Corn Plant Health Management to Help Maximize Yield Potential

Dan Fromme
Associate Professor - State Corn Specialist
LSU AgCenter
Dean Lee Research & Extension Center
Alexandria, Louisiana

Corn Yield Potential Component

Yield

- Ears per acre
- Kernel rows per ear
- Kernel number
- Kernel weight

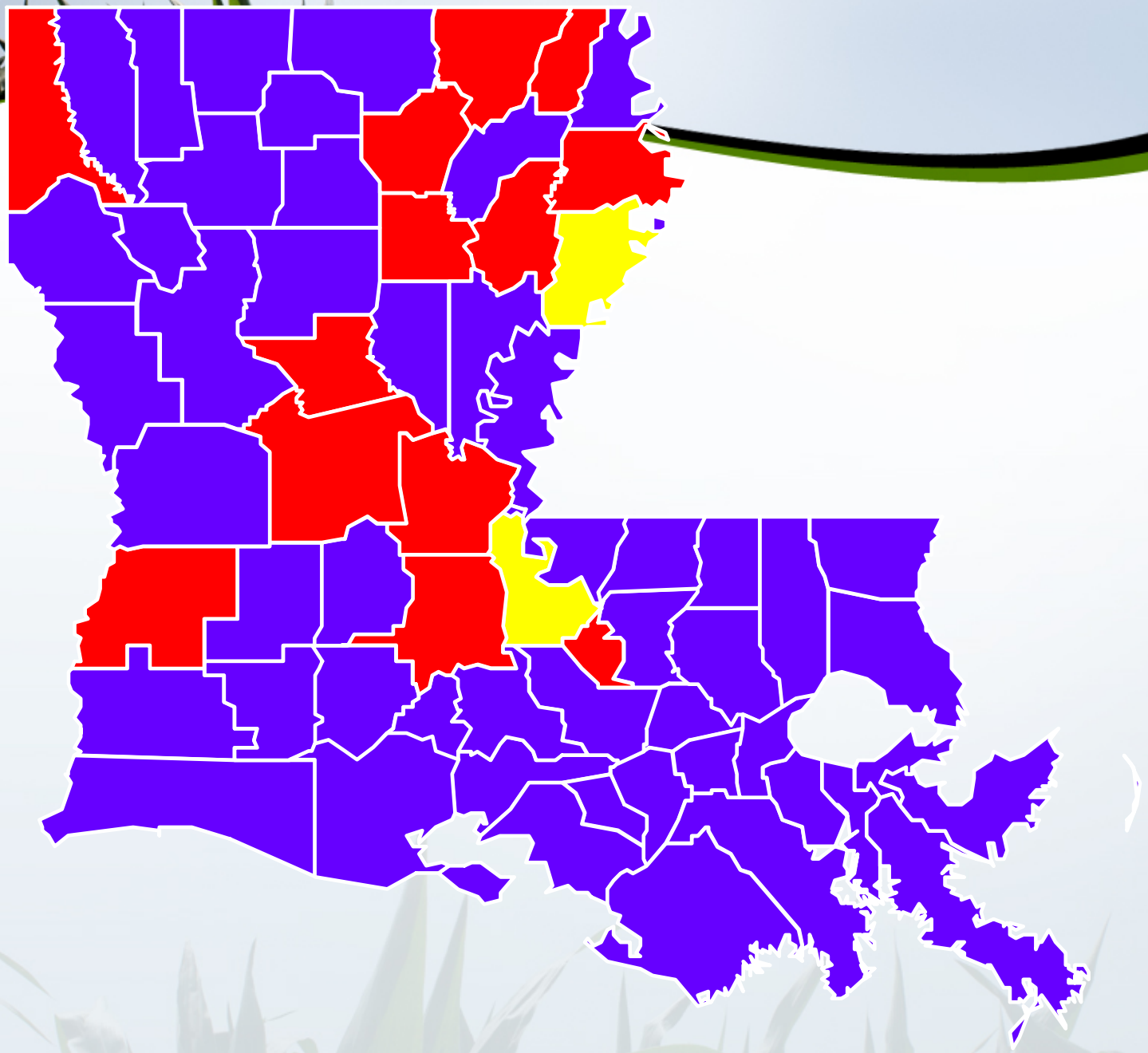
Factors

- Plant Health
  - Genetics
  - Date of planting
  - Uniform stand
  - Fertility
  - Water management
  - Soil types
  - Disease pressure
  - Soil compaction
  - Crop rotation
  - Mgt. of growth stages
  - Weather

Hybrid Selection

2017
Core Block Trial Demonstrations

- Producers and County Agents
- 10 hybrids
- 19 locations
  - 17 results
  - 1 lost to hog damage
  - 1 lost to field variability



On the Web

- lsuagcenter.com
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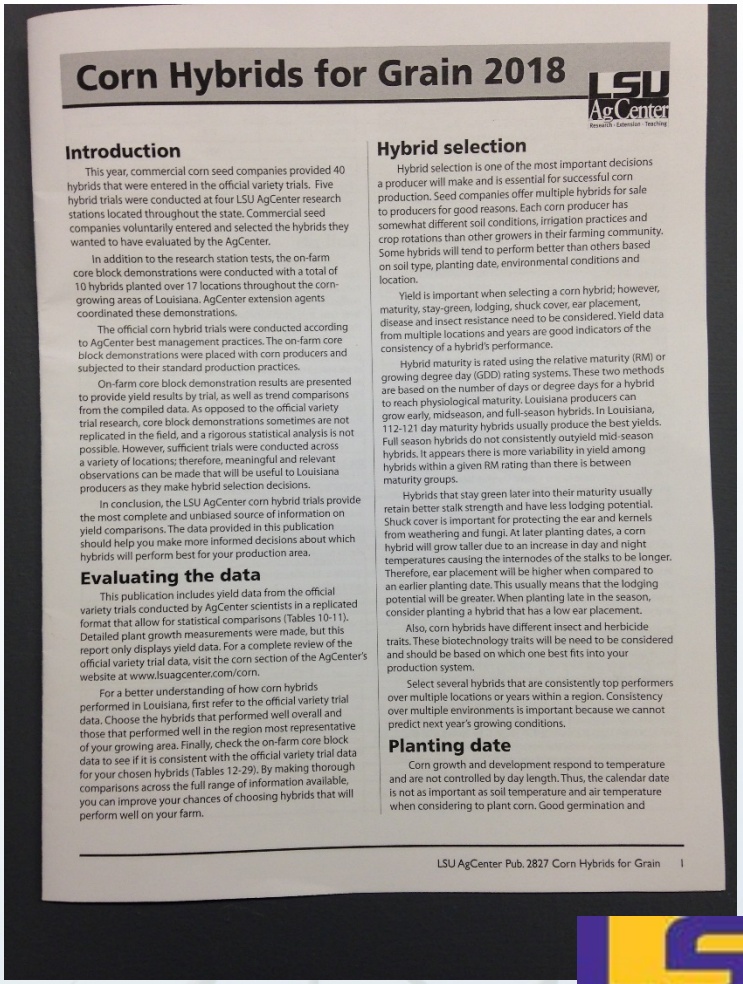
- hybrids



Corn Hybrids for Grain 2018

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Introduction

This year, commercial corn seed companies provided 40 hybrids that were entered in the official variety trials. Five hybrid trials were conducted at four LSU AgCenter research stations located throughout the state. Commercial seed companies voluntarily entered and selected the hybrids they wanted to have evaluated by the AgCenter.

