Factors That Impact Fiber Quality & Leaf Grades

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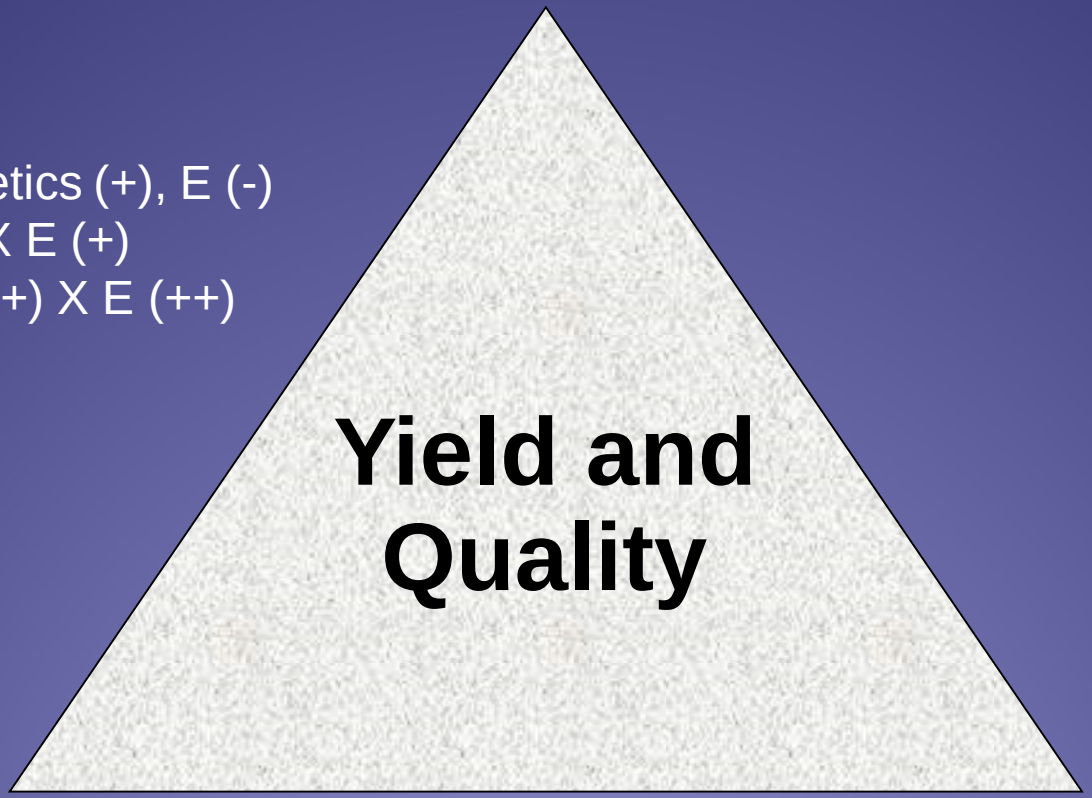
Environment x Genetics

Strength-Genetics (+), E (-)
Length-G (+) X E (+)
Micronaire-G (+) X E (++)



Environment

Genetics (Heredity)

Yield Attributed to These Factors

- Boll number
- Boll size
  - Number seed
  - Fiber number
  - Fiber development

The Cotton Boll

- Composed of 3 to 5 locules
  - compartments of the ovary
- Each locule has 8 or 9 seeds attached to the central column
- About 300 bolls are required to produce a pound of lint

The Cotton Boll

- The fruit of the plant; grows rapidly after fertilization, especially between 7-18 days
- Full size is reached in about 20 to 25 days
- Maturation (from anthesis to boll opening) usually takes ~ 50 days

Impact of Stress on Physiological Parameters

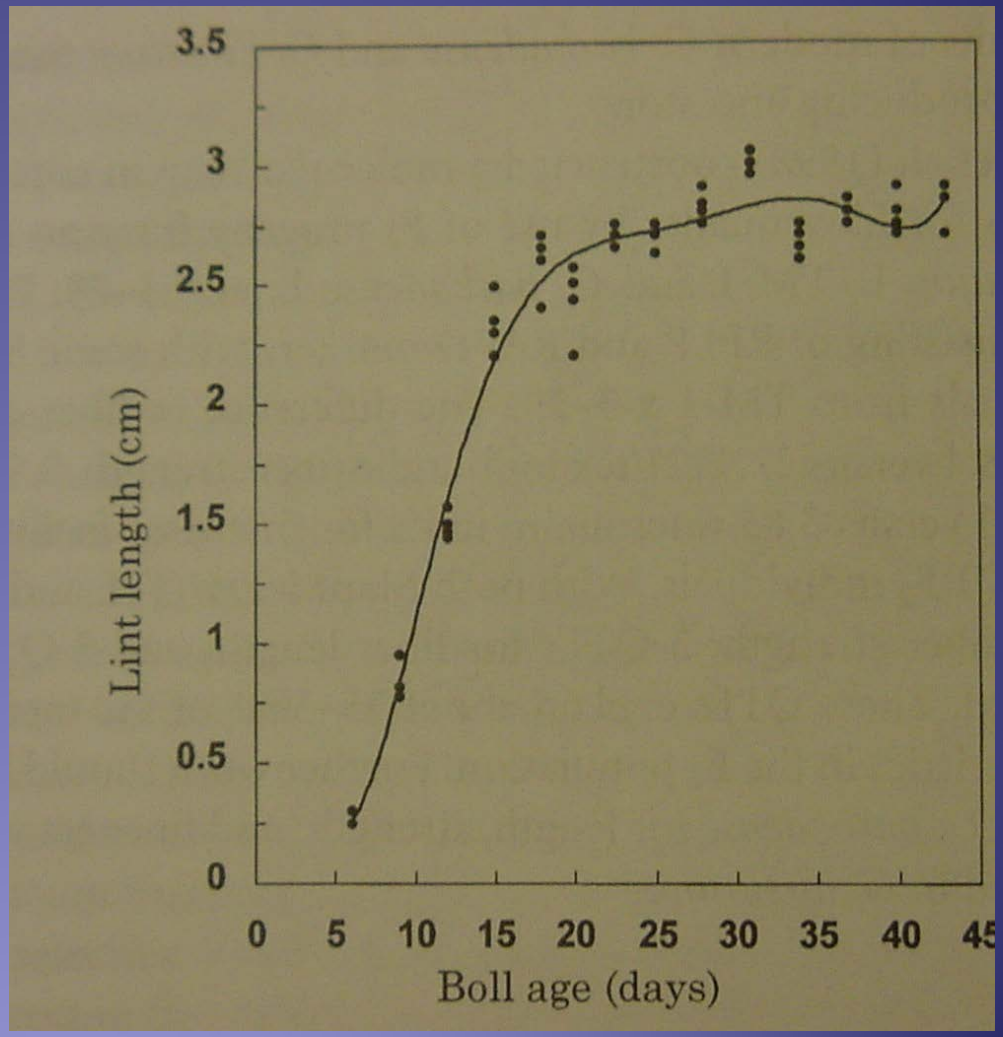
- **Boll Development**
  - **Pollination / temperature and water**
  - **Seed number**
  - **Fiber development / quality**

