

# Cotton Maturity and Plant Growth Regulators

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# Popular PGR Questions

- Why did I have low micronaire last year?
- Will I have high micronaire in 2018?
- If I irrigate properly, do I even need PGRs?
- It's August 20, and my cotton is tall and still growing. Can I rein it in with PGRs?

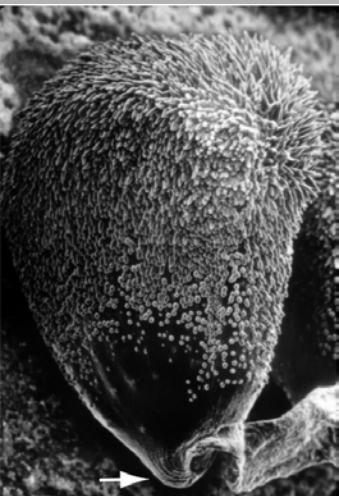
# What is Cotton Maturity?

- Vegetative/reproductive maturity
  - Combination of variety, management, environment
  - Based on node production, fruit production, fruit retention
- Fiber maturity
  - How far has an individual fiber progressed through the processes of elongation, secondary cell wall development, and maturation?
  - Combination of fruit production, environment within which the boll develops
  - Based on conditions experienced by individual bolls during developmental stages

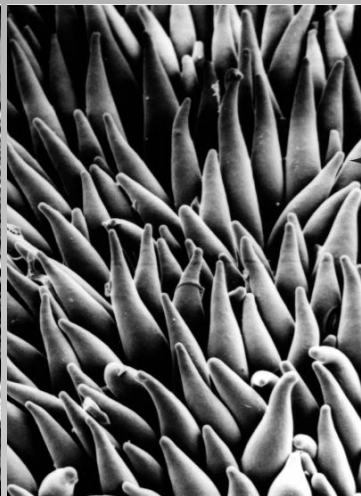
Does water deficit increase or decrease fiber maturity?

# Phases of Boll Development

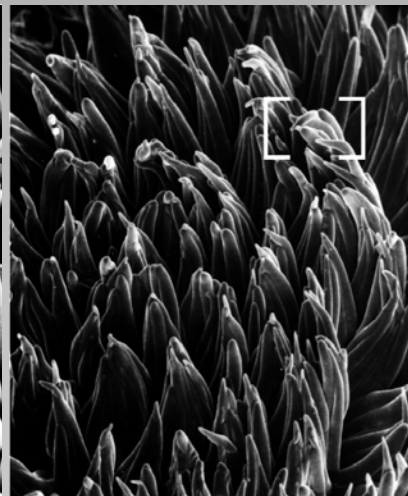
- Fiber initiation: -1 to 2 days after anthesis
- Fiber elongation/expansion: 3 days to 3 weeks after anthesis
- Secondary cell wall synthesis and fiber maturation: begins 15-20 days after anthesis, continues to open boll (45+ days)



