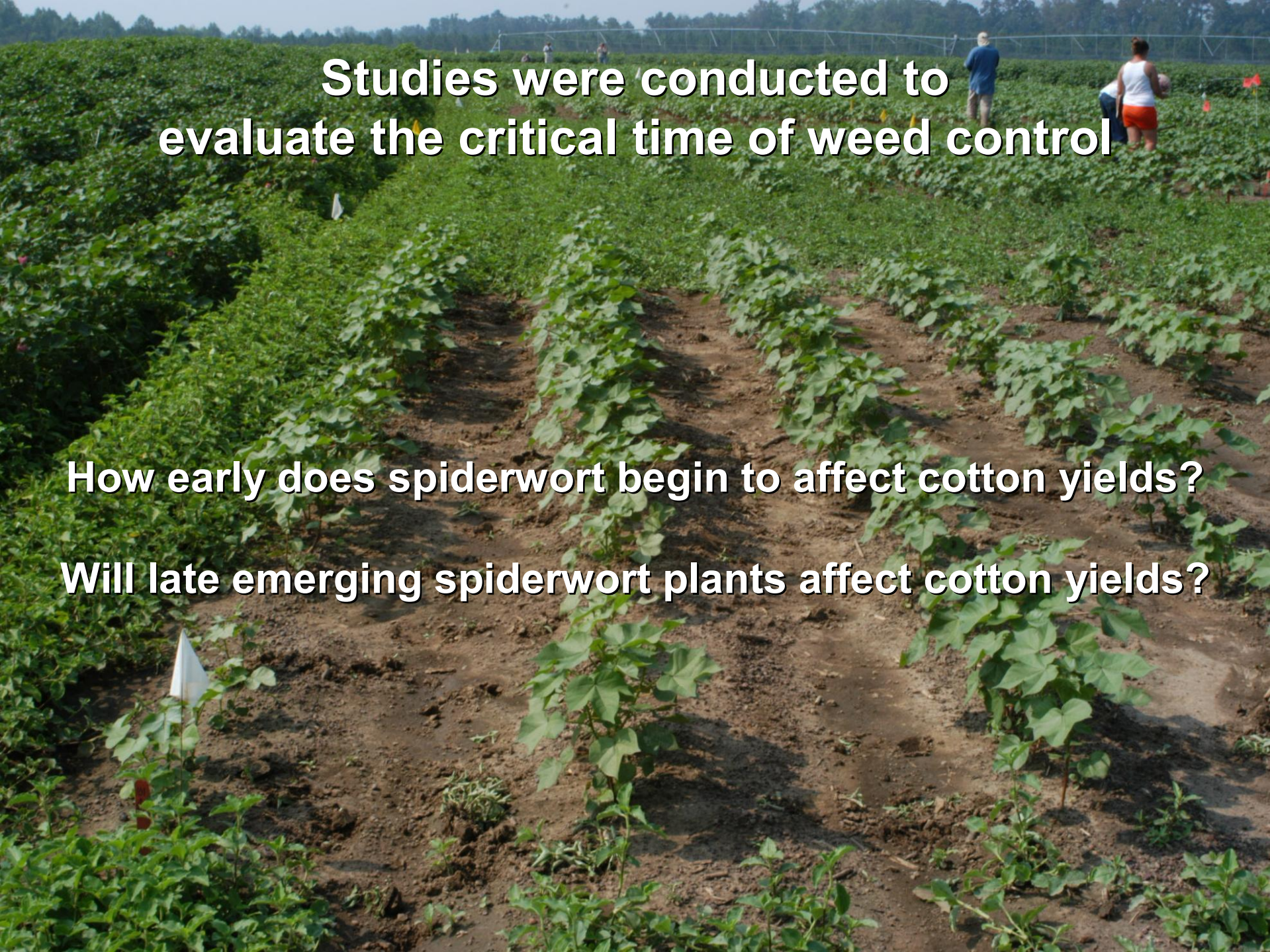
Emergence is relatively late in the growing season relative to most other agronomic summer annual weeds