Ideal Fiber-Quality Specifications Favored by Processors

- as white as snow
- as long as wool
- as strong as steel
- as fine as silk
- as cheap as hell

Stage 1 Fiber Elongation

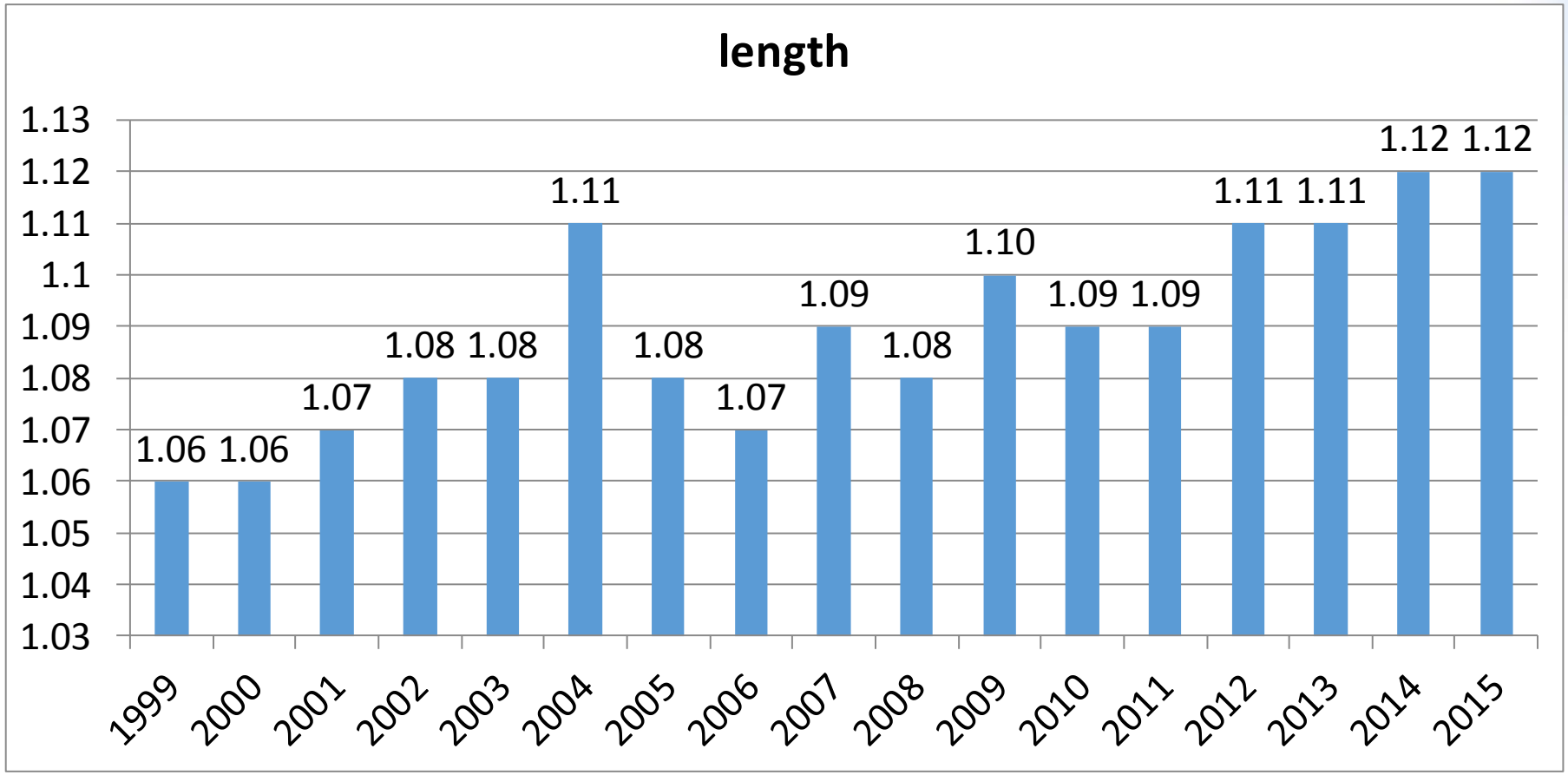
- Elongation of the fiber is driven by the internal water pressure of the elongating cell.
- Length
  - Determined in the 18 to 21 days after pollination.
  - Cell expansion.
  - Variety sets the bar
    - influenced by environment.



Causes of long and short staple

- **Causes of long staple**
  - Variety selection
  - Moderate temperatures during the first 3 weeks of boll development.
  - Limited stress during the first three weeks of boll development.
- **Causes of short staple**
  - Variety selection
  - Extremely high or low temps during fiber elongation (18-21 days after bloom).
  - Potassium deficiency during fiber elongation-moderate levels of K can reduce fiber elongation.
  - Water stress during fiber elongation –usually severe stress, since a cotton plant will shed bolls during stress, before fiber elongation is affected.

