



# **Enhanced Nutrition Sorghum**

## **A Major Forage Quality Advance**

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**Sorghum Check Off**

**Northeast SARE**

# **SUCCESSFUL LIVESTOCK PRODUCTION**

- **GROWING**
  - **ENERGY**
  - **PROTEIN**
  - **DIGESTIBLE FIBER**
  - **SUFFICIENT AMOUNTS & LOW COST**

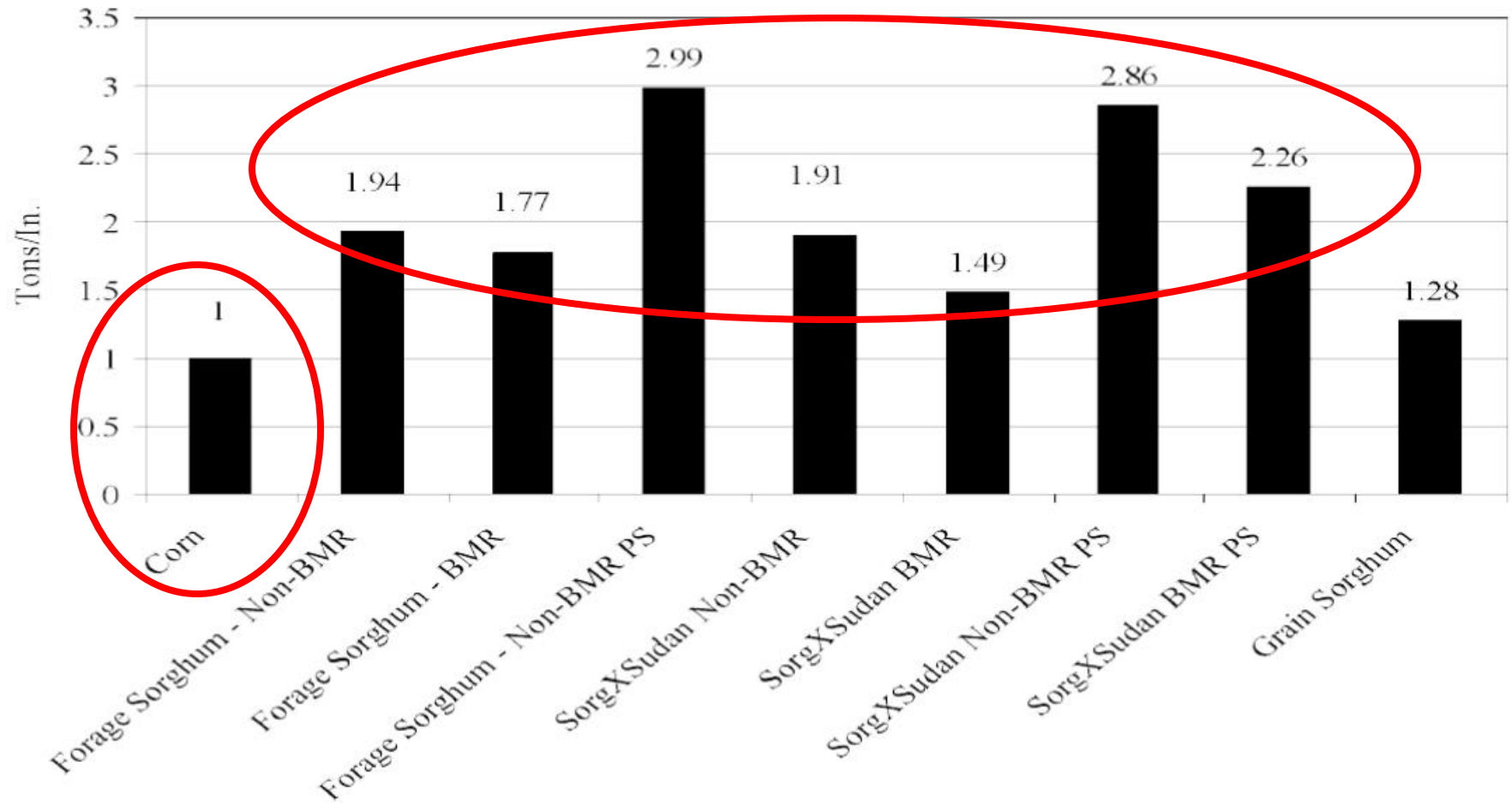
**Not Just Corn and Alfalfa**

# BMR Sorghum

- Planted after winter forage and haylage- balance work
- Improves soil structure: fine root system
- Lower cost \$/acre (seed **\$20/A** vs Corn **\$180/A**)
- WIPES OUT CORN ROOTWORM
- No processing needed (counterproductive)
- Deer hide in it and eat the neighbor's corn
- Non-BMR is excellent low-cost for growing optimum heifers without getting fat
- Drought/heat tolerant