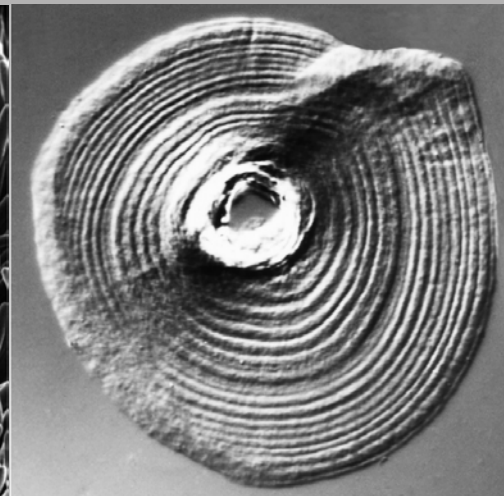
J. McD. Stewart



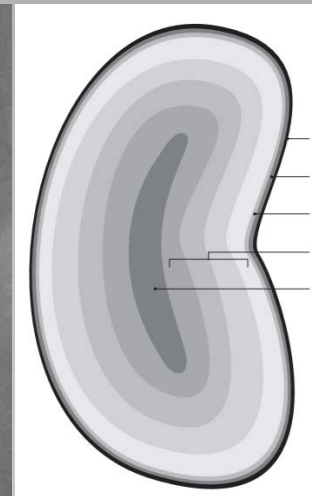
P. Lu and J. Jersted



J. McD. Stewart



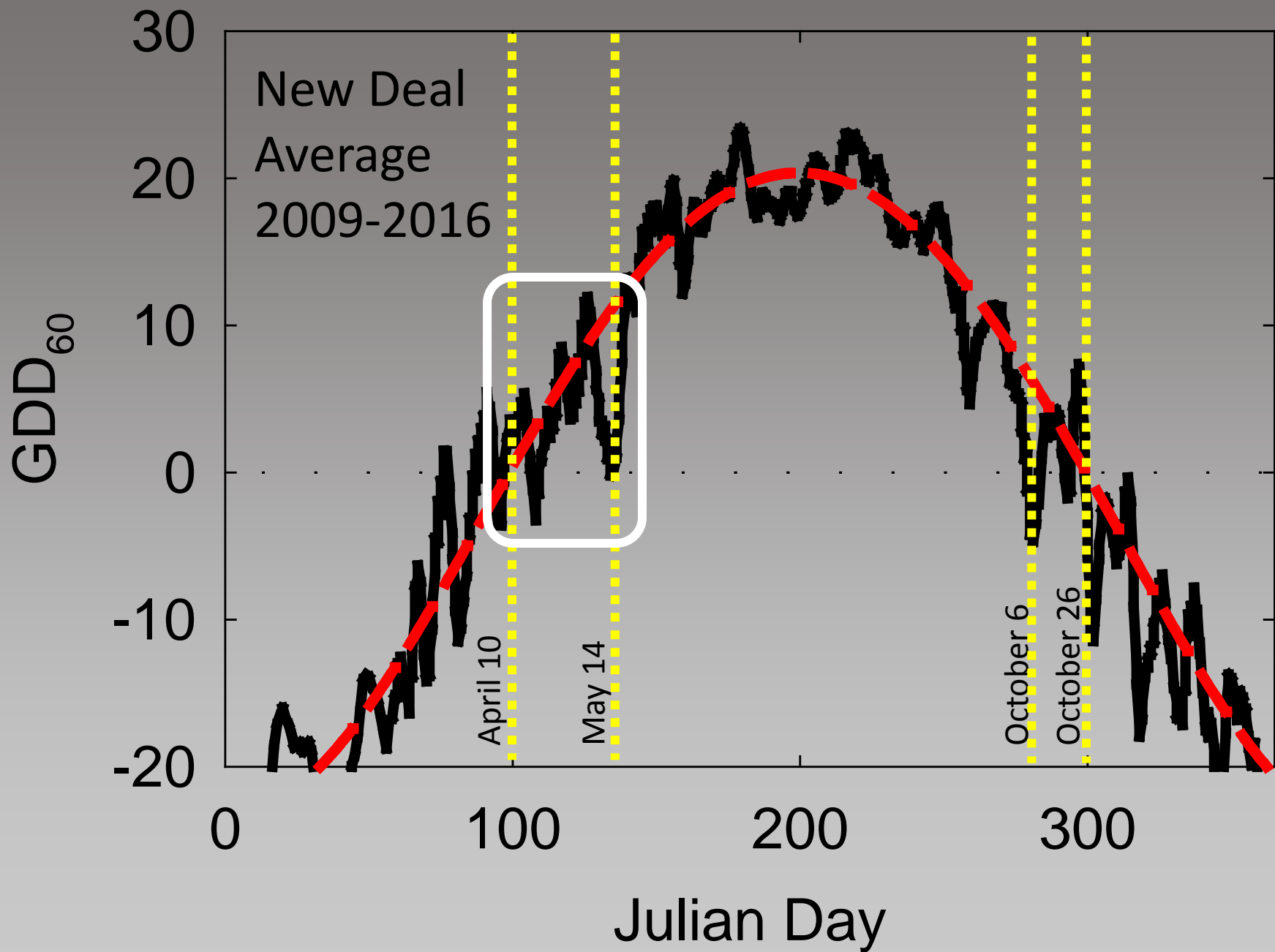