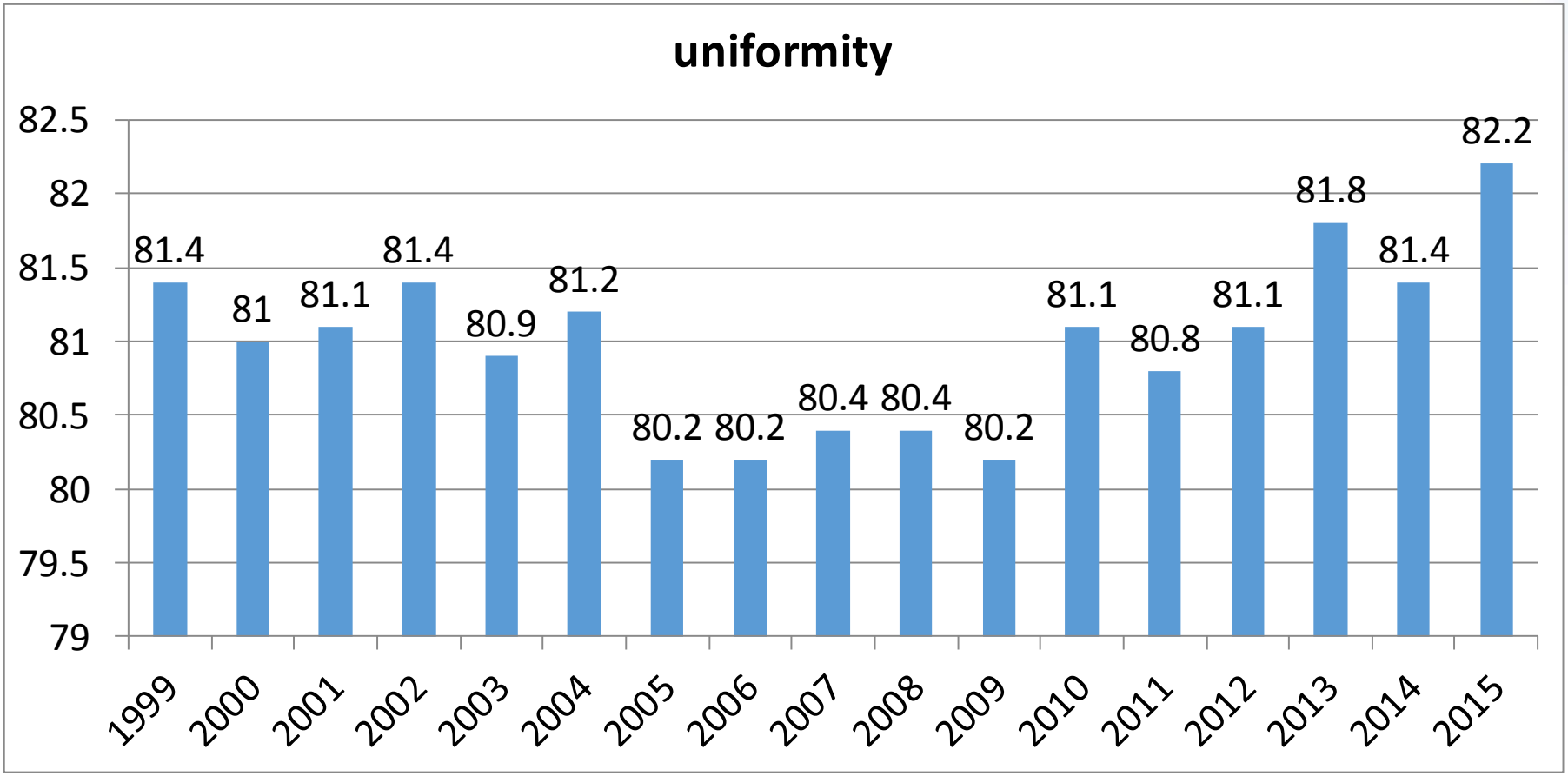
Fiber Quality-Rayville



Length

Inches	32nds	inches	32nds
0.79 & shorter	24	1.11-1.13	36
0.80-0.85	26	1.14-1.17	37
0.86-0.89	28	1.18-1.20	38
0.90-0.92	29	1.21-1.23	39
0.93-0.95	30	1.24-1.26	40
0.96-0.98	31	1.27-1.29	41
0.99-1.01	32	1.30-1.32	42
1.02-1.04	33	1.33-1.35	43
1.05-1.07	34	1.36 & longer	44 & longer
1.08-1.10	35		

Fiber Quality-Rayville



Length Uniformity

Degree of uniformity	Uniformity index
Very high	Above 85
High	83-85
Intermediate	80-82
Low	77-79
Very low	Below 77

Length uniformity is the ratio between the mean length and the upper half mean length of the fibers and is expressed as a percentage.