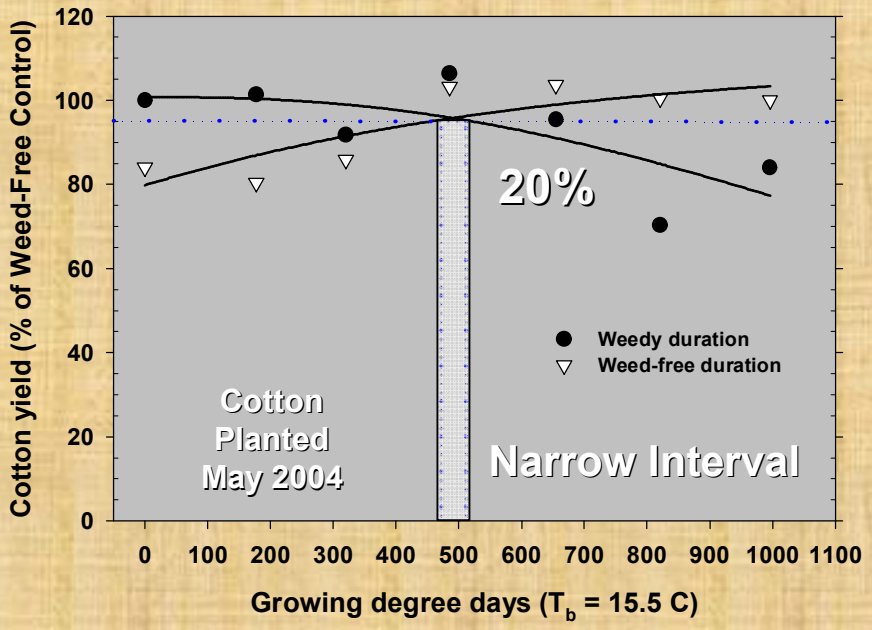


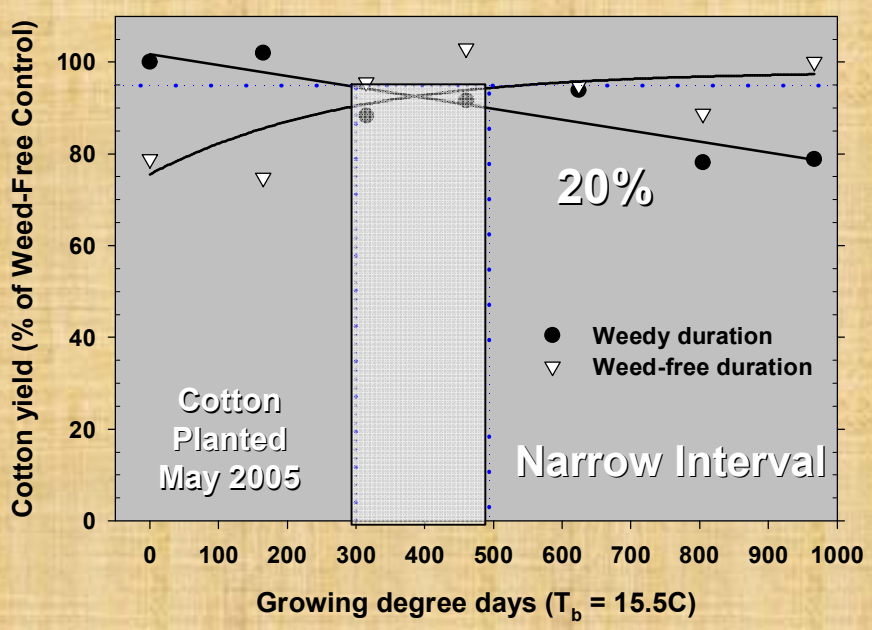
Bulk of emergence occurs in July

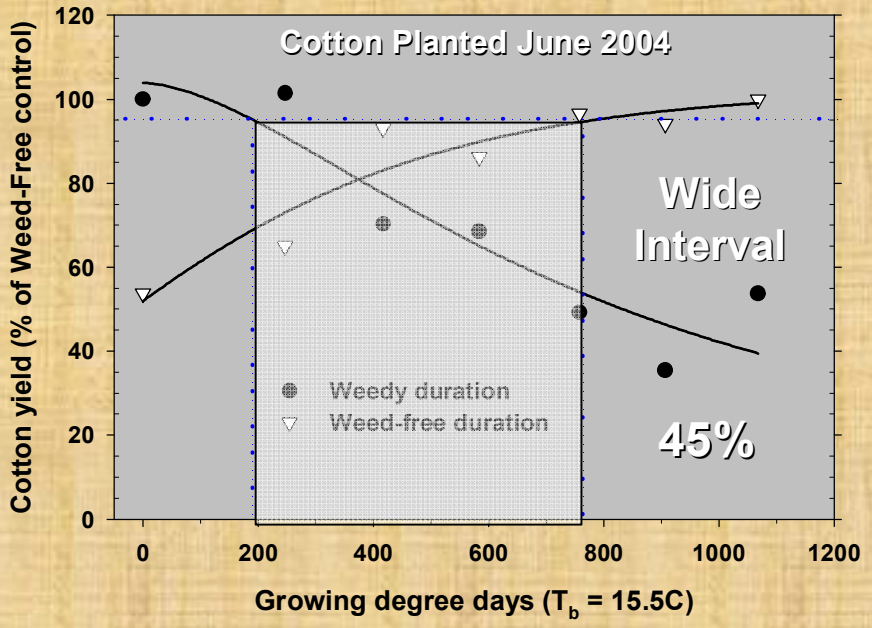
Four Seed Types Likely Complicates Prediction Of Emergence

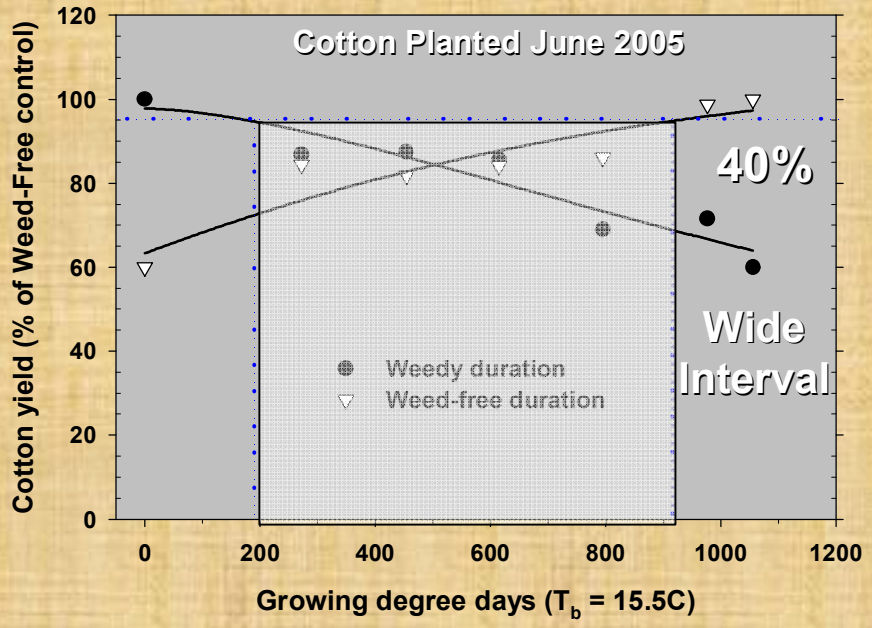

…But we can use late spiderwort emergence to our advantage


Studies were conducted to
evaluate the critical time of weed control
How early does spiderwort begin to affect cotton yields?
Will late emerging spiderwort plants affect cotton yields?