C.H. Haigler



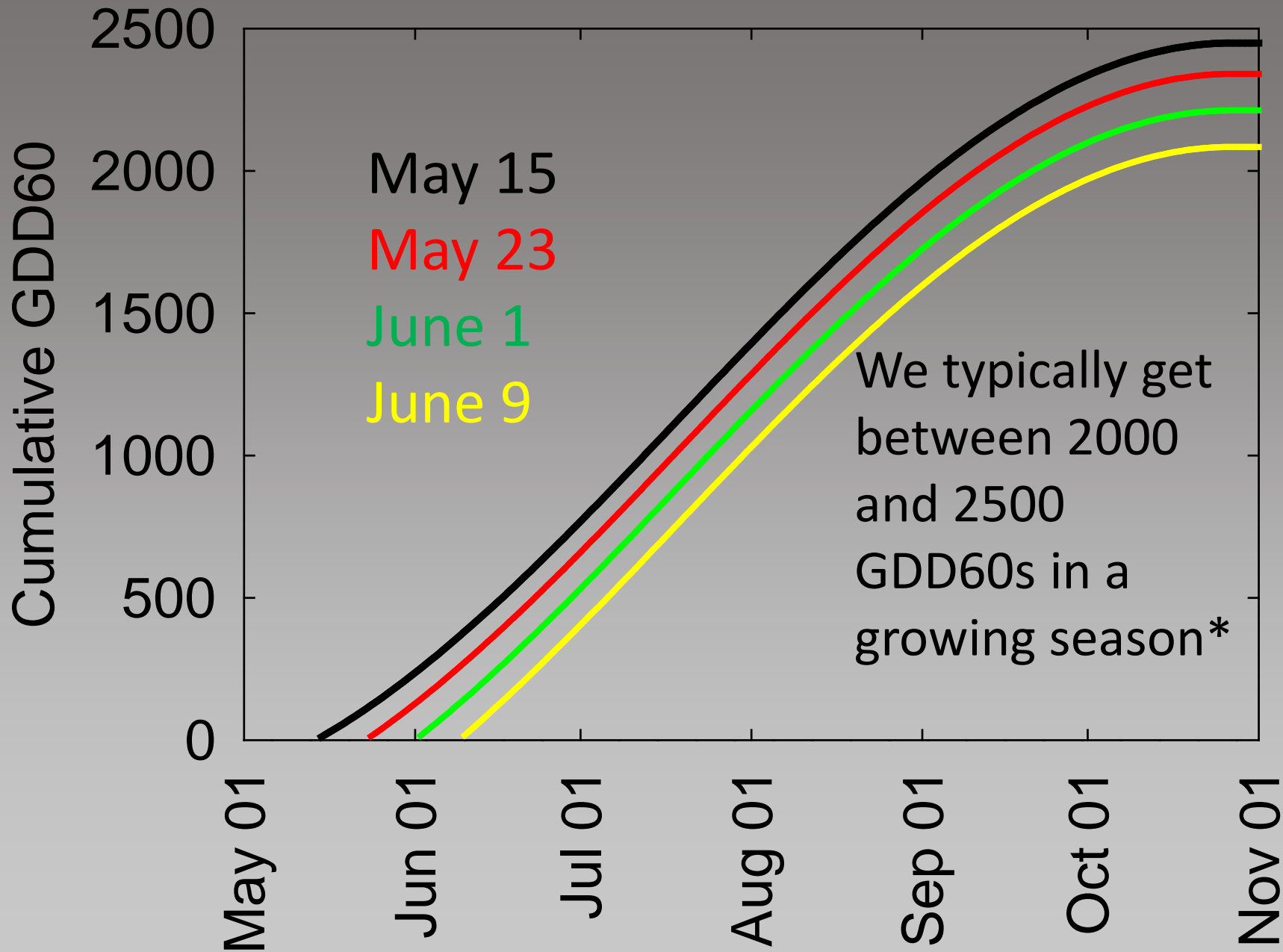
K. Charlton

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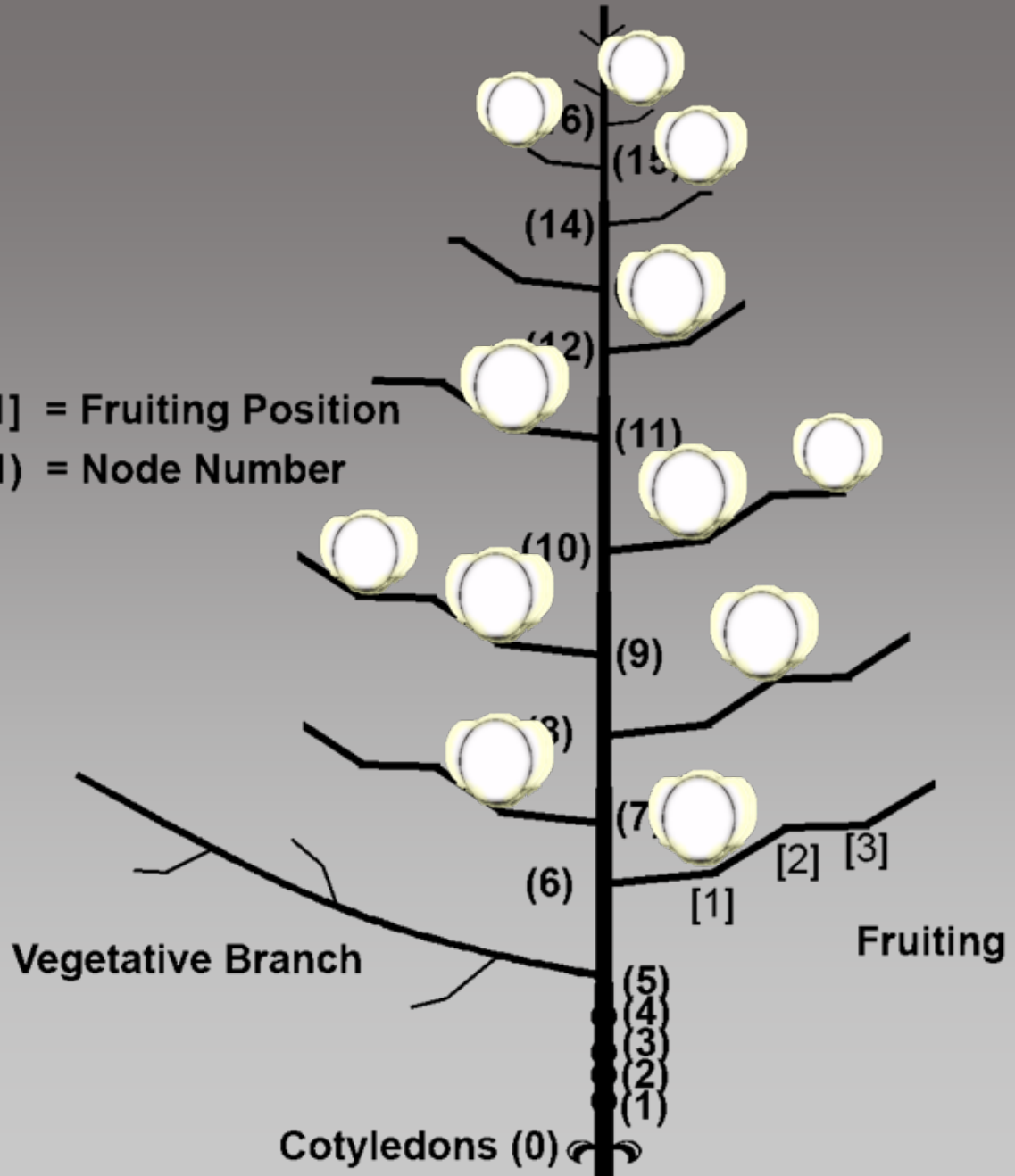