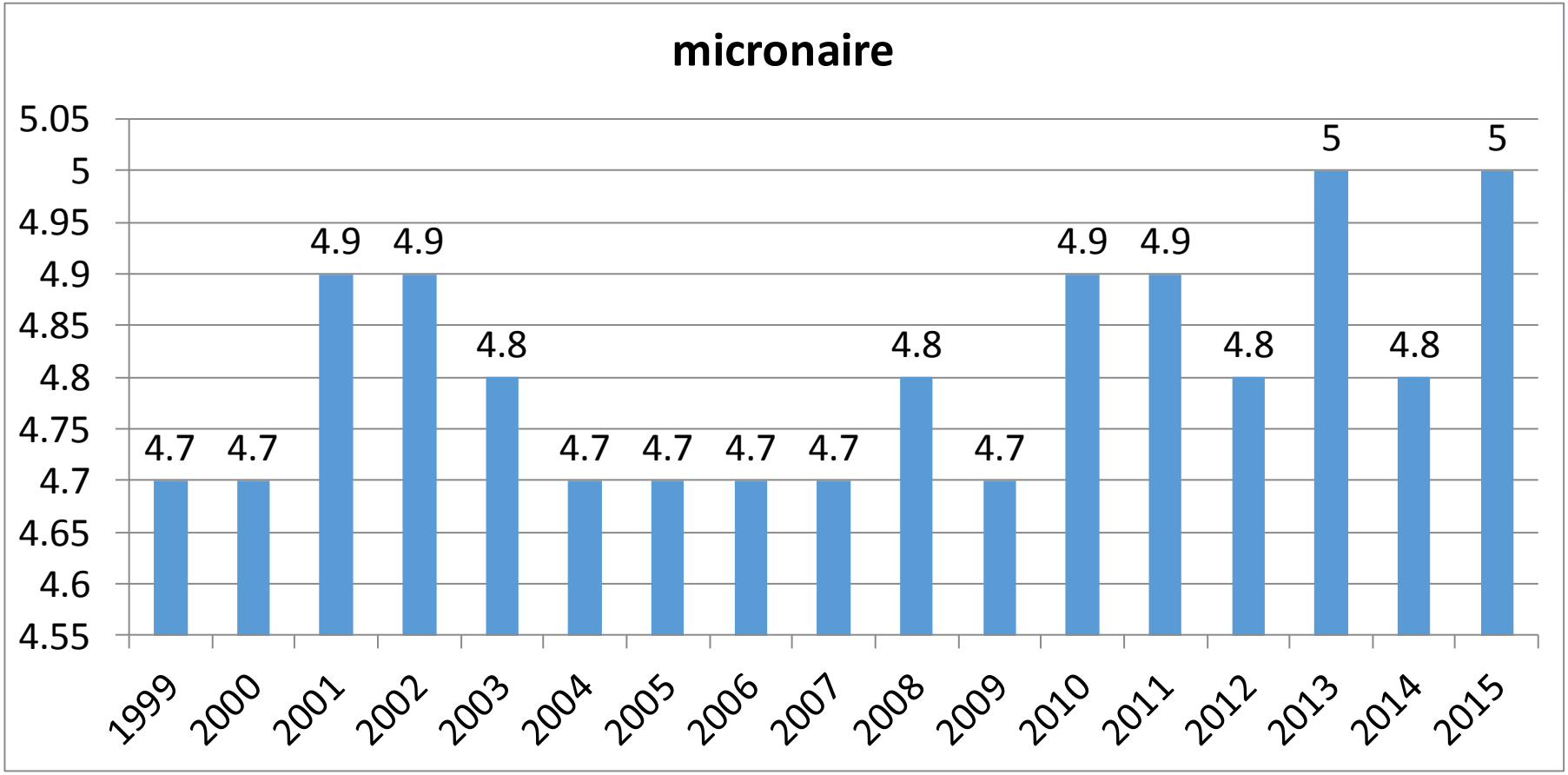
Stage 2 Thickening

- Secondary wall thickening occurs from 17 to 53 days after pollination.
  - Cellulose is deposited inside the elongated cell.
  - The cellulose is deposited at slightly differing angles.
- Fiber thickening will determine fiber fineness, or micronaire.