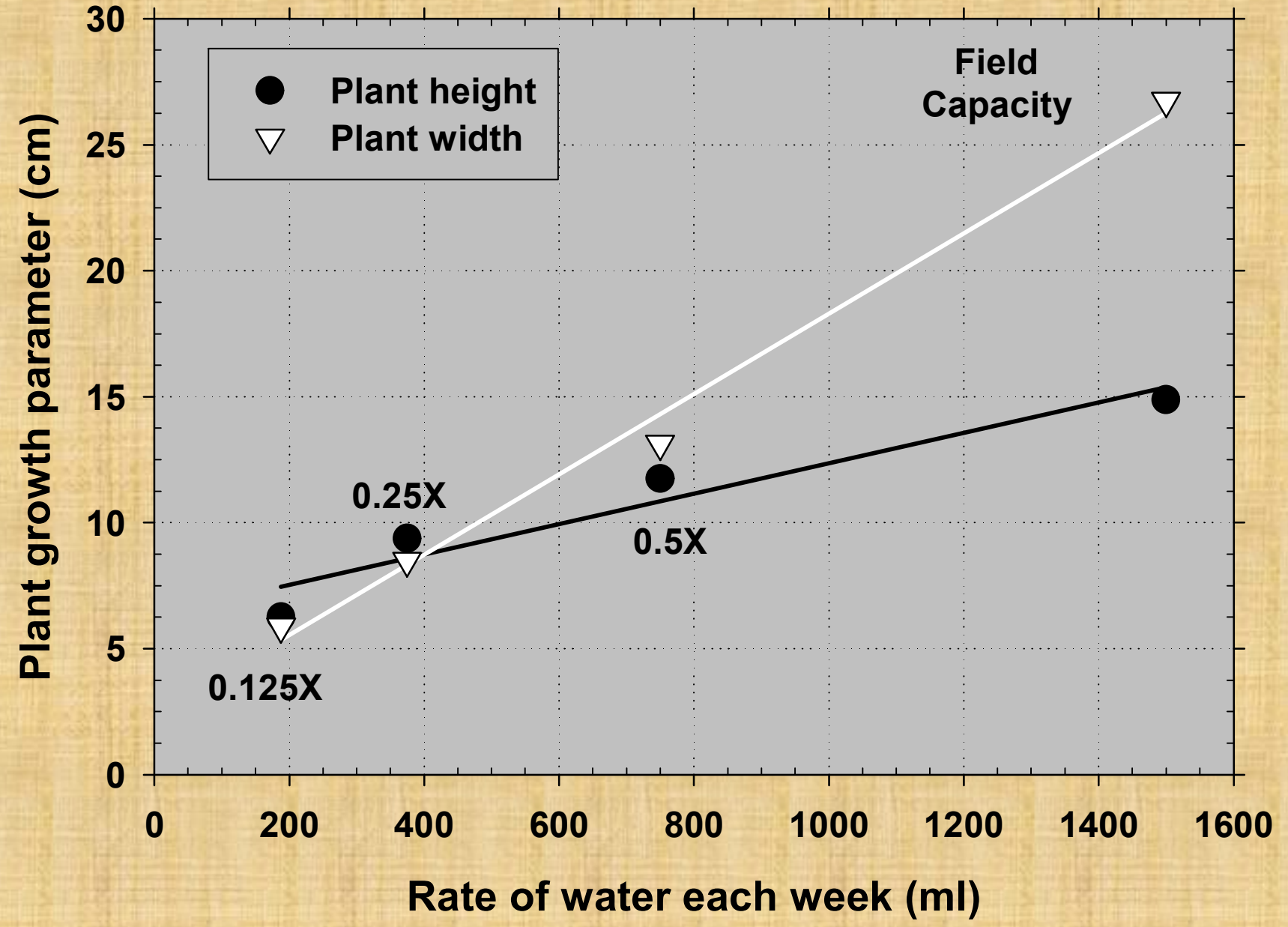

Cotton yield (% of Weed-Free Control)
Growing degree days (T_b = 15.5 C)
Cotton Planted May 2004
20%
Narrow Interval
Weedy duration
Weed-free duration


Cotton yield (% of Weed-Free Control)
Growing degree days (T_b = 15.5C)
Cotton Planted May 2005
20%
Narrow Interval
Weedy duration
Weed-free duration