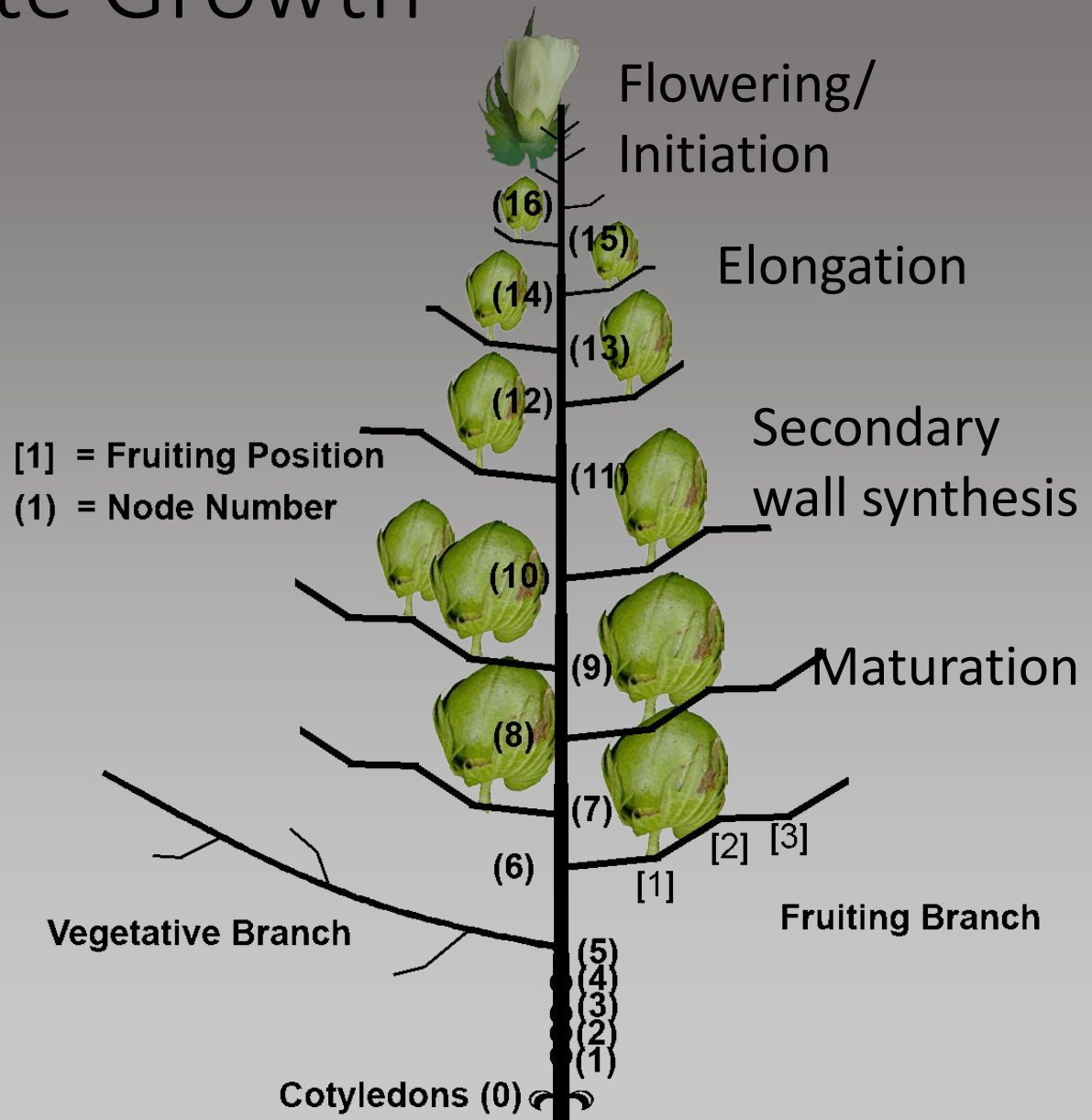
# Flowering

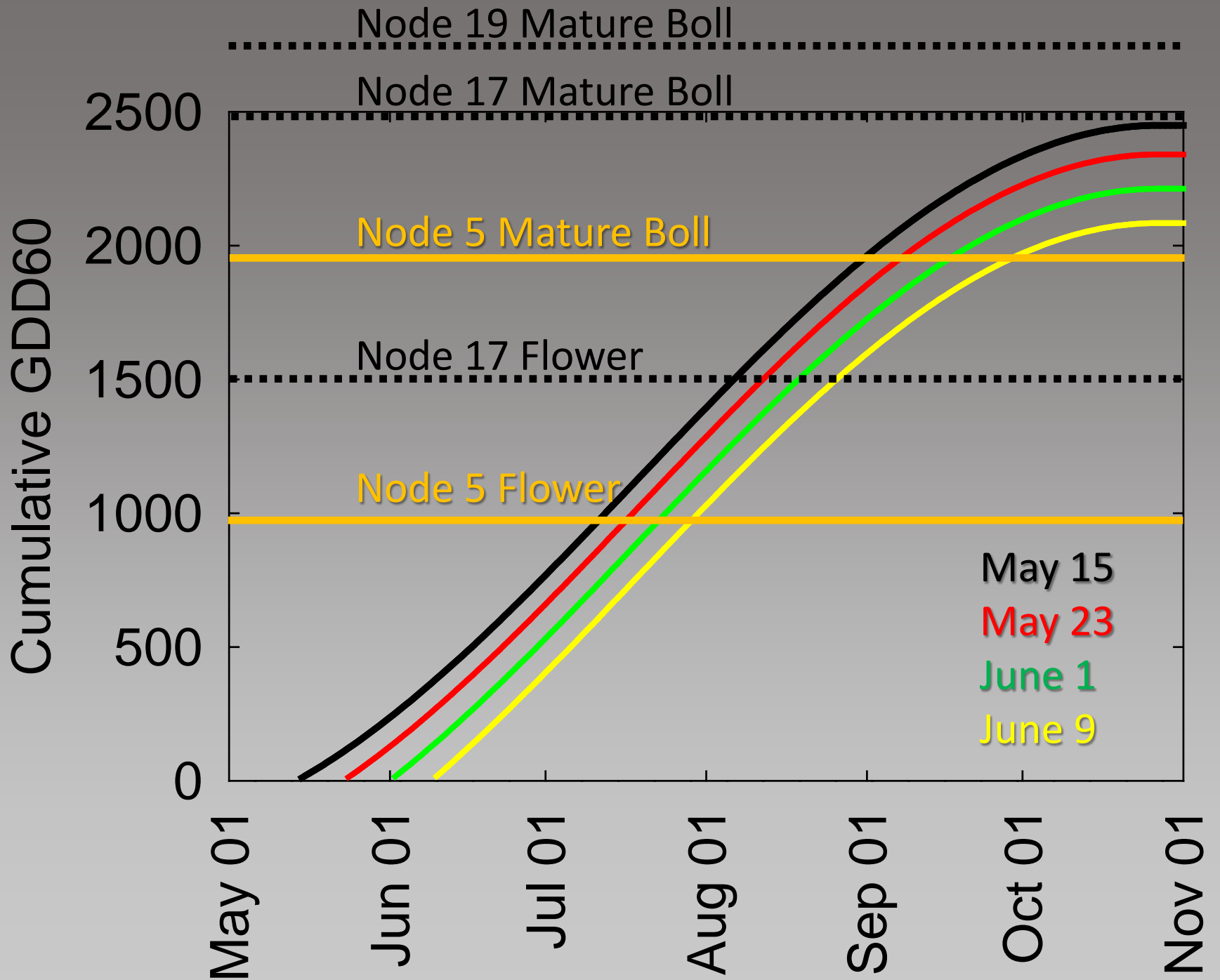
- Every node: behind 2-3 days
- Every position: behind 5-6 days
- Node 6 position 1 to Node 17 position 1: 25-30 days
- Node 6 position 1 to Node 15 position 2: 25-30 days