In addition to the research station tests, the on-farm core block demonstrations were conducted with a total of 10 hybrids planted over 17 locations throughout the corn-growing areas of Louisiana. AgCenter extension agents coordinated these demonstrations.

The official corn hybrid trials were conducted according to AgCenter best management practices. The on-farm core block demonstrations were placed with corn producers and subjected to their standard production practices.

On-farm core block demonstration results are presented to provide yield results by trial, as well as trend comparisons from the compiled data. As opposed to the official variety trial research, core block demonstrations sometimes are not replicated in the field, and a rigorous statistical analysis is not possible. However, sufficient trials were conducted across a variety of locations; therefore, meaningful and relevant observations can be made that will be useful to Louisiana producers as they make hybrid selection decisions.

In conclusion, the LSU AgCenter corn hybrid trials provide the most complete and unbiased source of information on yield comparisons. The data provided in this publication should help you make more informed decisions about which hybrids will perform best for your production area.

Evaluating the data

This publication includes yield data from the official variety trials conducted by AgCenter scientists in a replicated format that allow for statistical comparisons (Tables 10-11). Detailed plant growth measurements were made, but this report only displays yield data. For a complete review of the official variety trial data, visit the corn section of the AgCenter's website at www.lsuagcenter.com/corn.

For a better understanding of how corn hybrids performed in Louisiana, first refer to the official variety trial data. Choose the hybrids that performed well overall and those that performed well in the region most representative of your growing area. Finally, check the on-farm core block data to see if it is consistent with the official variety trial data for your chosen hybrids (Tables 12-29). By making thorough comparisons across the full range of information available, you can improve your chances of choosing hybrids that will perform well on your farm.

Hybrid selection

Hybrid selection is one of the most important decisions a producer will make and is essential for successful corn production. Seed companies offer multiple hybrids for sale to producers for good reasons. Each corn producer has somewhat different soil conditions, irrigation practices and crop rotations than other growers in their farming community. Some hybrids will tend to perform better than others based on soil type, planting date, environmental conditions and location.

Yield is important when selecting a corn hybrid; however, maturity, stay-green, lodging, shuck cover, ear placement, disease and insect resistance need to be considered. Yield data from multiple locations and years are good indicators of the consistency of a hybrid's performance.

Hybrid maturity is rated using the relative maturity (RM) or growing degree day (GDD) rating systems. These two methods are based on the number of days or degree days for a hybrid to reach physiological maturity. Louisiana producers can grow early, midseason, and full-season hybrids. In Louisiana, 112-121 day maturity hybrids usually produce the best yields. Full season hybrids do not consistently outyield mid season hybrids. It appears there is more variability in yield among hybrids within a given RM rating than there is between maturity groups.

Hybrids that stay green later into their maturity usually retain better stalk strength and have less lodging potential. Shuck cover is important for protecting the ear and kernels from weathering and fungi. At later planting dates, a corn hybrid will grow taller due to an increase in day and night temperatures causing the internodes of the stalks to be longer. Therefore, ear placement will be higher when compared to an earlier planting date. This usually means that the lodging potential will be greater. When planting late in the season, consider planting a hybrid that has a low ear placement.

Also, corn hybrids have different insect and herbicide traits. These biotechnology traits will be need to be considered and should be based on which one best fits into your production system.

Select several hybrids that are consistently top performers over multiple locations or years within a region. Consistency over multiple environments is important because we cannot predict next year's growing conditions.

Planting date

Corn growth and development respond to temperature and are not controlled by day length. Thus, the calendar date is not as important as soil temperature and air temperature when considering to plant corn. Good germination and

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Hybrid Results
Corn Core Block Demonstrations

- On farm core block demonstrations
  - Yields for hybrids ranged from 197 to 219 bushels per acre across 17 locations. (22 bushels)
- HPT
  - Yields for hybrids ranged from 178 to 196 bushels per acre across 5 trials. (18 bushels)
- Corn Trait Packages

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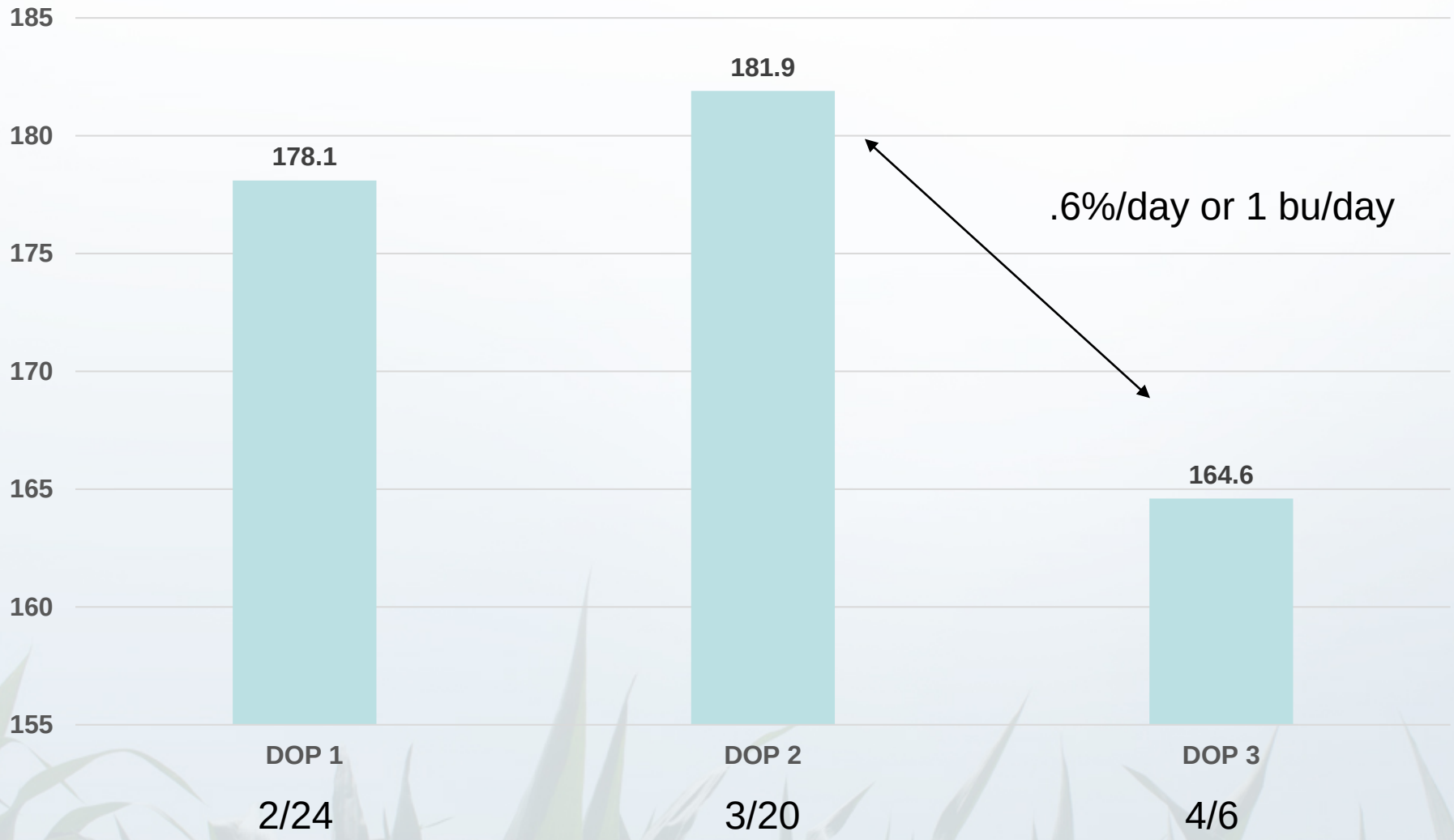
Date of Planting