# Water is the Key!



University of California

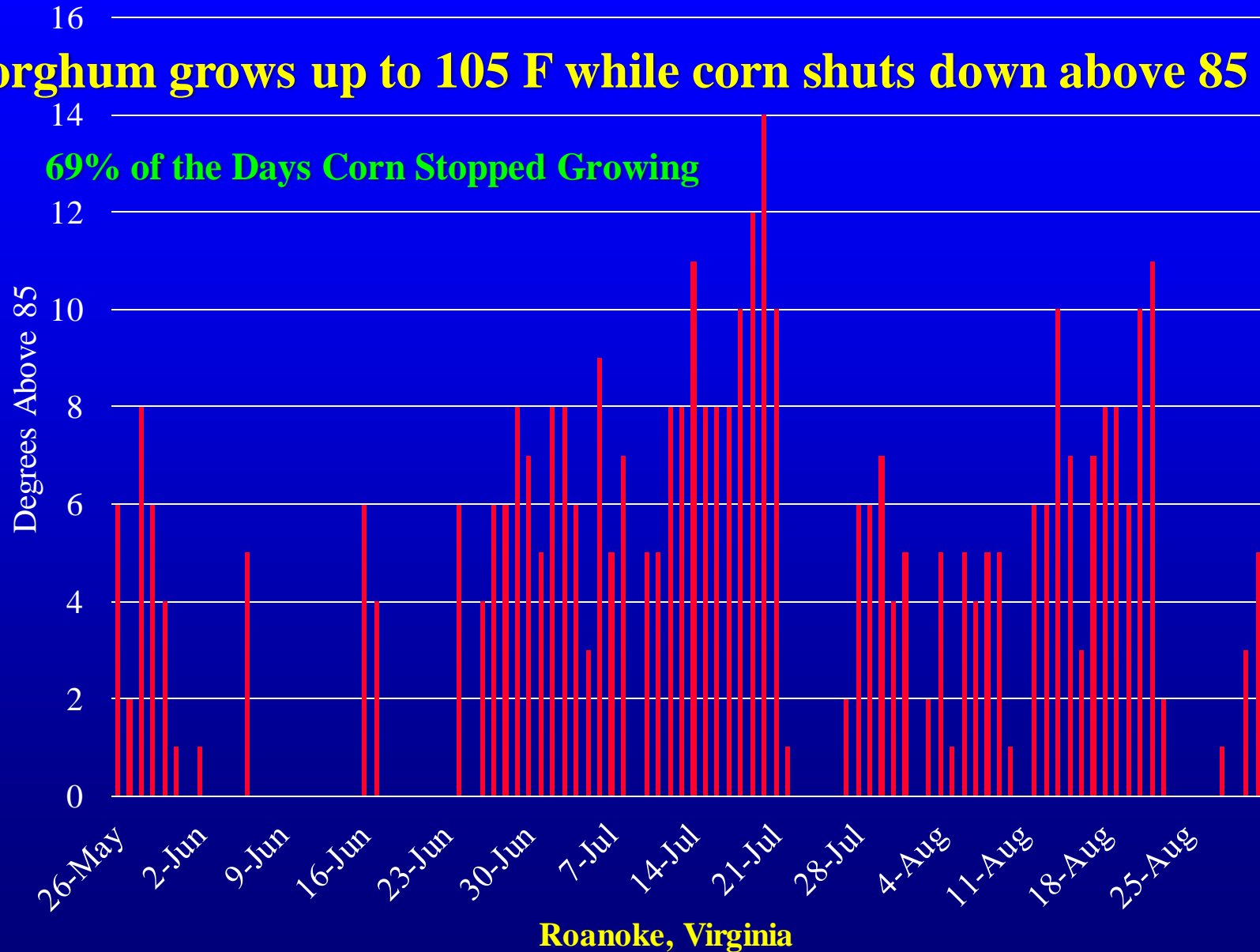
Agriculture and Natural Resources

Research and Extension Center System

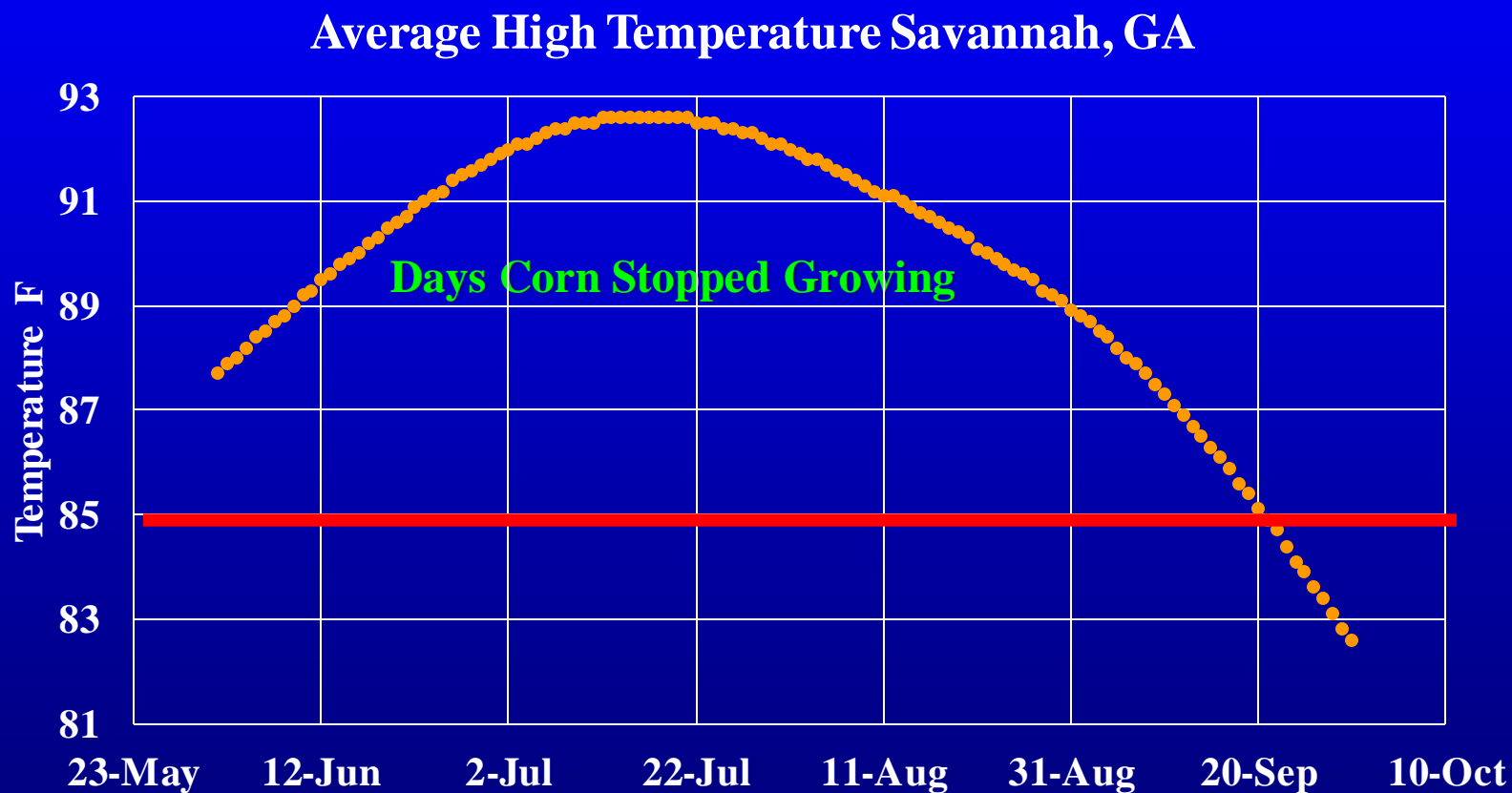


# Days When Corn Stopped Growing

**Sorghum grows up to 105 F while corn shuts down above 85 F.