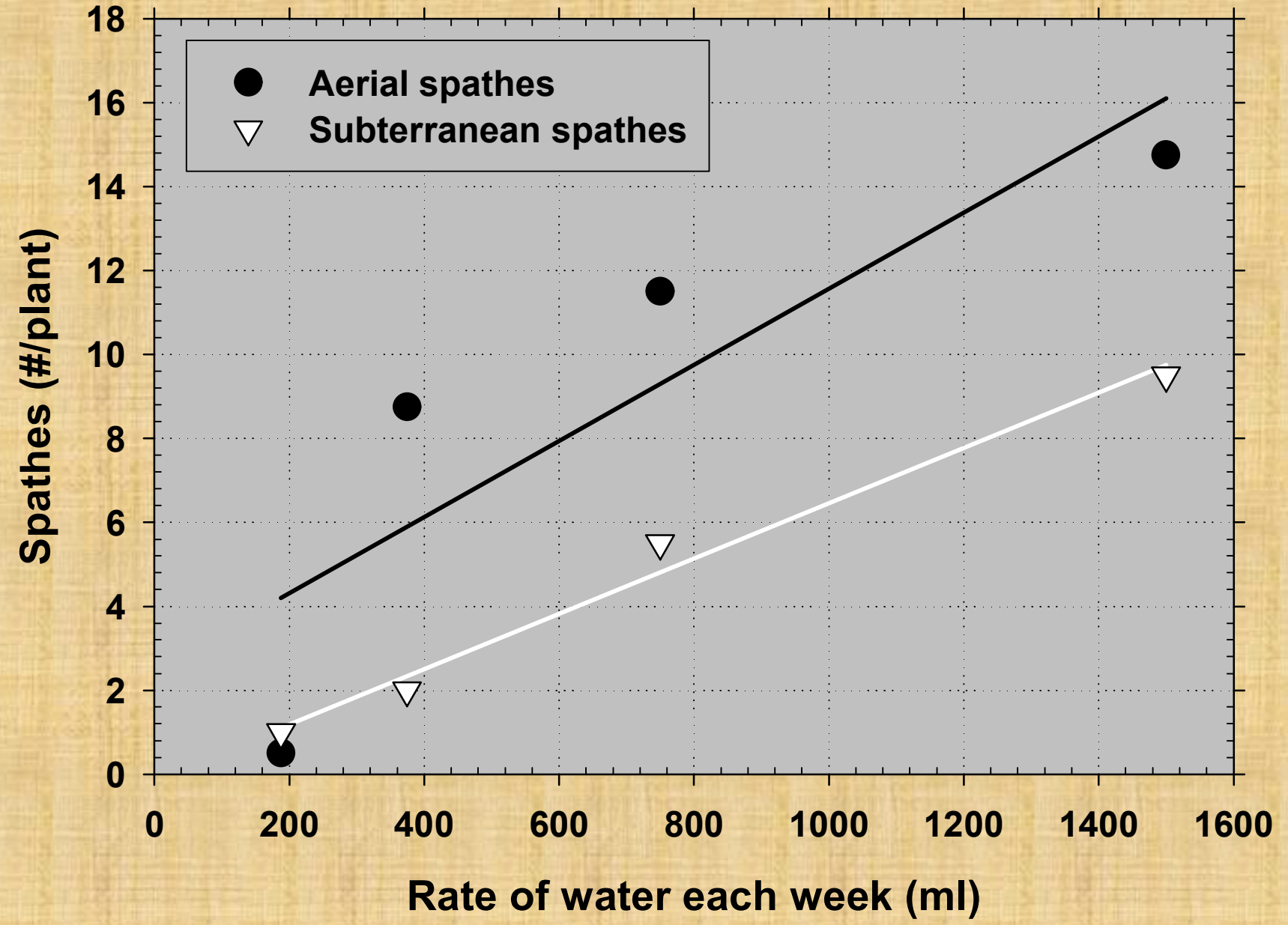

Cotton yield (% of Weed-Free control)
Growing degree days (T_b = 15.5C)
Cotton Planted June 2004
Wide Interval
45%
Weedy duration
Weed-free duration


Cotton yield (% of Weed-Free control)
Growing degree days (T_b = 15.5C)
Cotton Planted June 2005
40%
Wide Interval
Weedy duration
Weed-free duration


This “monsoon” weed thrives in our irrigated agriculture systems, but…


Plant height
Plant width
Field Capacity
0.25X
0.5X
0.125X
Plant growth parameter (cm)
Rate of water each week (ml)
0
5
10
15
20
25
30
0
200
400
600
800
1000
1200
1400
1600


Of the nearly 250,000 species of flowering plants…
… 36 have underground flowers


Aerial spathes
Subterranean spathes
Spathes (#/plant)
Rate of water each week (ml)
0
2
4
6
8
10
12
14
16
18
0
200
400
600
800
1000
1200
1400
1600