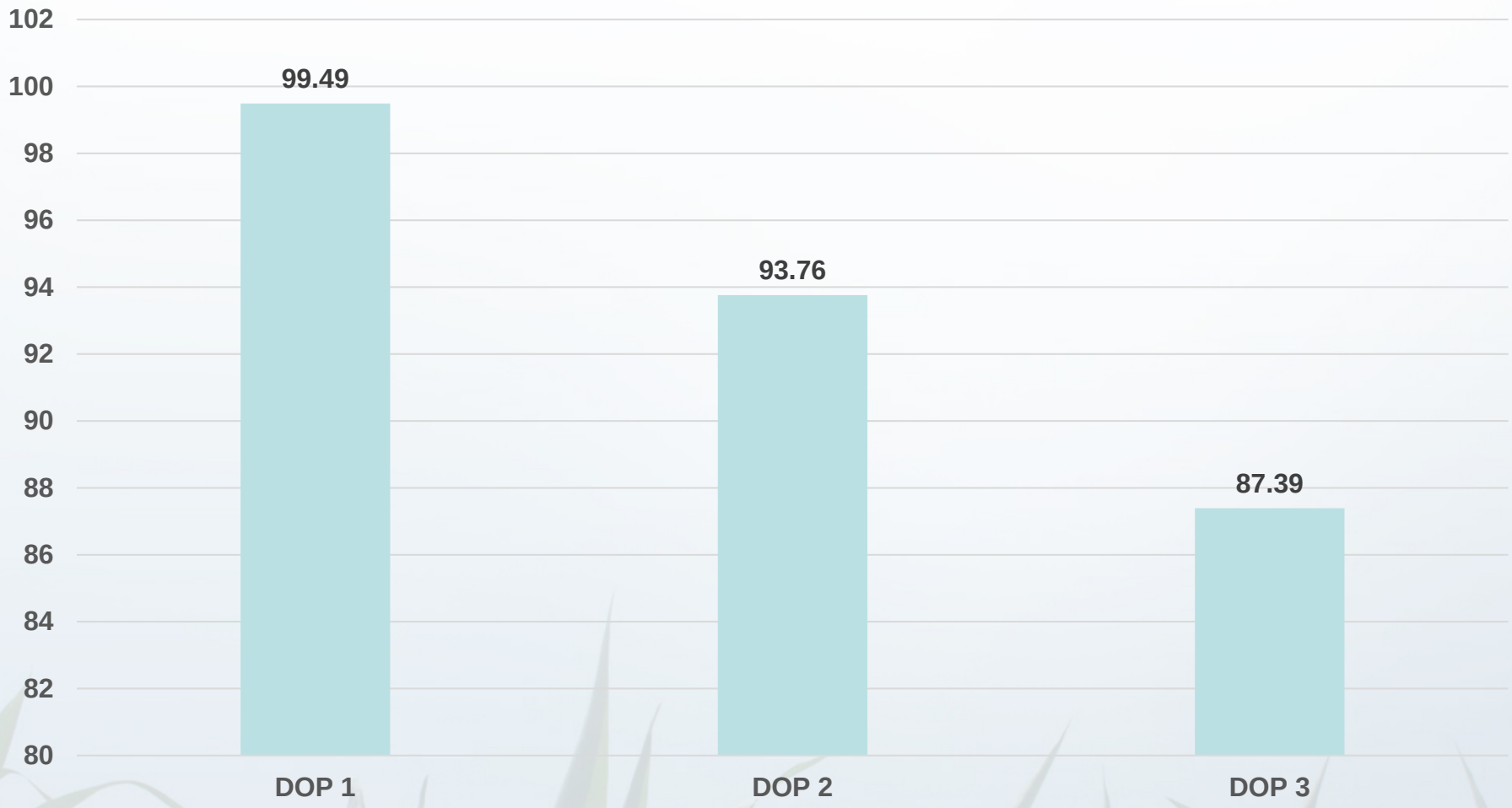
- February 24, 2017
- March 20, 2017
- April 6, 2017

- 34,000 seed/acre
- DKS62-08

Bu/acre


185
180
175
170
165
160
155
178.1
181.9
164.6
.6%/day or 1 bu/day
DOP 1
DOP 2
DOP 3
2/24
3/20
4/6

Seed weight (300 seed/grams)