**



**Sorghum grows up to 105 F while corn shuts down above 85 F.**



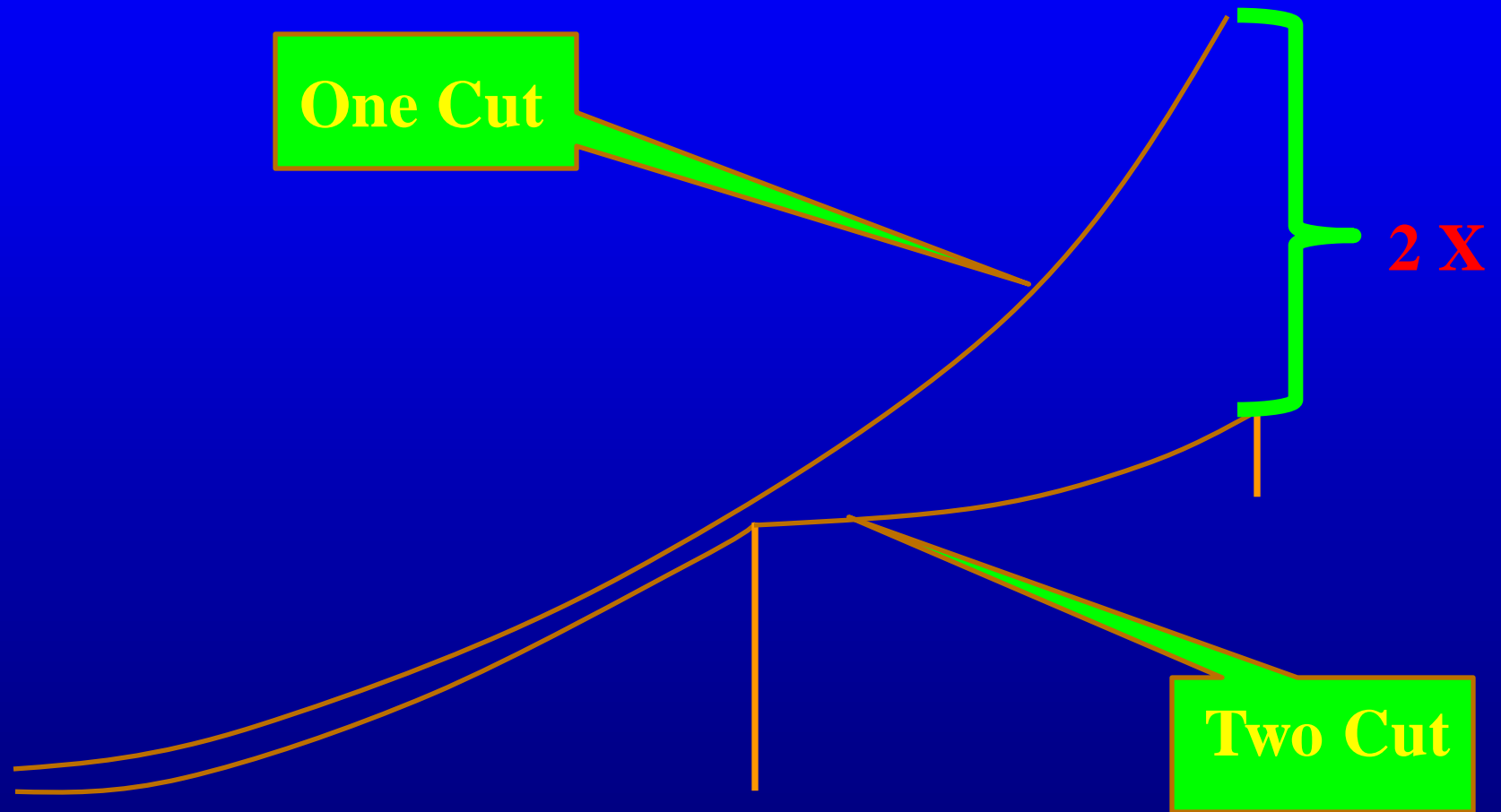
**Savannah, GA**



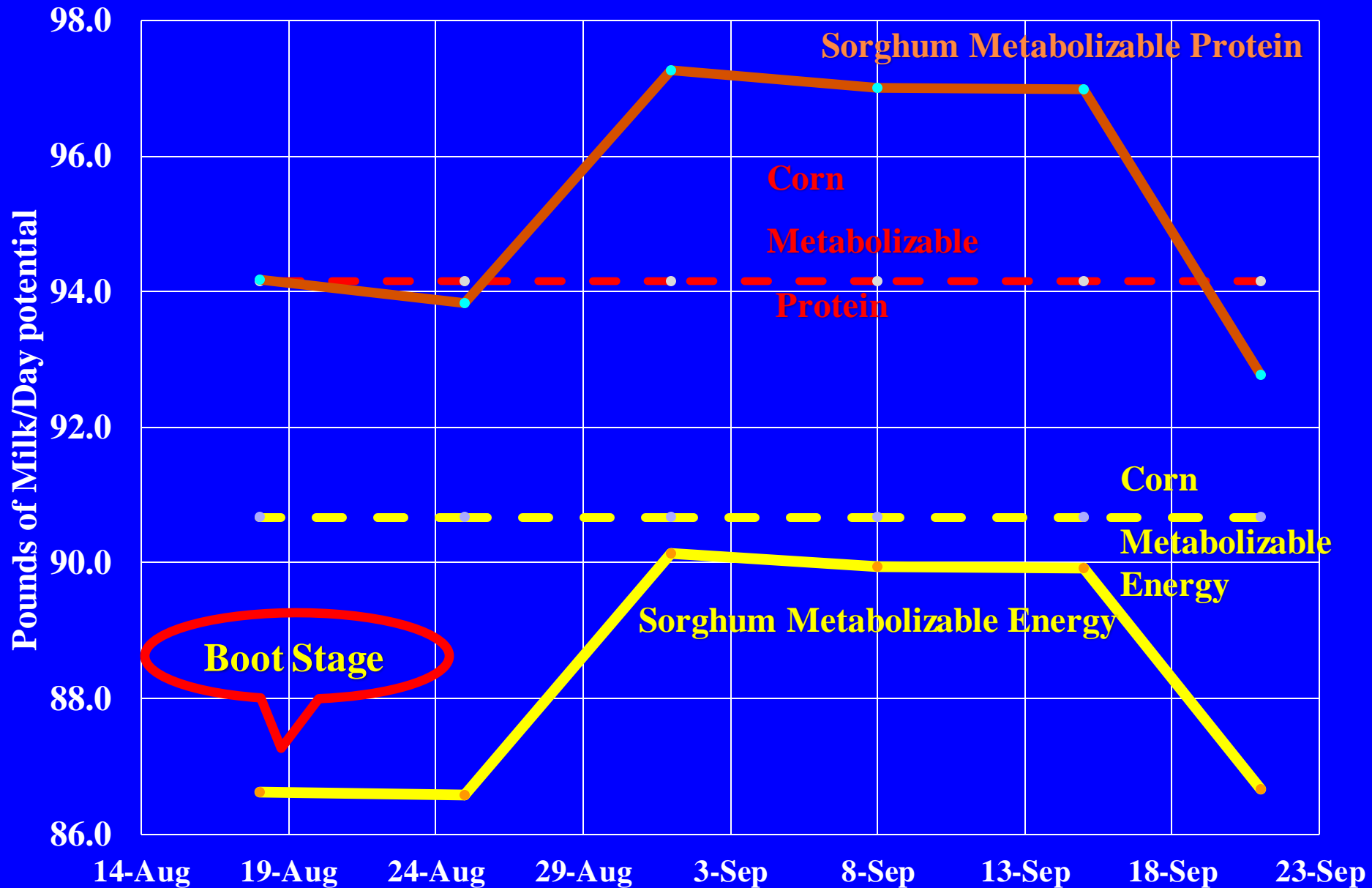
**One Cut Sorghum Sp.**



# Dry Matter Additions



# Valatie