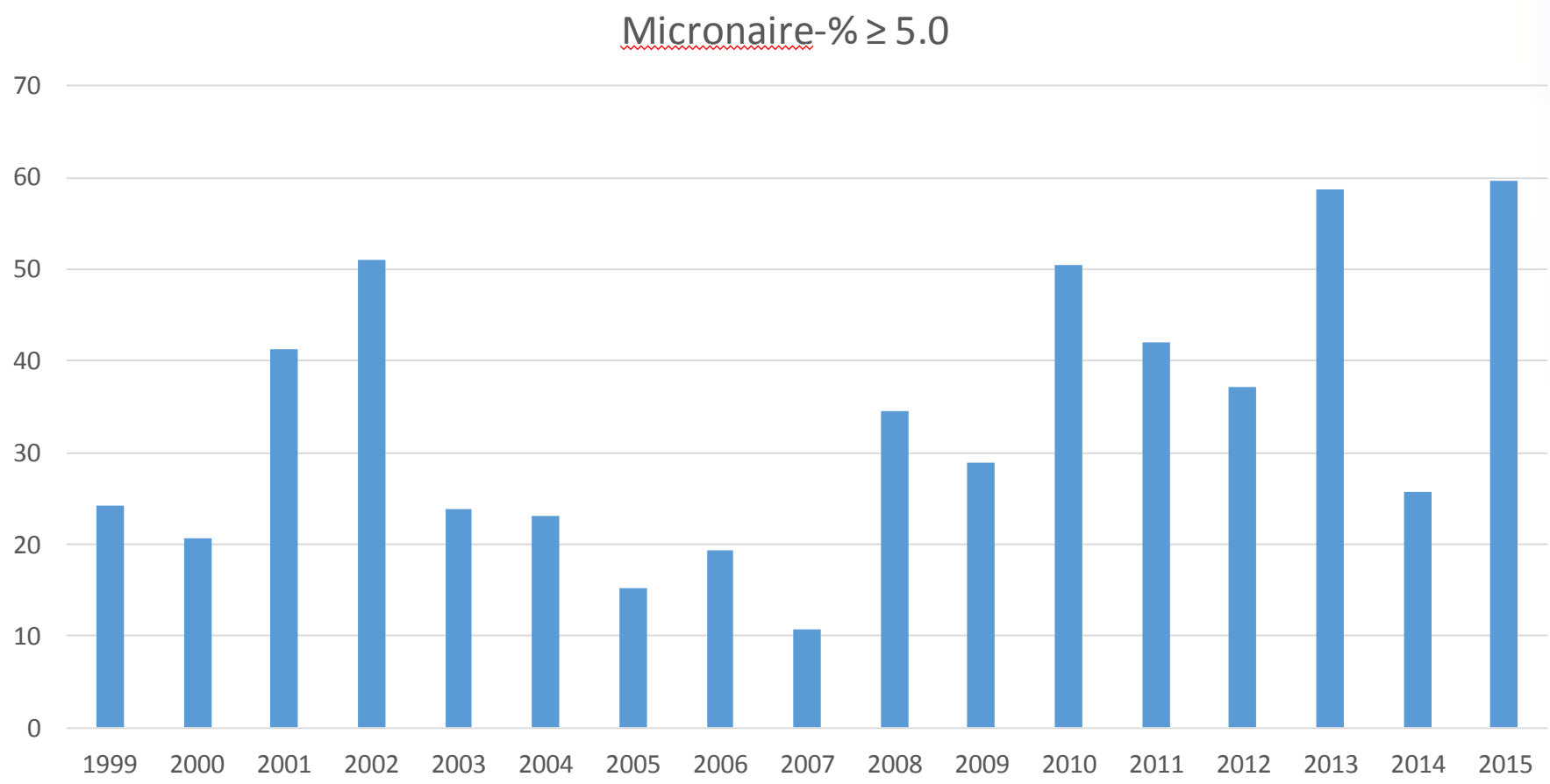
Causes of high and low micronaire

- **Causes of high micronaire**
  - Good early season boll set followed by poor to mid late boll set.
  - A preponderance of 1st position bolls at the expense of 2nd and 3rd position bolls.
  - Warm weather between 3 and 6 weeks after 1st bloom with poor fruit retention during this time.
  - Short fiber caused by water stress during 3 weeks following 1st bloom, followed by good weather for the next three weeks.
- **Causes of low micronaire**
  - Season being cut short due to weather and or cool temps.
  - Premature application of harvest aid.
  - Cool and cloudy weather between 3-6 weeks following the first bloom with good late fruit retention.
  - High levels of boll rot which affects the older first position bolls.
  - Extreme water stress and drought during boll fill (3-6 weeks after first bloom)

Fiber Quality-Rayville



Fiber Quality-Rayville



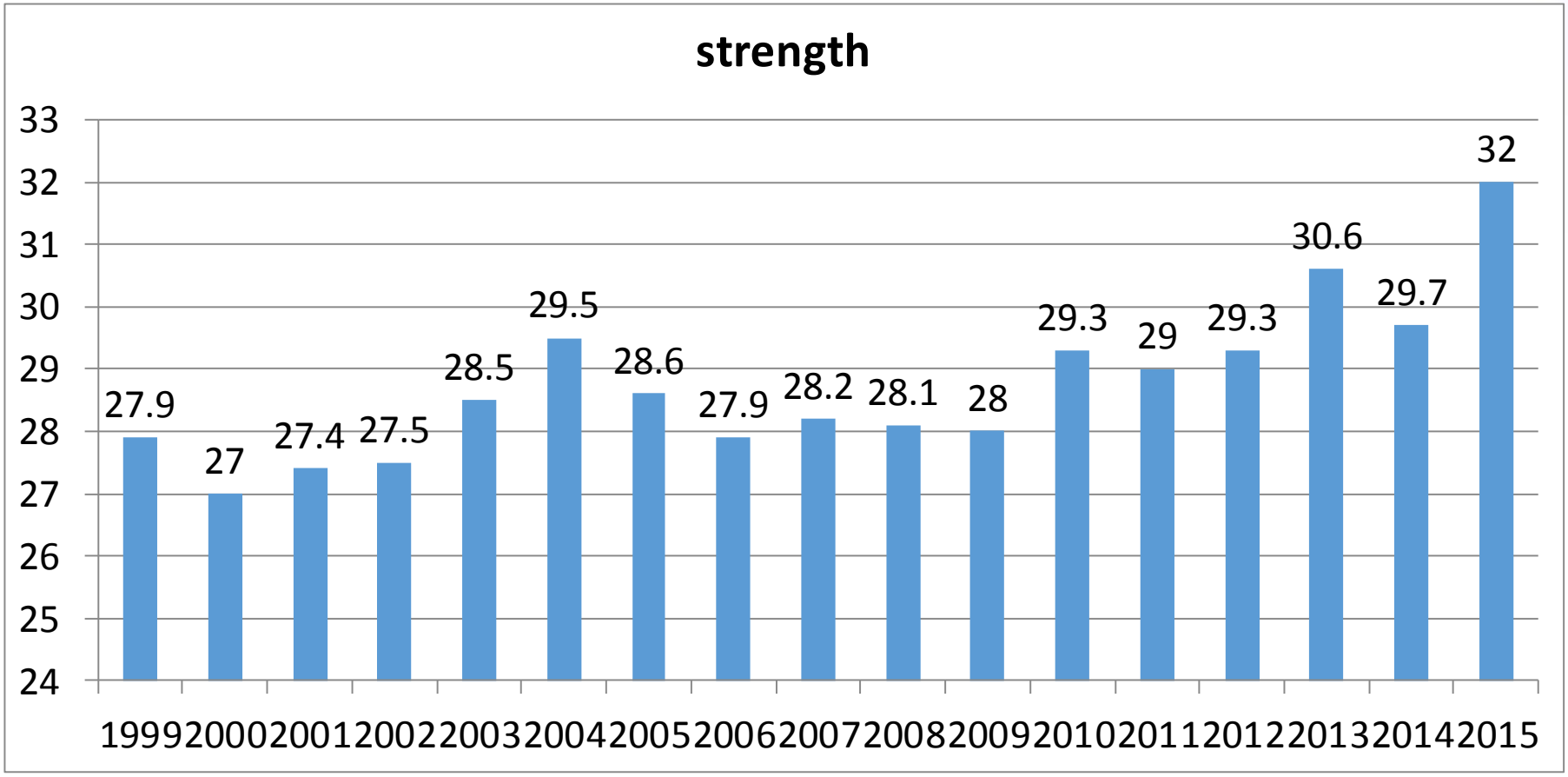
Micronaire

- 34 and below-discount range
- 50 and above-discount range
- 35-36-base range
- 43-49-base range
- 37-42-premium range

Causes of high and low strength

- **Causes of high strength**
  - **Varieties with higher strength produce longer cellulose molecules and greater cross - linkages resulting in fewer break points in the fiber.**
  - **Environments with maximal yields and minimal stress result in greater fiber strength (maximal expression of genetic potential of fiber strength)**
- **Causes of low strength**
  - **Varieties with lower strength potential.**
  - **Extreme temperatures during boll development to reduce carbon supply that produces cellulose for fiber.**
  - **Water stress during boll development with similar impact as extreme temperatures.**
  - **Potassium deficiency**
  - **Weathering of open bolls in the field prior to harvest**
  - **Aggressive ginning-especially with heat.**