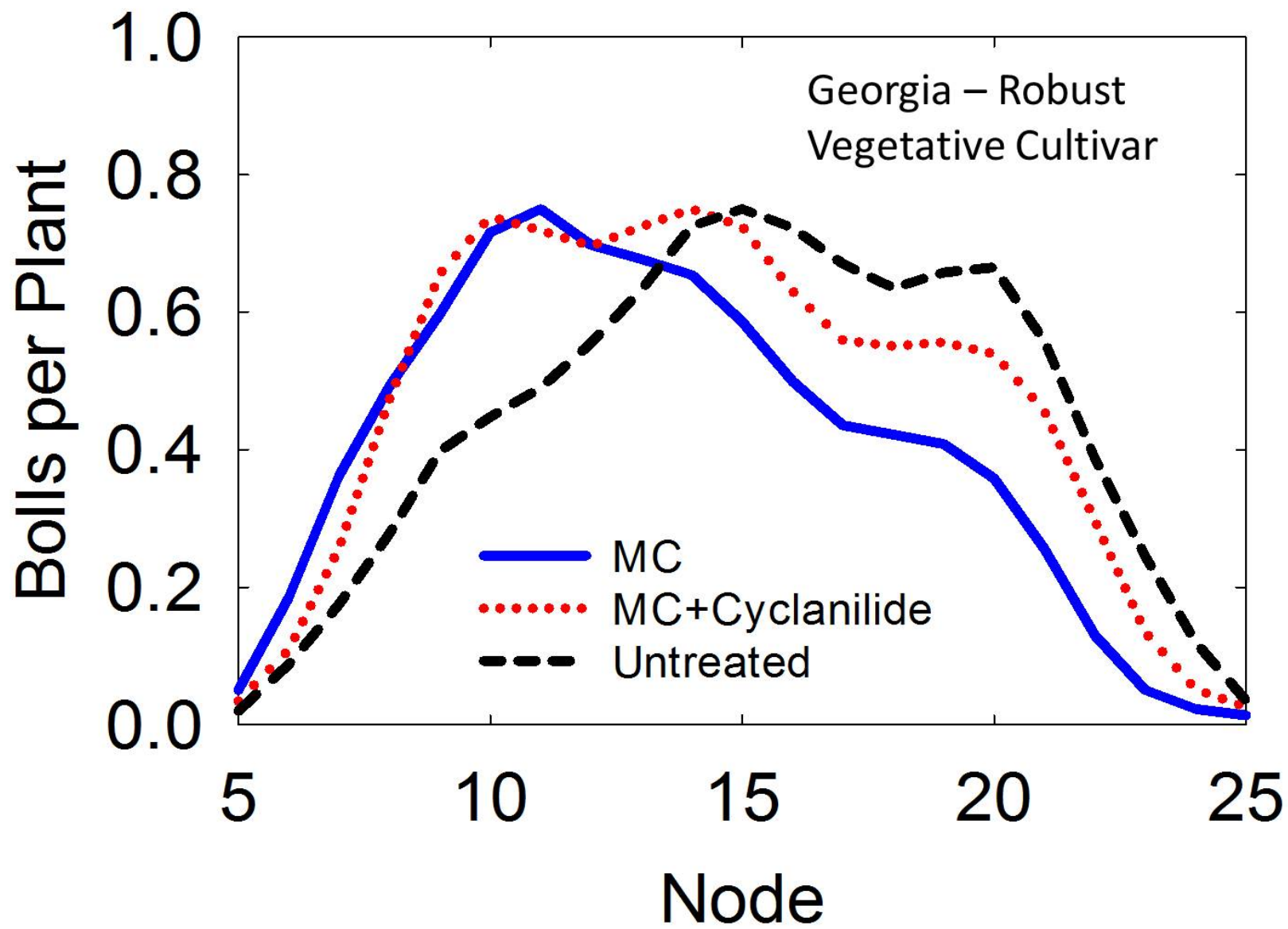


# Indeterminate Growth

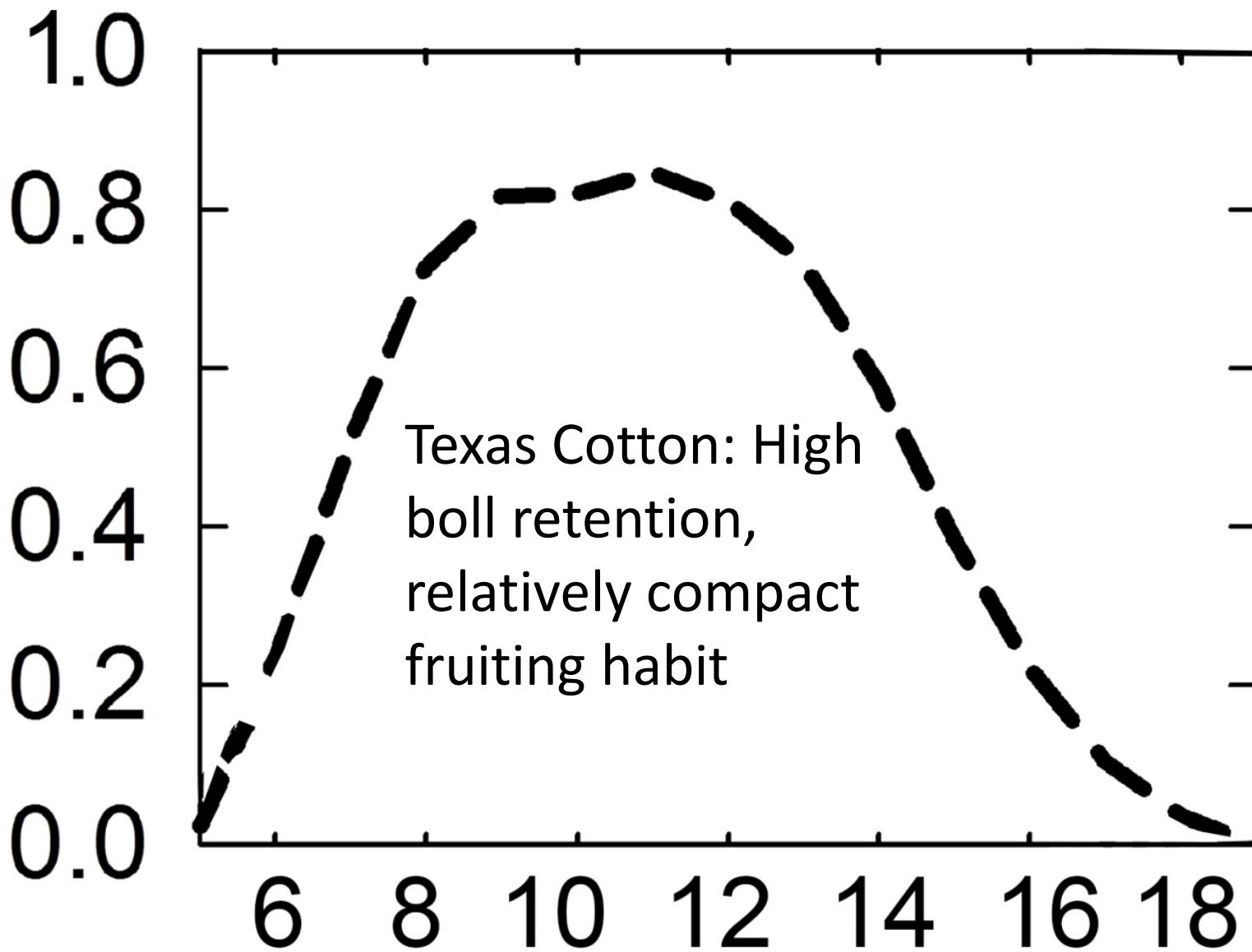
- Cotton has several fruit at differing stages at any given moment.