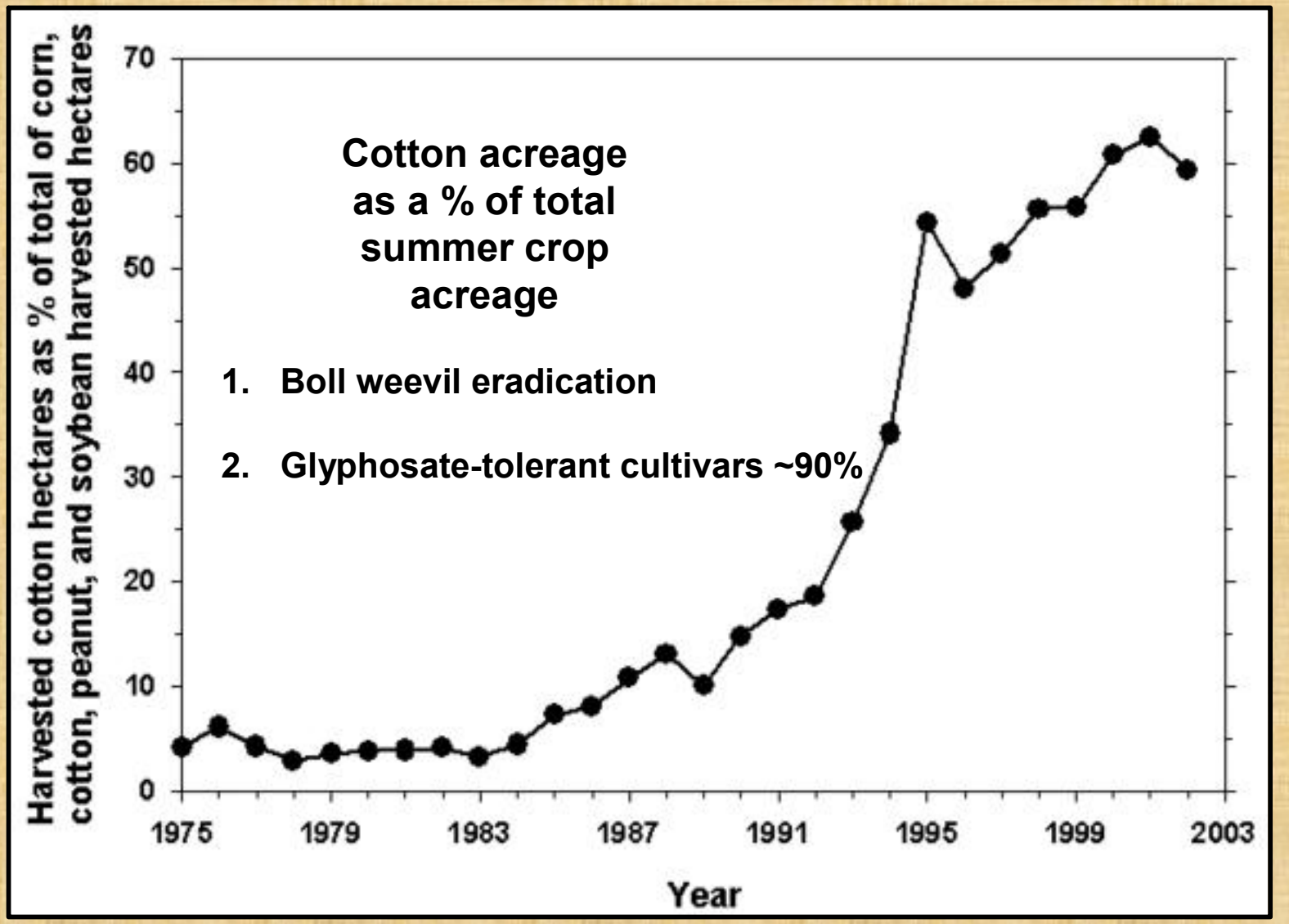
Why is Tropical Spiderwort a Weed?

Cotton (and peanut)

Georgia Agriculture

- 1988
  - Corn: 600,000 ac
  - Cotton: 350,000 ac
  - Soybean: 930,000 ac
  - Peanut: 690,000 ac
  - Wheat: 575,000 ac
  - Total: 4,268,000 ac
- 2003
  - Corn: 340,000 ac
  - Cotton: 1,450,000 ac
  - Soybean: 190,000 ac
  - Peanut: 540,000 ac
  - Wheat: 380,000 ac
  - Total: 3,807,000 ac

Why has cotton acreage increased?



The Perfect Storm?

- Georgia Agriculture: early 1990's
  - Reliance on PRE Herbicides with soil residual activity (fluometuron: 90% acres)
  - Cultivation: 2 to 3 cultivations/season
  - Conservation tillage: <1% of cotton acres

The Perfect Storm?

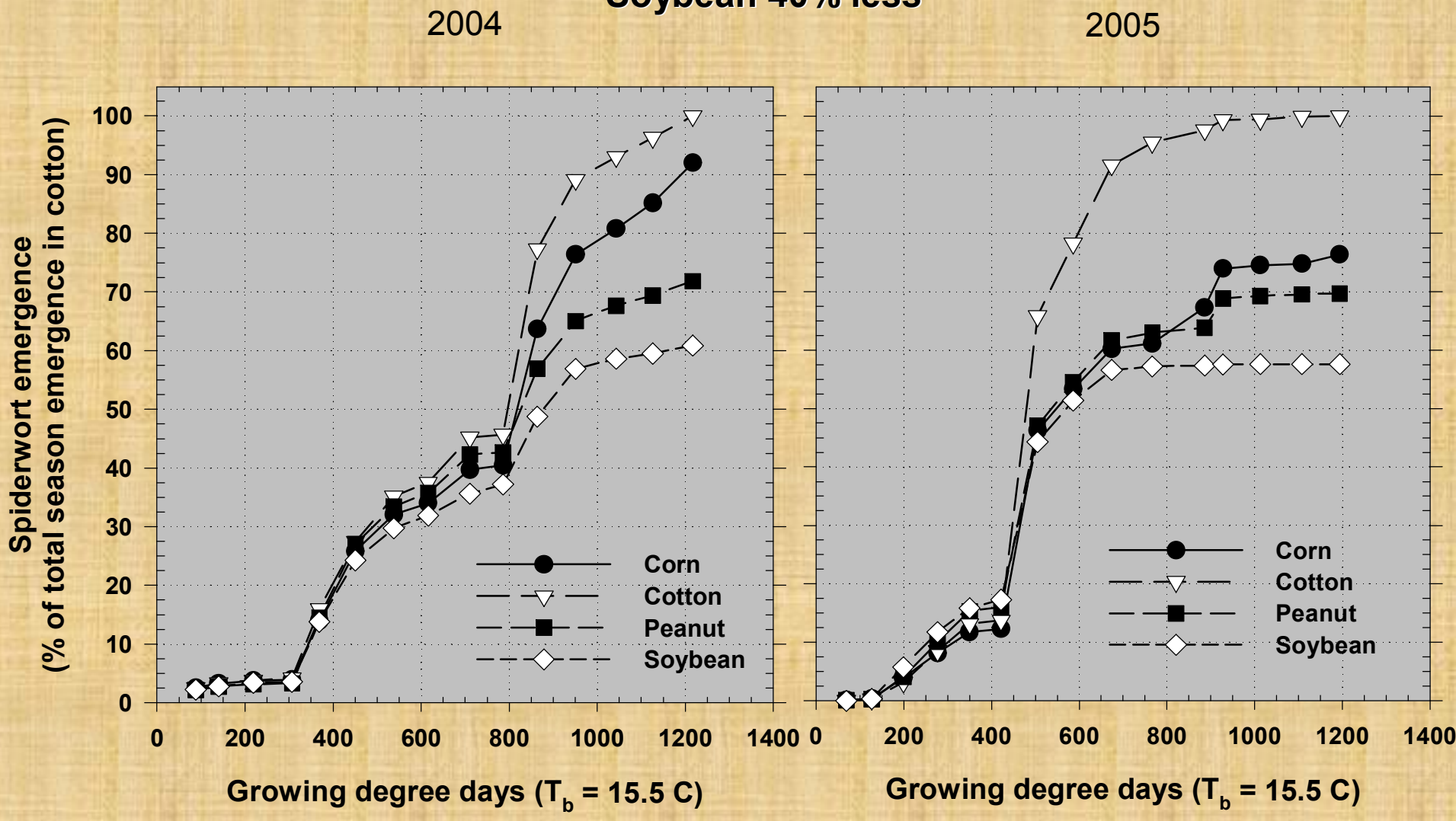
- Georgia Agriculture: current situation
  - Reliance Roundup Ready Cotton Cultivars (90%)
  - Abandonment of PRE Herbicides with soil residual activity (fluometuron: <10% acres)
  - Cultivation: <15% acres
  - Reduced tillage on 45% of the acres