Research Farm



A close-up photograph of two sorghum seed heads. The seed head on the left is darker, with many seeds showing a tan or brownish-orange color, indicating a later stage of maturity. The seed head on the right is lighter, with many green seeds, indicating an earlier stage of maturity. A green arrow points from the text box on the left towards the green seed head. A red arrow points from the text box on the right towards the tan seed head.

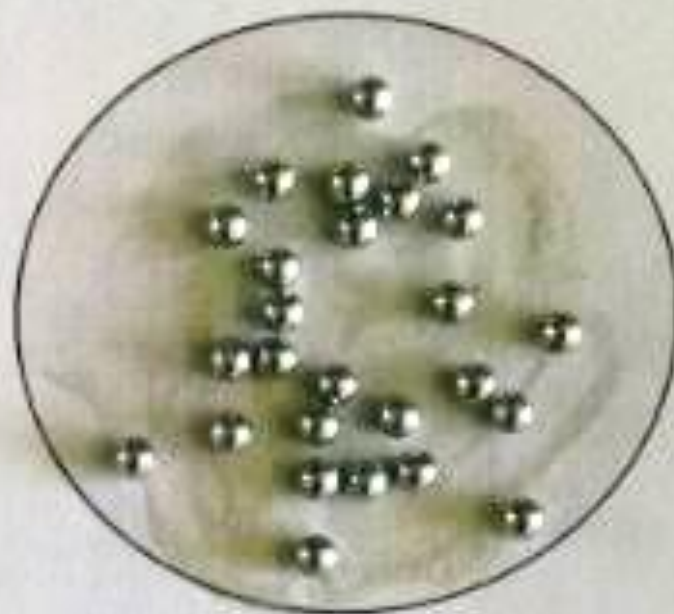
**Green Seed Head: tip like  
cooked oatmeal**