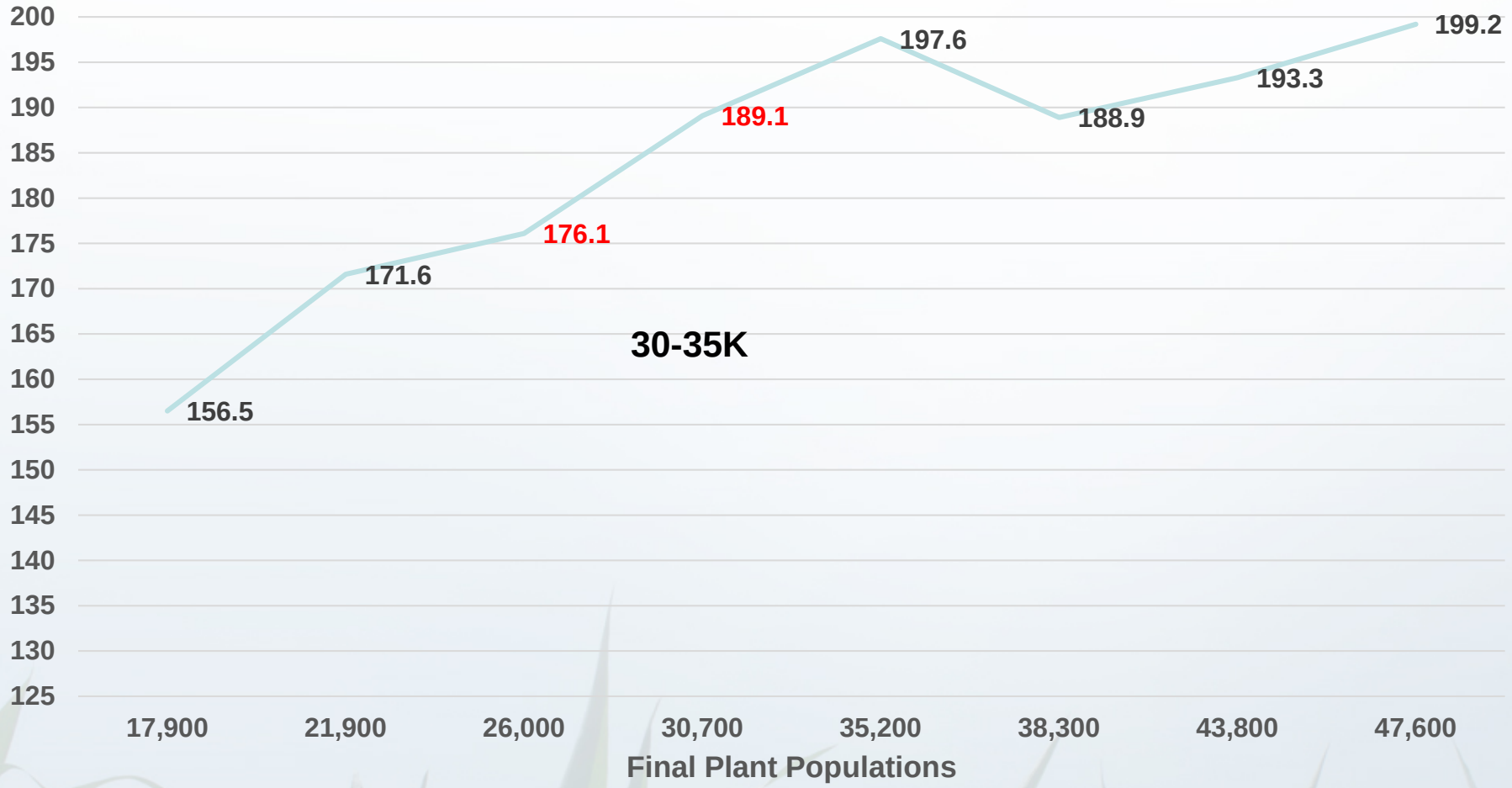


Plant Populations

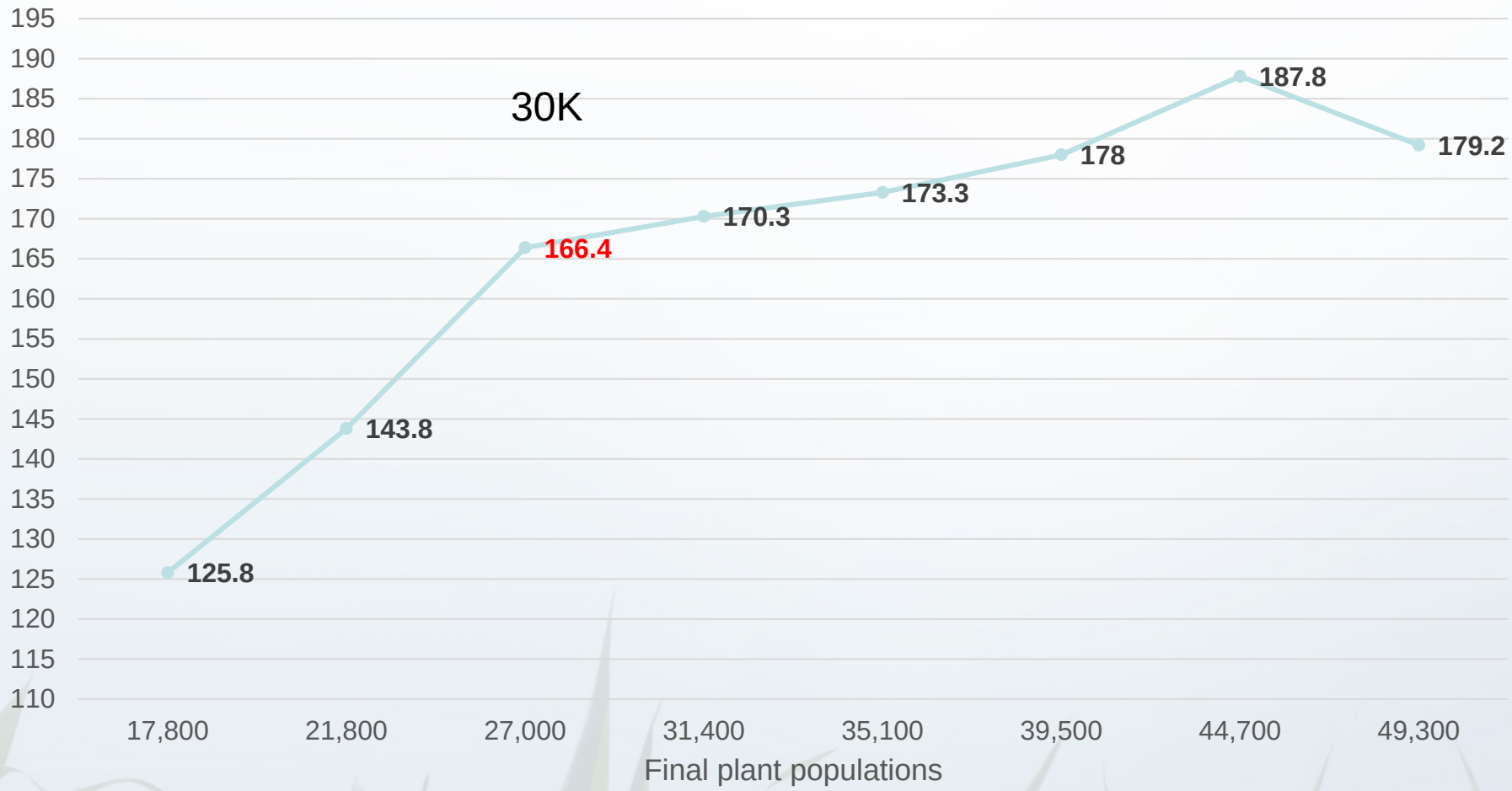
2015-17 Corn Plant Population Studies, Dean Lee

- 8 seeding rates
  - 20
  - 25
  - 30
  - 35
  - 40
  - 45
  - 50
  - 55

Average of all trials (3) 2017 Dean Lee



Avg. of all trials (12) 2015-2016 Dean Lee



Impact of Stand Uniformity and Emergence on Corn Yields

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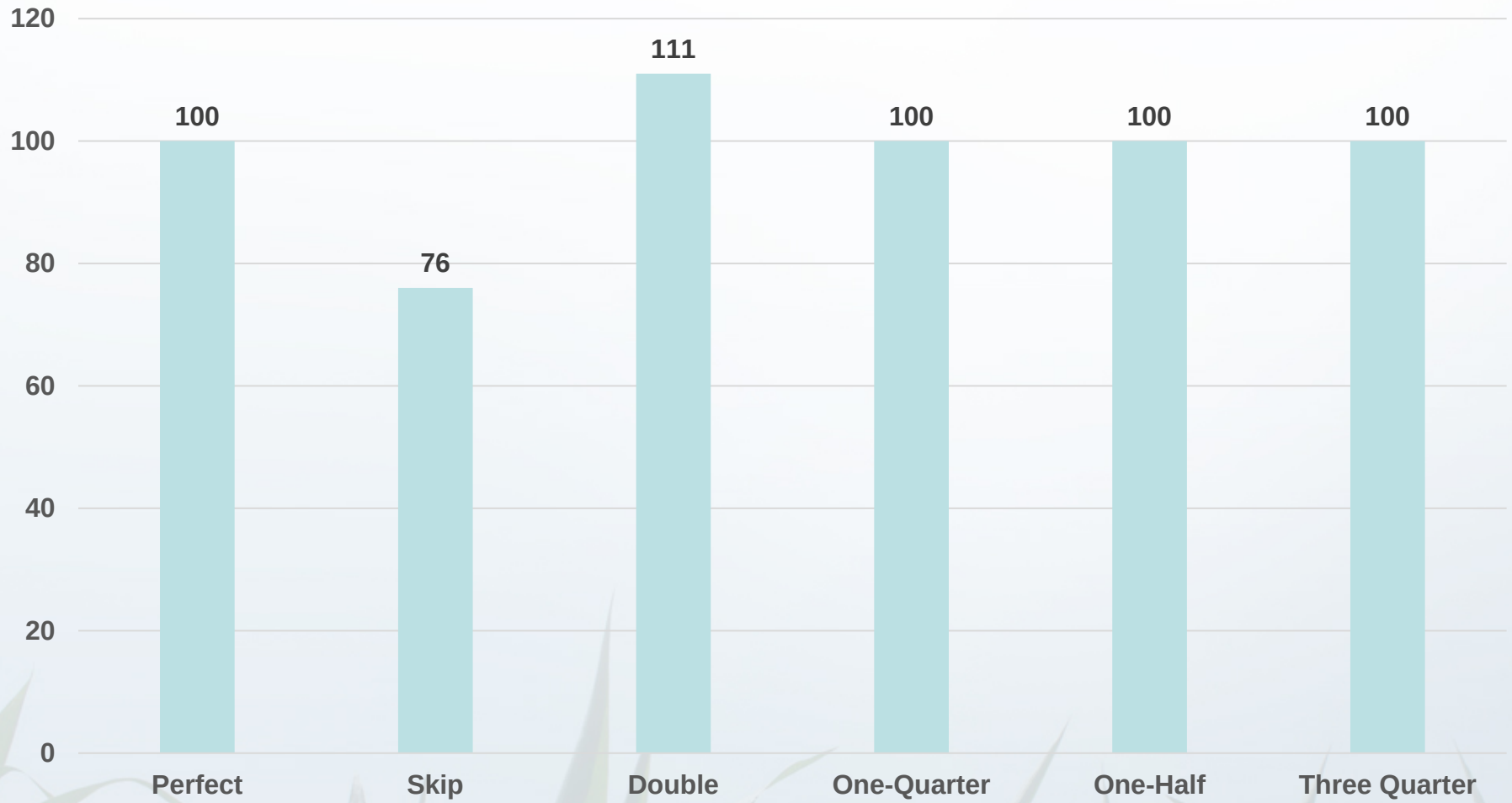
Plant spacing variability