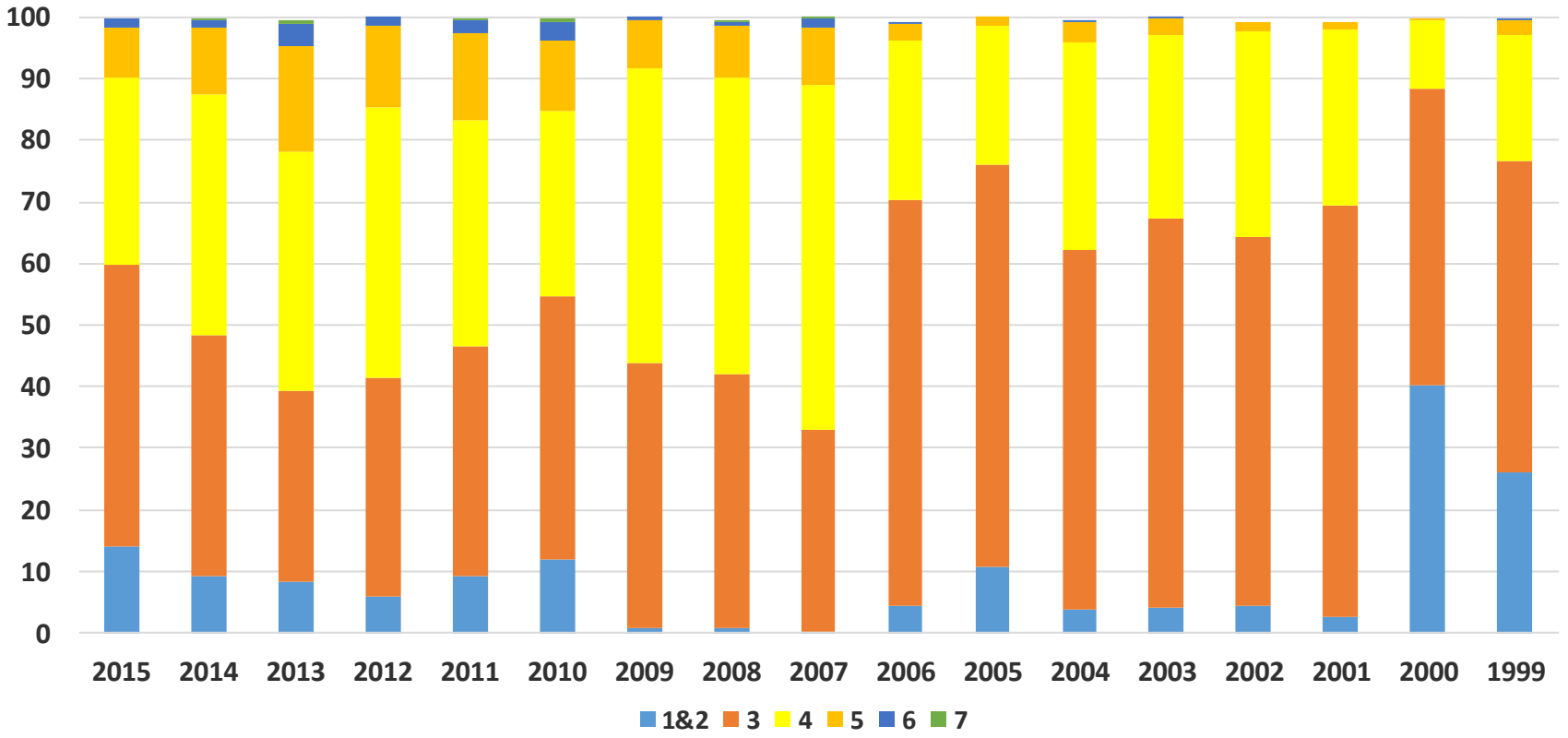
Fiber Quality-Rayville



Fiber strength

Degree of strength	Grams per tex
Very strong	31 & above
Strong	29-30
Average	26-28
Intermediate	24-25
weak	23 & below

Leaf Grades-Rayville



2015 Cotton Varieties Planted-Top 10

USDA

Variety	Louisiana (%)	U.S. (%)
PHY 499WRF	32.04	6.07
DP 1133B2RF	21.22	0.81
PHY 333WRF	10.30	5.02
DP 1321B2RF	6.39	1.42
PHY 495W3RF	5.48	0.48
ST 6448GLB2	4.97	1.14
DP 1137B2RF	4.35	1.59
ST 5289GLT	3.97	0.14
DP 0912B2RF	2.16	1.57
ST 4946GLB2	1.72	10.92