Bolls per Plant



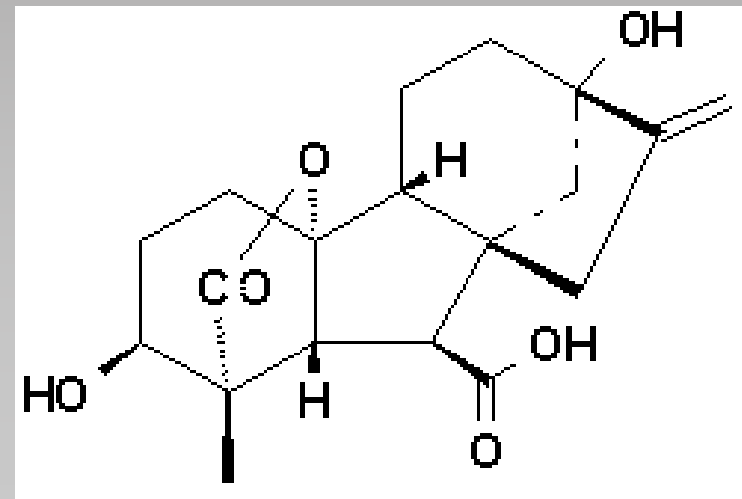
# “Typical Year”

- On May planted cotton, upper nodes are at risk of immaturity.
- On June planted cotton, most of the nodes are at risk of immaturity.



# Why Cotton Grows Tall: Gibberellins

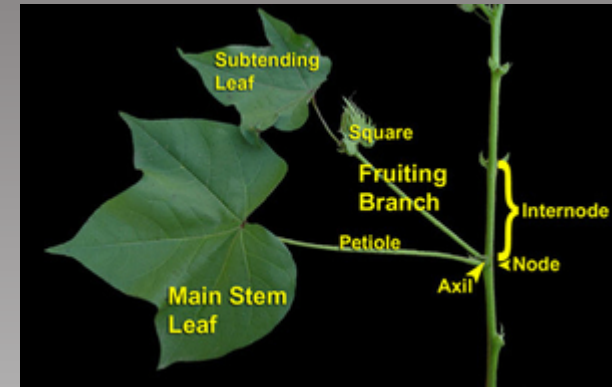
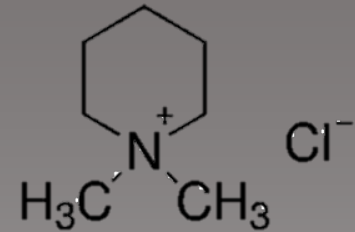
- Gibberellins have a number of effects on plant development. They can:
  1. Stimulate rapid stem and root growth
  2. Induce mitotic division in leaves