Planting Outcome	Plant 1	Plant 2	Plant 3
Perfect Spacing	X	X	X
Seed No. 2-Skip	X		X
Seed No. 2-double planted	X	XX	X
Seed No. 2-misplaced by 1/4	X	X	X
Seed No. 2-misplaced by 1/2	X	X	X
Seed No. 2-misplaced by 3/4	X	X	X

Planted at 90,000 seed per acre and hand thinned to 34,000 plants per acre with a precision planter.

Grain Yield
% of Yield at Perfect Spacing



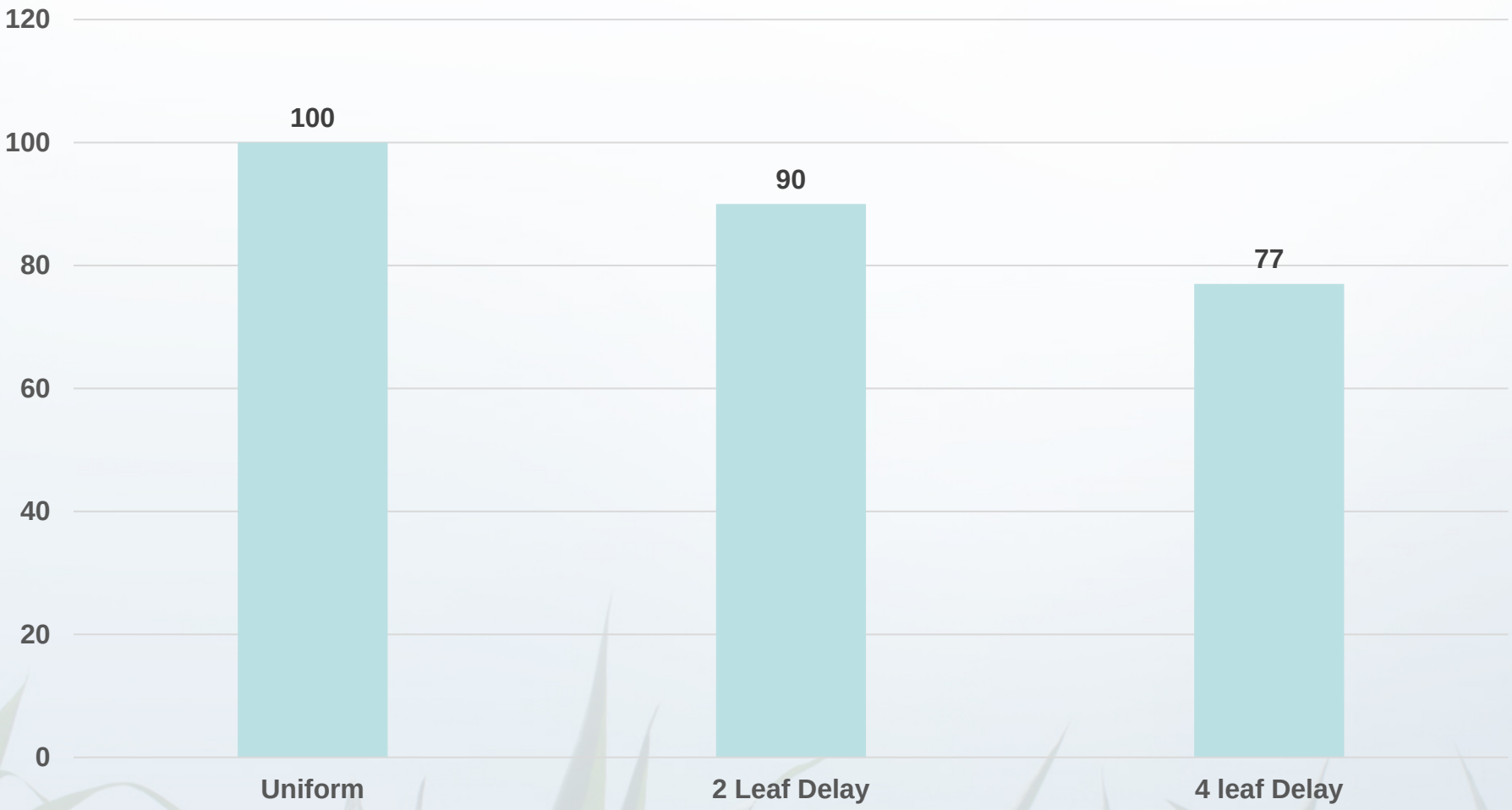
Plant emergence variability

Treatment	Plant 1	Plant 2	Plant 3
0 Leaf Delay	X	X	X
2 Leaf Delay	X	X	X
4 Leaf Delay	X	X	X

For the 2 leaf delay, plant 2 was planted when plants 1 and 3 emerged. For the 4 leaf delay, plant 2 was planted when plants 1 and 3 reached the two leaf stage.

Hand planted at 34,000 plants per acre.