Why Cotton?

Emergence In:

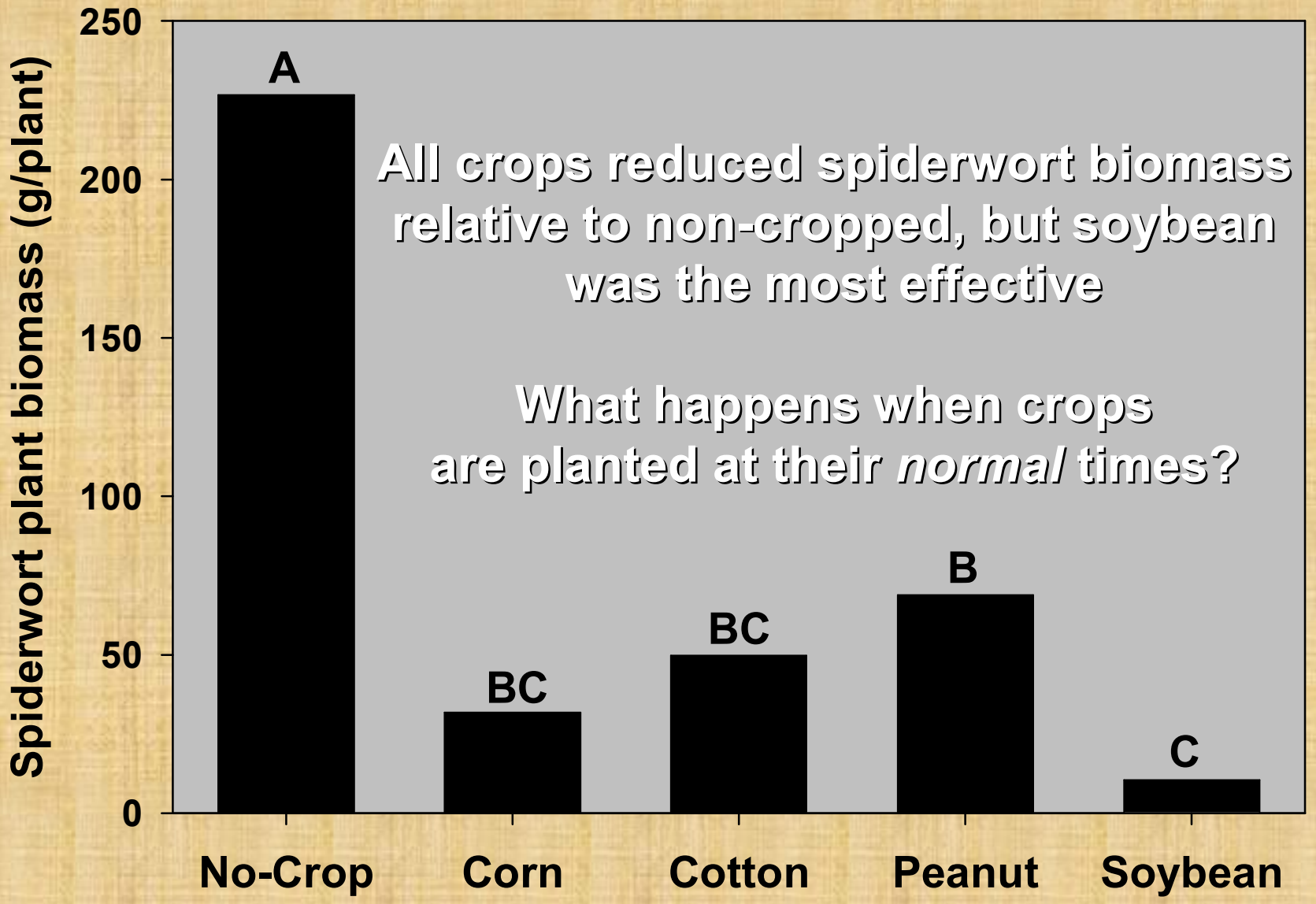
Peanut 30% less

Soybean 40% less



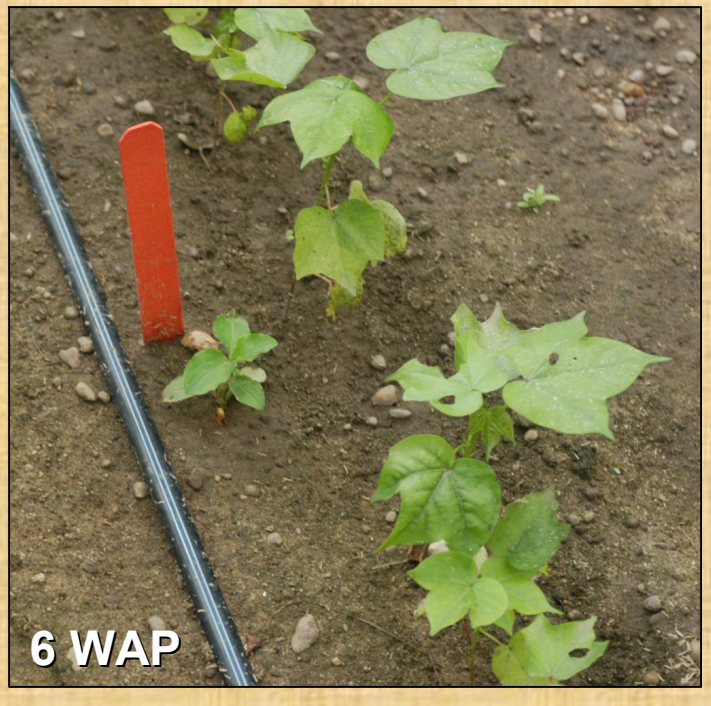
All Crops Planted Final Week of April

All Crops Planted Final Week of April



Corn planted April 14; Cotton/Soybean/Peanut planted May 16; Spiderwort transplanted June 16