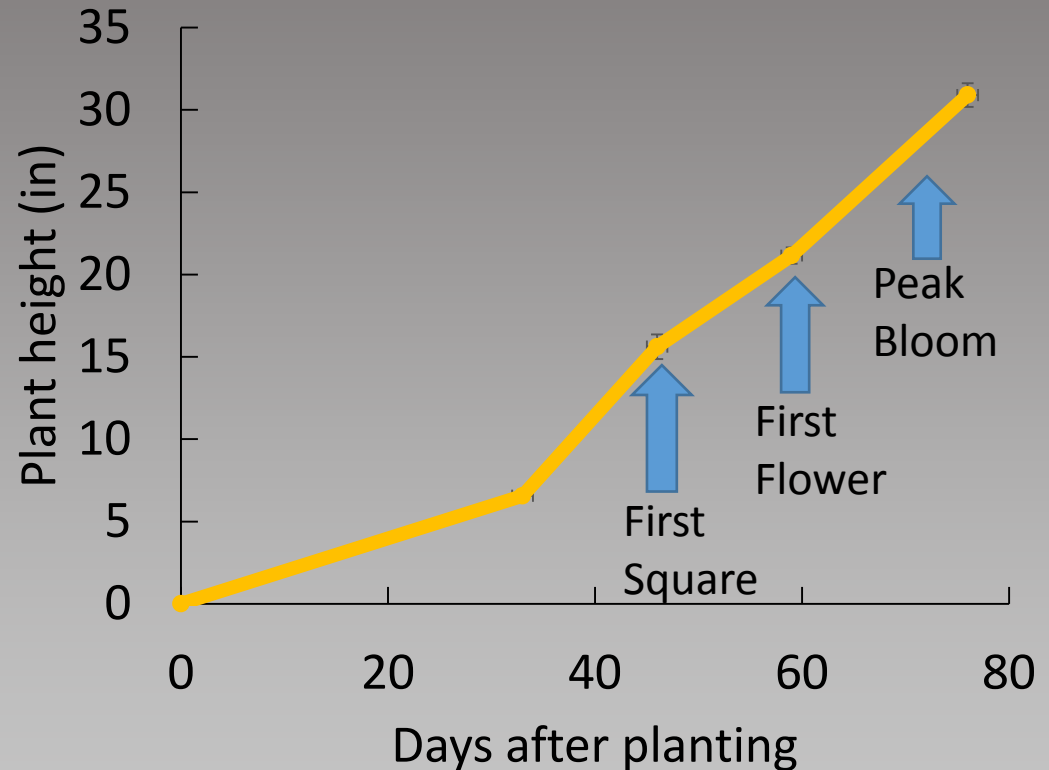
# PGRs in Cotton

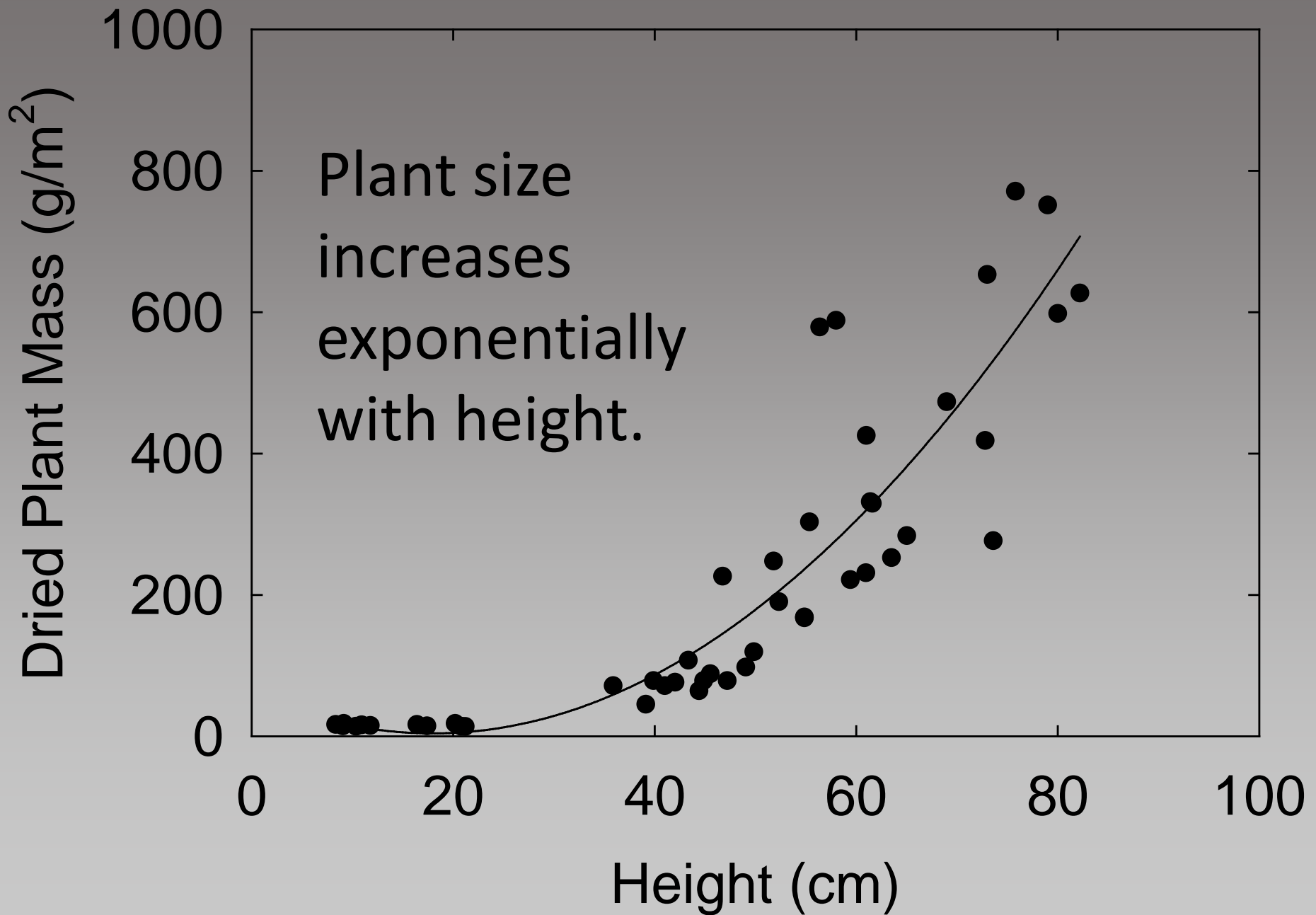
- Purpose: decrease crop growth
- Gibberellin inhibitors
  - Decreased internode length
  - Decreased leaf area
  - Decreased node number
  - Increased fruit retention on lower nodes
  - Earlier maturity