Percent of Yield at Uniform Emergence



Soil Fertility

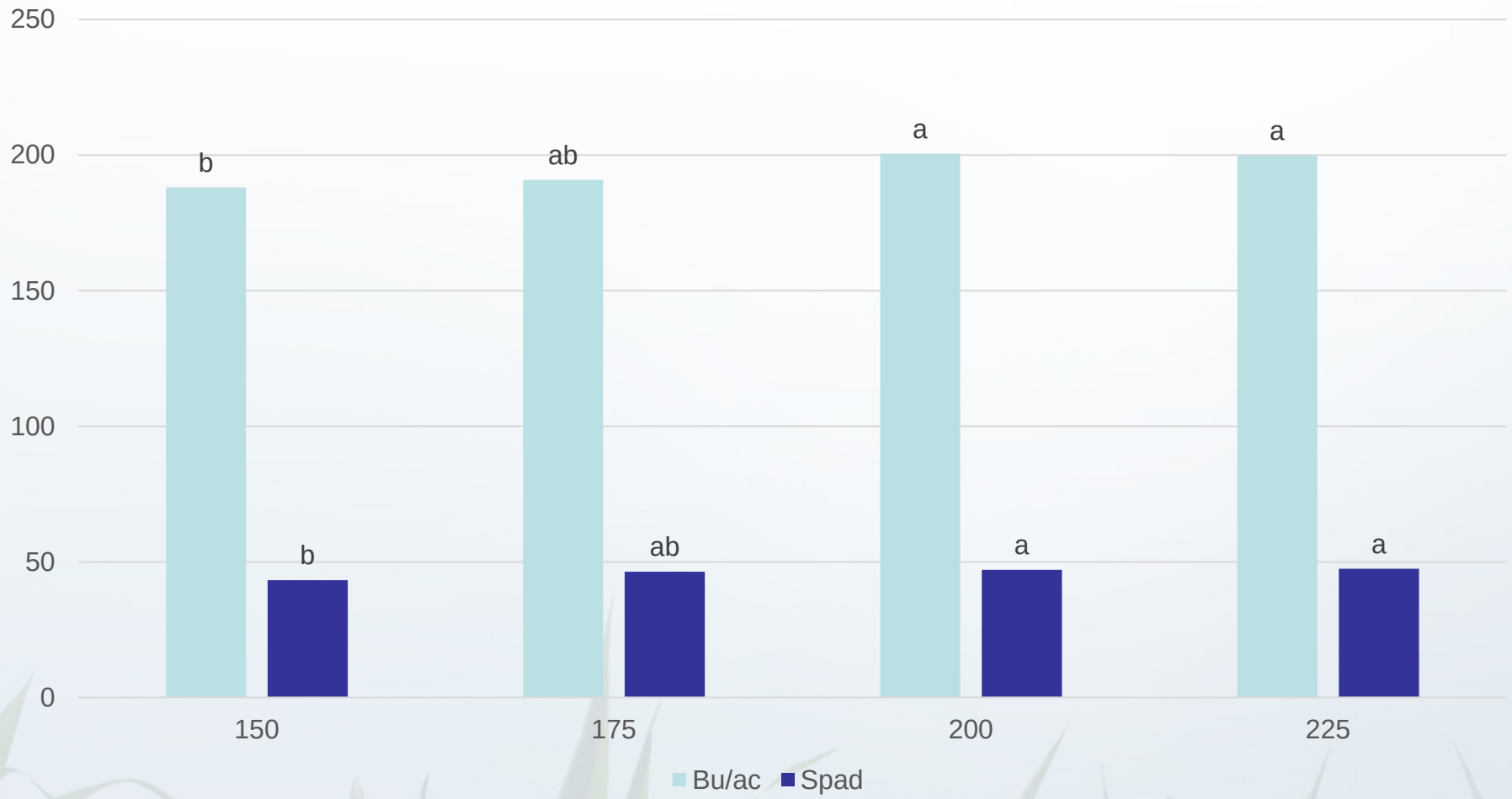
Nitrogen

Table 3. Nitrogen rates for corn in Louisiana based on field conditions.		
Soil	**Irrigation**	**Nitrogen Rate (lbs./acre)**
Alluvial	Yes	180-270
Alluvial	No	140-210
Upland	Yes	160-230
Upland	No	120-190

Nitrogen

- Split applications

2017
Corn Nitrogen Test-Dean Lee



Phosphorus

Table 4. Phosphorus recommendations for corn, Mehlich 3 extraction.

	Soil test for phosphorus (ppm)				
	Very low	Low	Medium	High	Very high
	<10	10-19	20-34	35-50	>50
	Pounds per acre P_2O_5				
Alluvial-Irrigated	120	90	60	0	0
Alluvial-Non-irrigated	100	80	60	0	0
Upland-Irrigated	100	80	60	0	0
Upland-Non-irrigated	80	60	40	0	0

Potassium-irrigated

Table 5. Potassium recommendations for corn on alluvial soils (irrigated), Mehlich 3 extraction.

Soil Type	V. Low		Low		Med.		High		V. High	
	ppm	K_2O	ppm	K_2O	ppm	K_2O	ppm	K_2O	ppm	K_2O
Clay	<141	100	141-210	90	211-316	60	317-334	0	>334	0
Clay Loam	<123	100	123-175	90	176-263	60	264-282	0	>282	0
F. Sandy Loam	<53	100	53-87	90	88-122	60	123-141	0	>141	0
Loamy Sand	<35	100	35-52	90	53-78	60	79-123	0	>123	0
Silty Clay	<141	100	141-210	90	211-316	60	317-334	0	>334	0
Silt Clay Loam	<123	100	123-175	90	176-263	60	264-282	0	>282	0
Silt Loam	<70	100	70-105	90	106-140	60	141-158	0	>158	0
V. F. Sandy Loam	<53	100	53-87	90	88-122	60	123-141	0	>141	0

Potassium-dryland

Table 6. Potassium recommendations for corn on alluvial soils (non-irrigated), Mehlich 3 extraction.										
Soil Type	**V. Low**		**Low**		**Med.**		**High**		**V. High**	
	ppm	**K_2O**	**ppm**	**K_2O**	**ppm**	**K_2O**	**ppm**	**K_2O**	**ppm**	**K_2O**
Clay	<141	100	141-210	80	211-316	60	317-334	0	>334	0
Clay Loam	<123	100	123-175	80	176-263	60	264-282	0	>282	0
F. Sandy Loam	<53	100	53-87	80	88-122	60	123-141	0	>141	0
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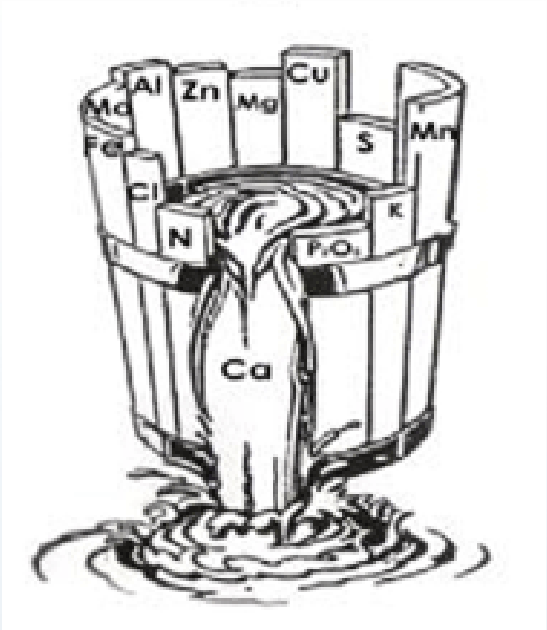
Silt Loam	<70	100	70-105	80	106-140	60	141-158	0	>158	0
V. F. Sandy Loam	<53	100	53-87	80	88-122	60	123-141	0	>141	0