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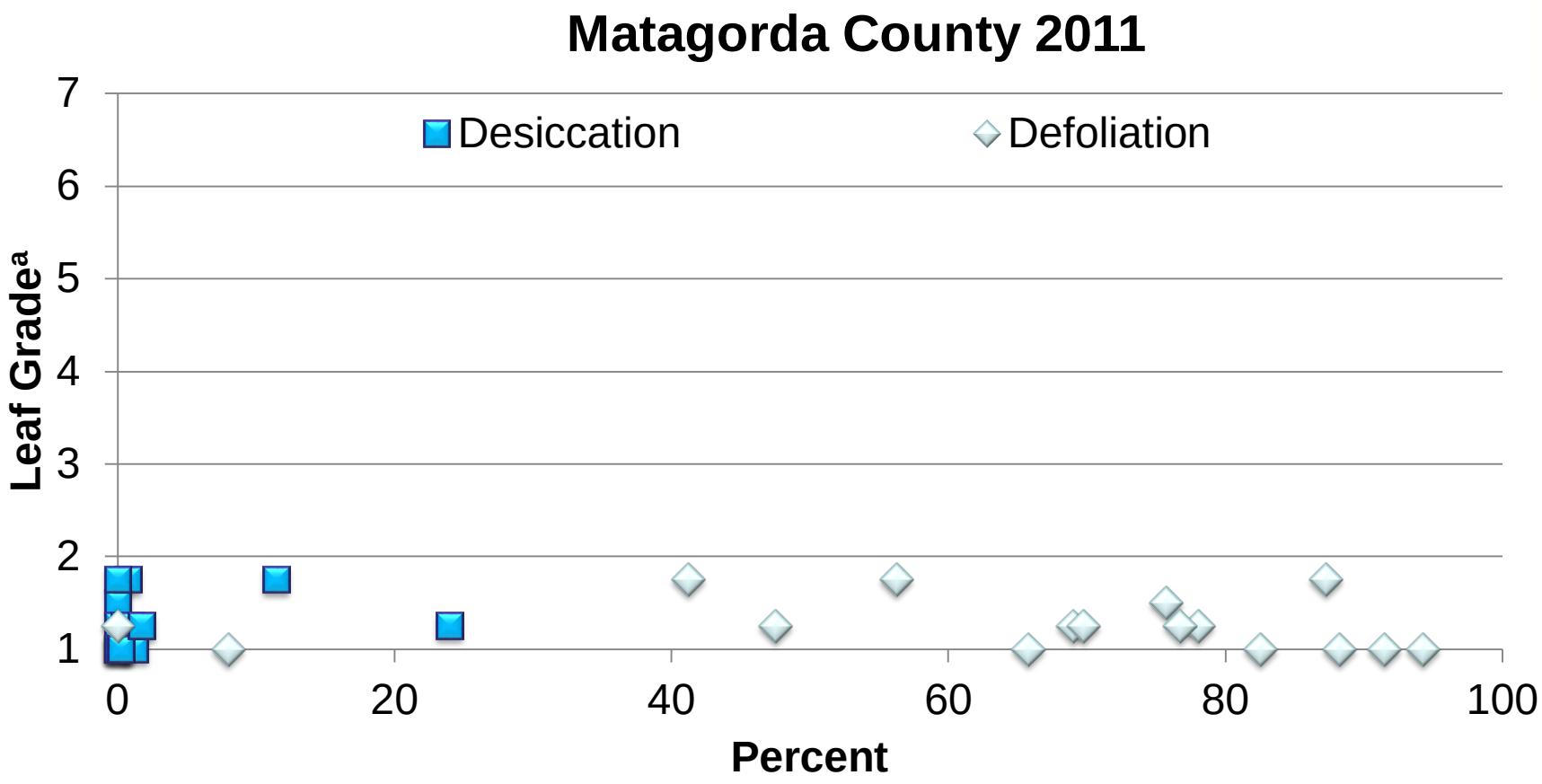
Leaf grades-Defoliation