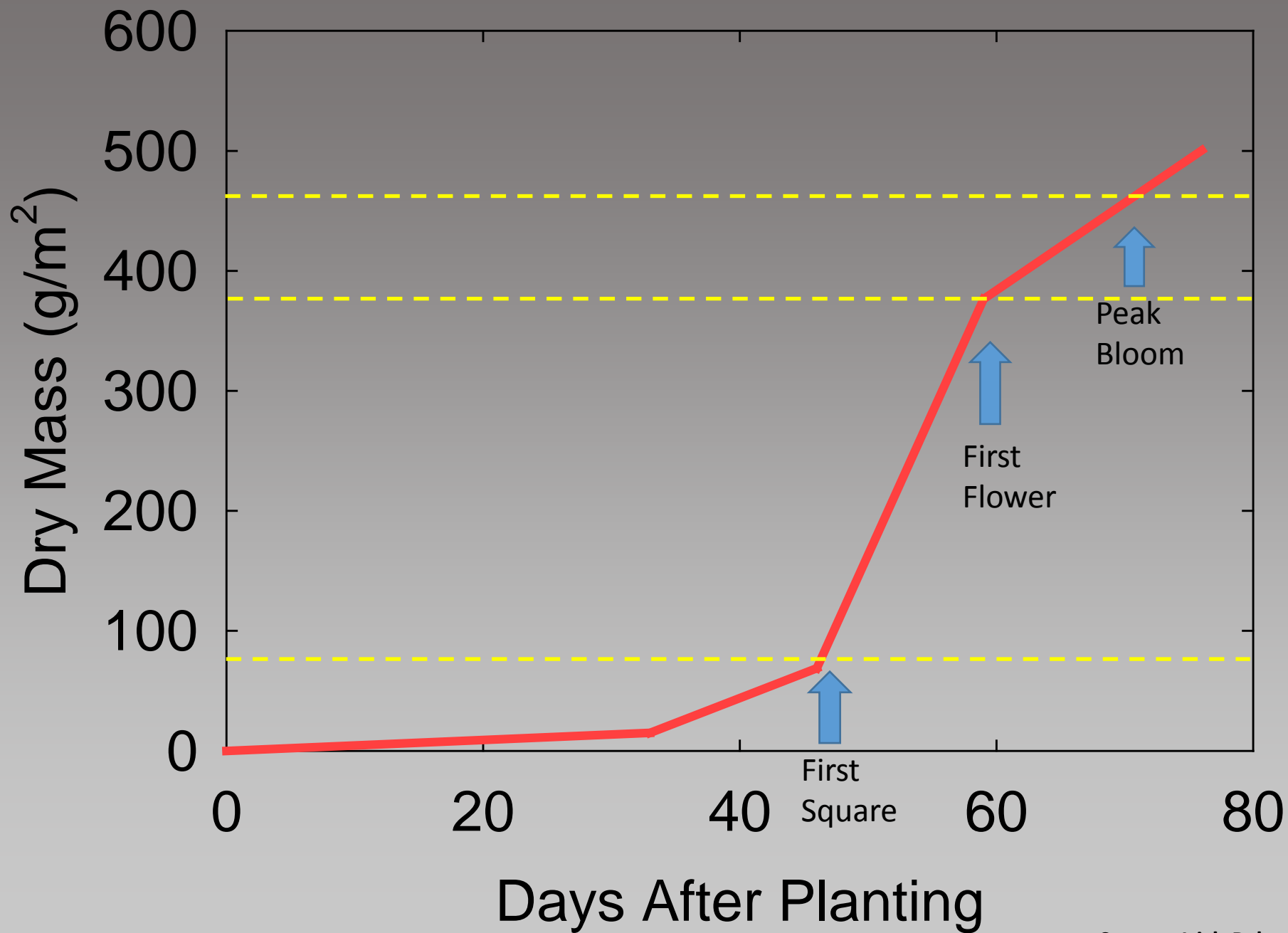


# Plant Growth Regulators

- When water and nitrogen are plentiful, cotton height increases dramatically over time.







# Spray Rate

- If you spray at flowering, the plants are 2-3x as big. At peak bloom, the plants are 3-4x as big.
- If dosage is based on biomass, 18 oz during flowering is equivalent to 6 oz at squaring
- 24 oz at peak bloom is equivalent to 6 oz at squaring



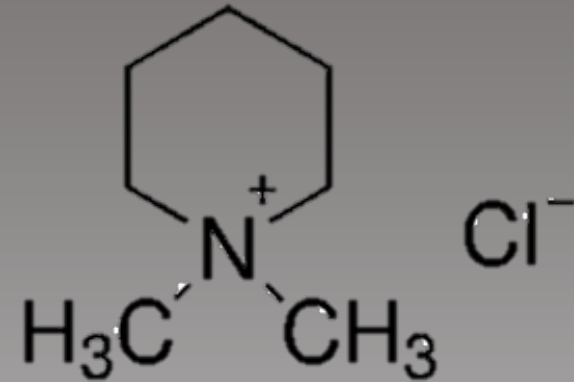
# If I irrigate properly, do I even need PGRs?

- Dr. Wayne Keeling, September 11, 2018:

“I think that plant growth regulators are a mask for poor irrigation management.”

# In-Season Plant Growth Regulators vs Irrigation

- PGR mode of action:
  1. Inhibits gibberellin synthesis
  2. Shorter internodes, smaller leaves
  3. More energy to fruit
  4. Shorter plants, boll set lower on the plant
- Water deficit:
  1. Shorter internodes, smaller leaves
  2. More energy to fruit
  3. Shorter plants, more compact boll set





# Irrigation as PGR

- Emergence to 1<sup>st</sup> square: 1.5 inches in 5 weeks (soil storage)
- 1<sup>st</sup> square to first flower: 2.5 inches in 3 weeks (0.8 inches per week)
- Irrigation at flowering can be up to 2 inches per week

Table1. UGA Checkbook Cotton Irrigation for Full Season

| Cotton Irrigation Schedule      |                     |                      |                 |                |
|---------------------------------|---------------------|----------------------|-----------------|----------------|
| Growth Stage                    | Days after Planting | Weeks after Planting | Inches per Week | Inches per Day |
| Emergence                       | 1 - 7               | 1                    | 0.04            | 0.01           |
|                                 | 8 - 14              | 2                    | 0.18            | 0.03           |
| Emergence to First Square       | 15 - 21             | 3                    | 0.29            | 0.04           |
|                                 | 22 - 28             | 4                    | 0.41            | 0.06           |
|                                 | 29 - 35             | 5                    | 0.56            | 0.08           |
| First Square to First Flower    | 36 - 42             | 6                    | 0.71            | 0.10           |
|                                 | 43 - 49             | 7                    | 0.85            | 0.12           |
|                                 | 50 - 56             | 8                    | 1.08            | 0.15           |
| First Flower to First Open Boll | 57 - 63             | 9                    | 1.28            | 0.18           |
|                                 | 64 - 70             | 10                   | 1.47            | 0.21           |
|                                 | 71 - 77             | 11                   | 1.52            | 0.22           |
|                                 | 78 - 84             | 12                   | 1.43            | 0.20           |
|                                 | 85 - 91             | 13                   | 1.42            | 0.20           |
|                                 | 92 - 98             | 14                   | 1.33            | 0.19           |
|                                 | 99 - 105            | 15                   | 1.16            | 0.17           |
|                                 | 106 - 112           | 16                   | 0.88            | 0.13           |
|                                 | 113 - 119           | 17                   | 0.69            | 0.10           |

# Late Season PGR

- Large biomass – would require heavy application
- Would only affect actively growing tissue (uppermost 3-4 nodes)
- Bolls: major carbohydrate sink (natural growth regulator), gibberellin inhibitors probably not great for fiber elongation

# When Do I Use PGRs?

- Wet weather early (especially prior to 1<sup>st</sup> flower)
- Long internodes (normal: 2 fingers between adjacent nodes)
- Wet weather in forecast
- Delayed fruiting
- Vigorous cultivar



# Popular PGR Questions

- Why did I have low micronaire last year?
  - Cool, wet weather ➡ fewer heat units and more rank growth ➡ poor fiber maturity
- Will I have high micronaire in 2018?
  - Yes
- If I irrigate properly, do I even need PGRs?
  - Heat units/cultivar/rainfall
- It's August 20, and my cotton is tall and still growing. Can I rein it in with PGRs?
  - Good luck!



# Questions?

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