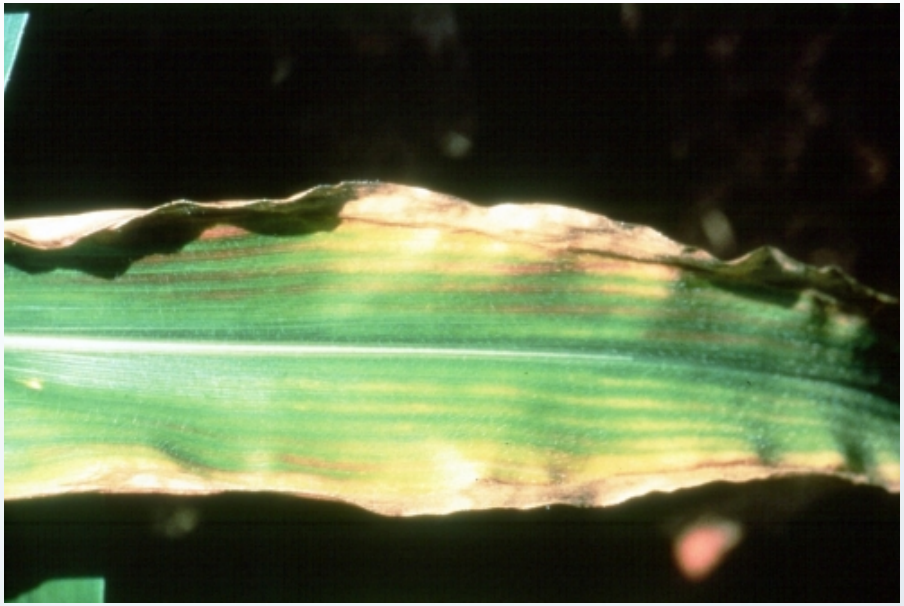
LAW OF THE MOST LIMITING FACTOR



Liebigs's Law

Excess N and Low K

- Stalk rot
- Lodging
- Soybeans in rotation
  - Use a lot K



Starter Fertilizer

- Phosphorus
  - Beneficial
    - Low P soil test levels

Critical Growth Stages of Corn

VE-Emergence

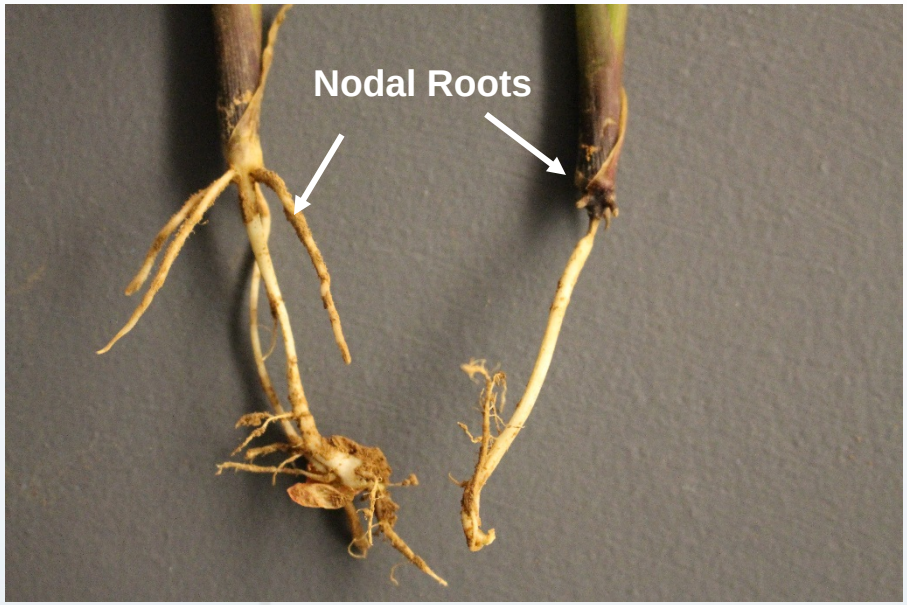
- First leaf called the spike or coleoptile appear.
- Seed absorbs water (30% of its weight) and oxygen for germ.
- Sensitive to imbibitional chilling with 12-36 hrs after planting
- Emergence takes 90-120 GDD (5-20 days)
- **Management**
- 50-55F soil temps
- Seed placement or depth is critical

VE - Emergence

- **Management**
  - 50-55F soil temps
  - Seed placement or depth is critical

Planting Depth

2 inches versus 1 inch



V1-First Leaf

- Management
  - Scout for proper emergence.

Estimating Plant Population

Feet of row representing 1/1,000 of an acre at different row widths	
Row spacing (inches)	**Row length**
15	**34’ 10”**
20	**26’ 2”**
30	**17’ 5”**
36	**14’ 6”**
38	**13’ 9”**
40	**13’ 1”**

V6-Sixth Leaf

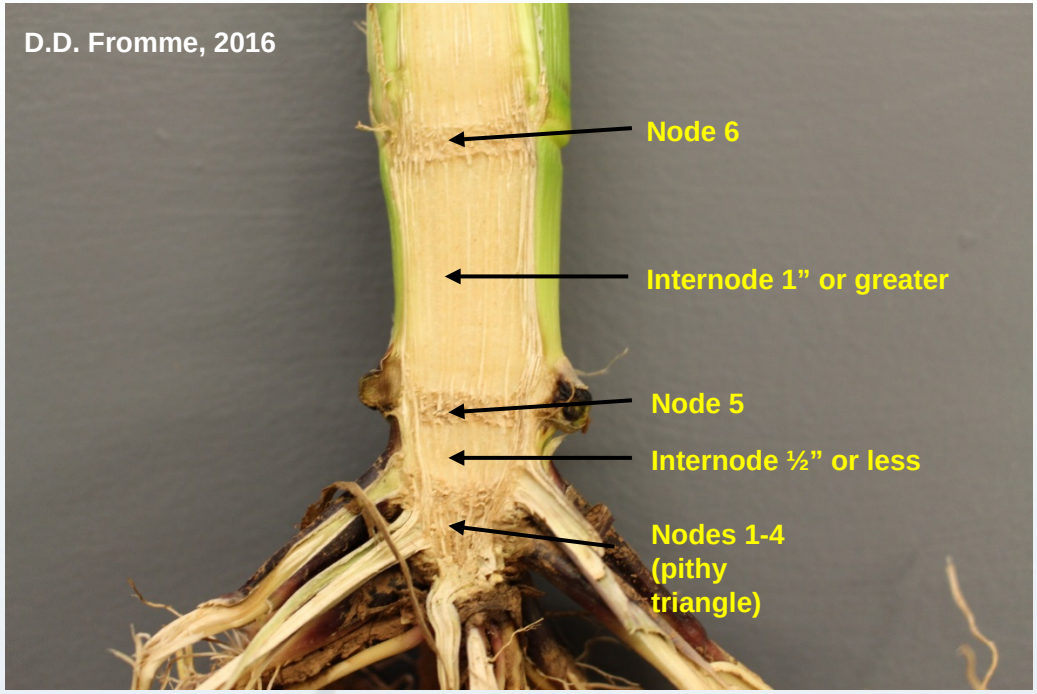
V6 – Sixth-Leaf

Six leaves with collar visible. The first leaf with the rounded tip is senescent; consider this point when counting leaves. The growing point emerges above the soil surface. All plant parts are initiated. Sometime between V6 and V10, the potential number of rows (ear girth) is determined. Potential row number is affected by genetics and environment and is reduced by stress conditions. The plant increases in height due to stalk elongation; nodal roots are established in the lowest, below-ground nodes of the plant.

V6-Sixth Leaf

Management
Scout for weeds, insects, and diseases. Rapid nutrient uptake begins at this stage. Timing nutrient applications to match this uptake enhances the potential for greater nutrient use efficiency, particularly for mobile nutrients such as nitrogen.