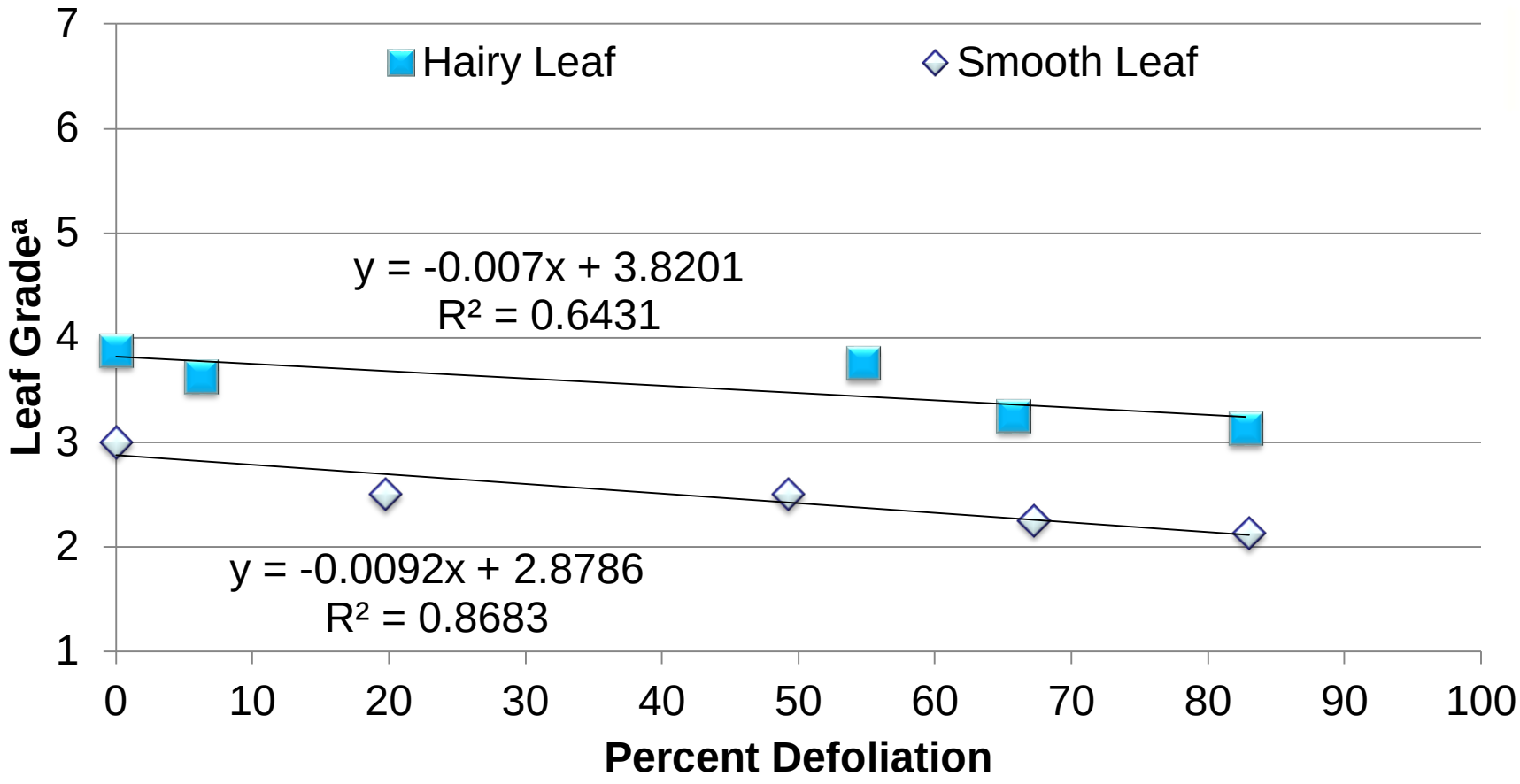


Cotton leaf trichome density

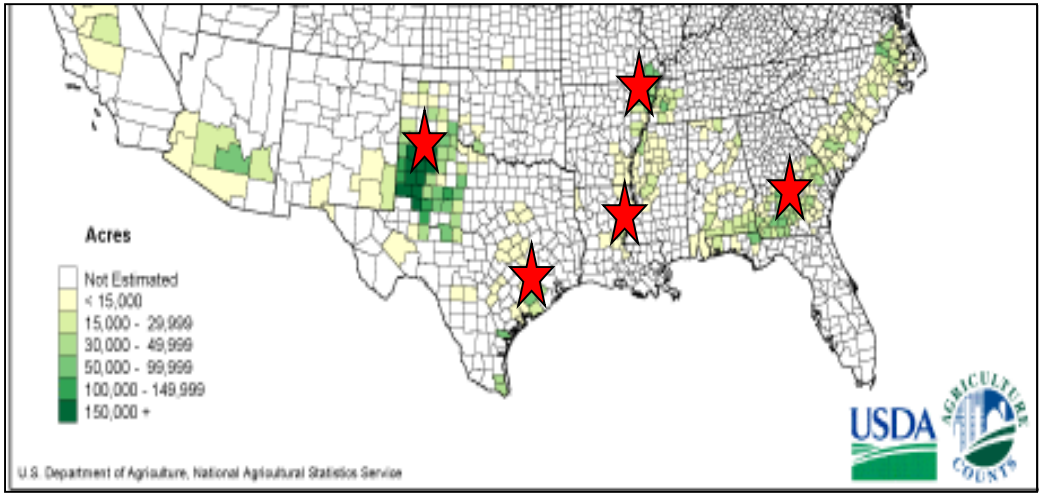
Low

High

Leaf Grade-Variety



Locations


Acres
Not Estimated
< 15,000
15,000 - 29,999
30,000 - 49,999
50,000 - 99,999
100,000 - 149,999
150,000 +
U.S. Department of Agriculture, National Agricultural Statistics Service
USDA
AGRICULTURE COUNTS

Leaf Grades-Variety

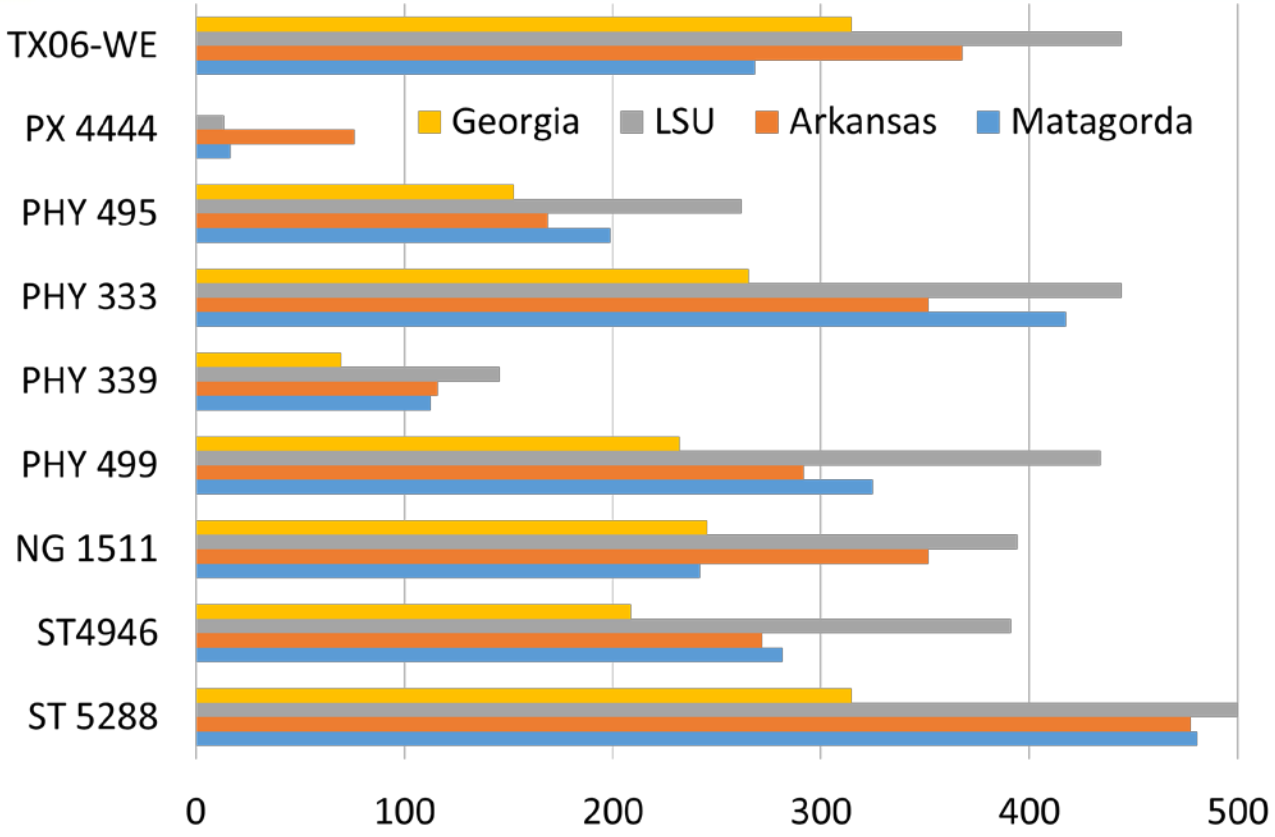


Figure 4. Trichome density for nine varieties at four locations across the Cotton Belt in 2014.

Relationship of trash measurement to classer's leaf grade

Trash measurement (4–year average) (% area)	Classer's Leaf Grade
0.13	1
0.20	2
0.34	3
0.51	4
0.72	5
1.00	6
1.25	7
1.57	8

2015 Results

- **Leaf trichome densities do differ by environment, including by location and year, which concurs with previous findings by Bourland et al. (2003) and Norman et al. (1994). However, the relative hairiness of a variety to other varieties within trial location was consistent and agrees with Bourland et al., (2003) reports of no site by variety interaction. With the lack of site by variety interaction for normalized trichome density across the diverse locations, then the premise for developing an industry-wide standard for leaf hairiness is achievable.**

Acknowledgments

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Thank You

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Questions

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