2 weeks after transplant



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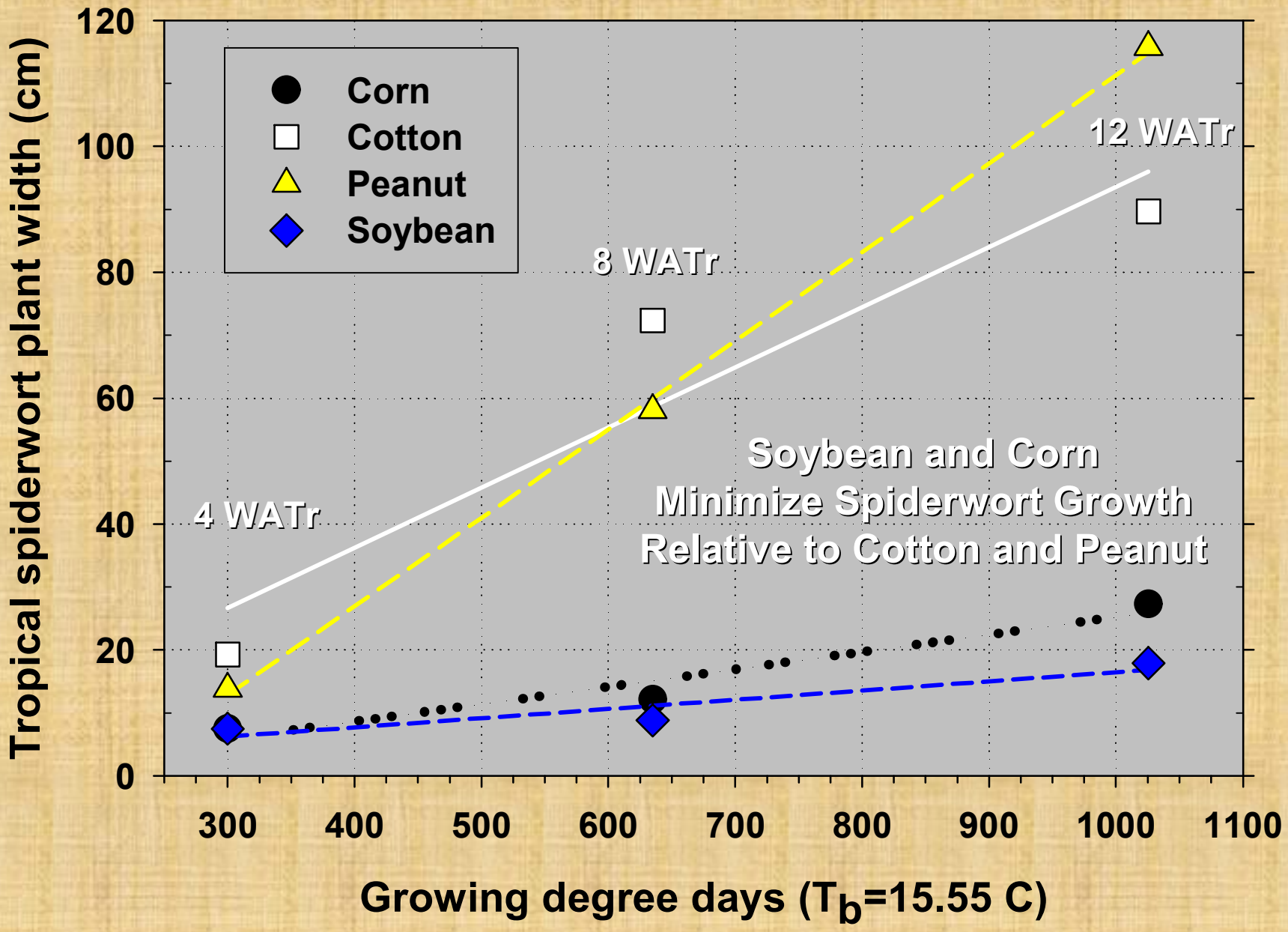
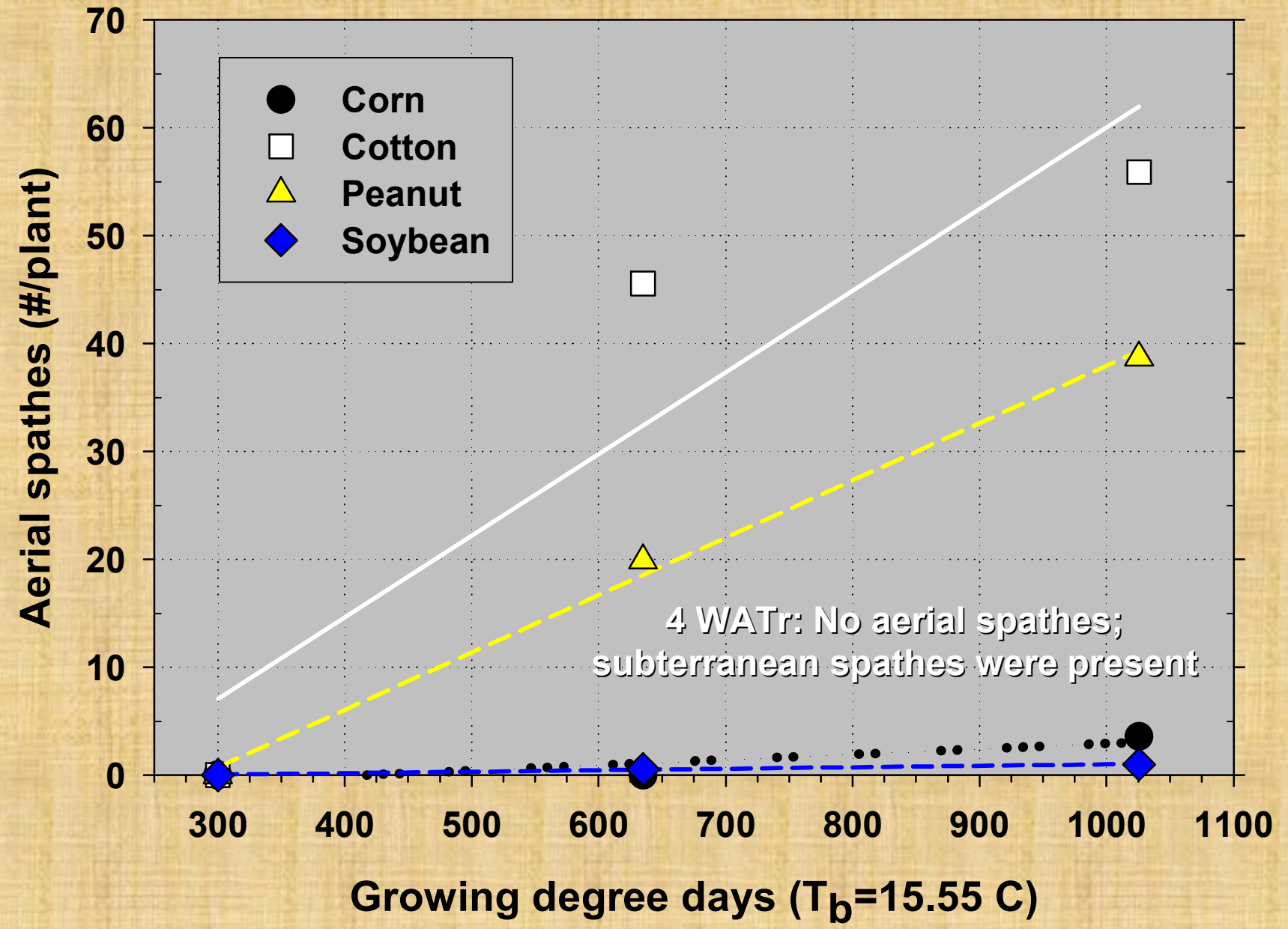


Corn planted April 14; Cotton/Soybean/Peanut planted May 16; Spiderwort transplanted June 16



Why is Tropical Spiderwort a Weed?

The secret to it's success?

Corn planted in March


Corn is too tall for control tactics as
tropical spiderwort begins to germinate;
Atrazine has dissipated prior to June

Tropical spiderwort: August

Lack of management in corn;
Spiderwort can complete a
“generation” in 42 days

Tropical Spiderwort: September

No post-crop harvest management

Research Directions

- Develop a predictive model for tropical spiderwort emergence
- Evaluate the seedbank longevity of tropical spiderwort
  - Burial studies
  - Zero-threshold studies
- Post-Crop Harvest Management
- Determine the primary dispersal mechanisms
- Characterize the environmental limits of tropical spiderwort in the US

Research Needs

Develop cropping systems with low susceptibility to tropical spiderwort invasion and high tolerance to tropical spiderwort presence

- Eliminate tropical spiderwort *safe-sites*
- Optimize the benefits of cultural practices
- Utilize aggressive control tactics
- Eliminate opportunities for tropical spiderwort reproduction

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- Michael Smith
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1000+ Worker-Hours in 2004 and 2005

Grower Cooperators:

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- Donald Connell
- Jim Tenewitz

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- Cotton Incorporated
- Georgia Cotton Farmers