Staging older corn plants (when lower leaves are missing)



V12 – Twelve Leaf

- Number of kernel rows is set
- Number of ovules (potential kernels) on each ear and size of ear is being determined
- New V-stage approximately every 2 days
- Soil moisture and nutrient availability become increasingly critical for yield determination

Water use rate (inches/day)	Growth stage
0.25	12 leaf
0.28	Early tassel
0.30	Silking
0.26	Blister
0.24	Milk
0.20	Dough
0.18	Full dent

V-18 – Eighteen leaf

- Ear development is rapid
- The upper ear shoot is developing faster than the others
- Brace roots are now growing from nodes above the soil surface, they will scavenge the upper soil layers for water and nutrients during the reproductive stages.
- Potential kernel number has been determined which were related to conditions prior to R1 while the number of harvestable kernels is related to the conditions during and after R1.

V18 – Eighteen leaf

- **Management**
- Late season nitrogen applications should be applied no later than this stage.

R1 - Silking

- 65 days from planting
- Silking stage begins when the silk is visible outside the husk.
- Pollen falls onto the silks to potentially fertilize the ovules.
- **Management**
- Moisture stress at this time can cause the desiccation of silks and/or pollen grains, which could reduce seed set.

R2 - Blister

- About 12 days after silking.
- Ear silks are mostly brown and drying fast.
- At this stage, kernel moisture content is approximately 85 percent.
- **Management**
- Stress can cause kernel abortion from the ear tip.

R3 - Milk

- About 20 days after silking.
- Also known as the “roasting ear stage”.
- Kernel moisture content is approximately 80 percent.
- **Management**
- Severe stress can still abort kernels.

R4 - Dough

- About 26 days after silking.
- The shelled cob is now light red or pink.
- About half the mature kernel dry weight is in place.
- Kernel moisture weight is approximately 70 percent
- **Management**
- Kernel abortion is much less likely once kernels have reached early dough stage, but stress can still impact yield by reducing kernel weight.

R5 - Dent

- About 38 days after silking.
- A distinct horizontal line appears near the dent end of the kernel and slowly progresses to the tip end of the kernel over the next 20 days.
- This is called the “milk line” and marks the boundary between the liquid (milk) and solid (starchy) areas of the maturing kernels.
- At full dent, kernel dry matter is about 60 percent of final.
- **Management**
- Stress can reduce kernel weight

R6 - Maturity

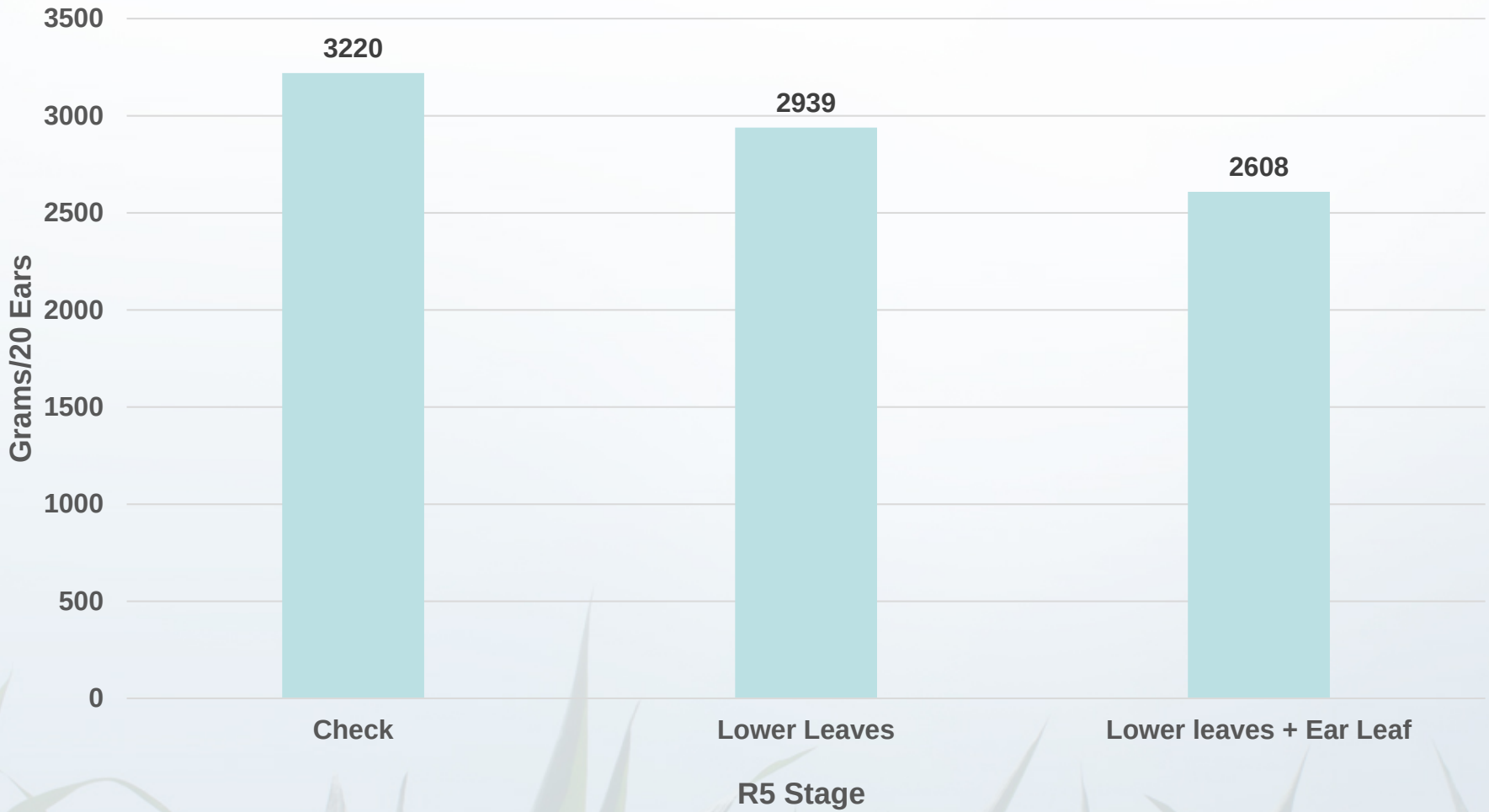
- Kernels continue to gain weight until black layer formation or physiological maturity 60-65 days after silking approximately 2700 GDUs occurs.
- The black layer forms where the kernel attaches to the cob.
- Kernel moisture is at 30-35 percent.

Growing stages, moisture content, and total dry matter progression during reproductive period

			Average per substage	
R stage	Moisture %	Dry matter (% of total dry wt)	GDD, F	Days
5.0 (Dent)	60	45	75	3
5.25 (1/4 milk line)	52	65	120	4
5.5 (1/2 milk line)	40	90	175	6
5.75 (3/4 milk line)	37	97	205	7
6.0	35	100		
Total (Average)			575	20

Corn Defoliation

Corn Defoliation 2017 Dean Lee



Other

- Crop rotation
- Soil compaction

Weather

- Early season
  - Water logged soils
    - 24-48 hours prior to V6
  - Drainage
- July
  - Temperature

Summary

- Hybrid selection
  - Yield
  - Disease resistance
- Date of planting
- Adequate plant stand-uniform and vigorous
- Crop rotation
- Apply fertilizer according to soil test recommendations
- Subsoil below the row to help lessen soil compaction that may impede root growth
- Use fungicides when needed to help reduce potential losses.
- Know the critical growth stages of corn

Thank You

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Questions

Dan Fromme
dfromme@agcenter.lsu.edu
Office: 318-473-6522
Cell: 318-880-8079

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