**Tan Seed Head: soft dough  
half way down seed head**





**Forage Sorghum Seed**  
**18,500 seeds/Lb.**



**#3 Steel Shot**  
**BlackCloud FS Steel**

# Photoperiod Sensitive

## Did Not Help

Photoperiod Sensitive

does not head;

nor dry;

nor increase energy concentration



# **The potential of eliminating the grain sink for enhancing biofuel traits in sweet sorghum hybrids**

by

Jebril Ali Abdalla Mohamad Jebril

B.S., Sabha University, 1994  
M.S., University Putra Malaysia, 2005

measured. Elimination of the grain sink significantly increased °Brix % (17.8%), dry biomass (27.8%), juice yield (23.9%), and total sugar yield (43.5%).



The A<sub>3</sub> cytoplasm mediated male sterility increased biomass, soluble solids, and total sugar in sweet sorghum hybrids

Jebril Jebril <sup>a</sup>, Donghai Wang <sup>b</sup>, Kraig Rozeboom <sup>a</sup>, Tesfaye Tesso <sup>a, \*</sup>

<sup>a</sup> Department of Agronomy, Kansas State University, Manhattan, KS 66506, United States

<sup>b</sup> Department of Biological and Agricultural Engineering, Kansas State University, Manhattan, KS 66506, United States

**Male Sterile Sorghum**  
**Biomass 29% increase**  
**Total sugar 57%**  
**Resistant to lodging and disease.**

# Impact of Nutrient Make-up

Corn Silage energy partition

**Plant Fiber  
& Sugars**

**Grain  
Starch**

**Fertile Seeded**



**Male Sterile  
No Fertile Seed**



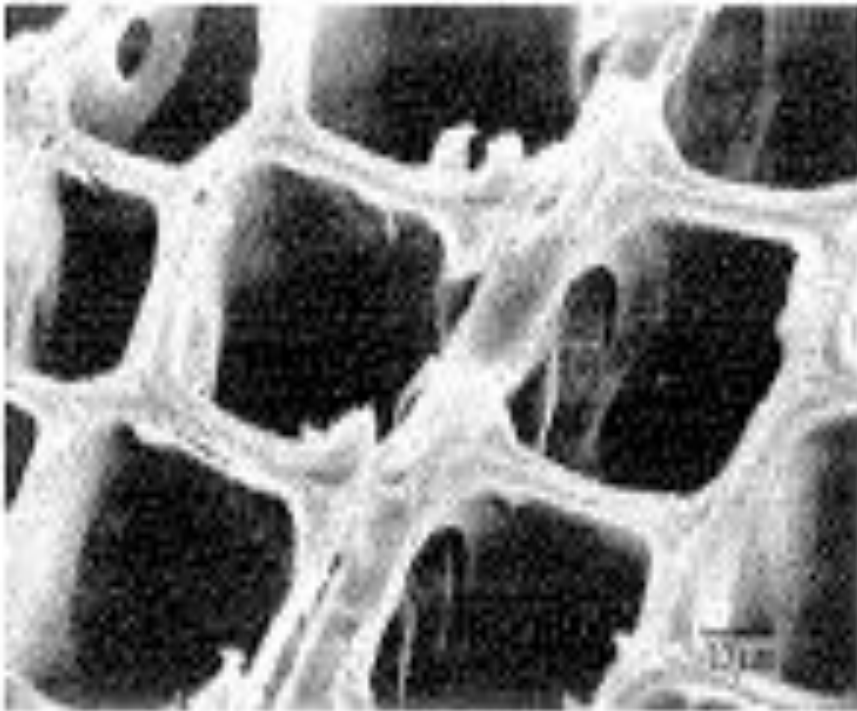


# Impact of Nutrient Make-up: Male Sterile BMR Sorghum

Same Total Energy – Different Source

**Plant Fibers &  
Plant Cell Sugar and Starch**

# Sugar and Starch stored in forage plant cells, not in seed head



➤ Cells must be ruptured for bacteria to enter

➤ Slow Steady nutrient release

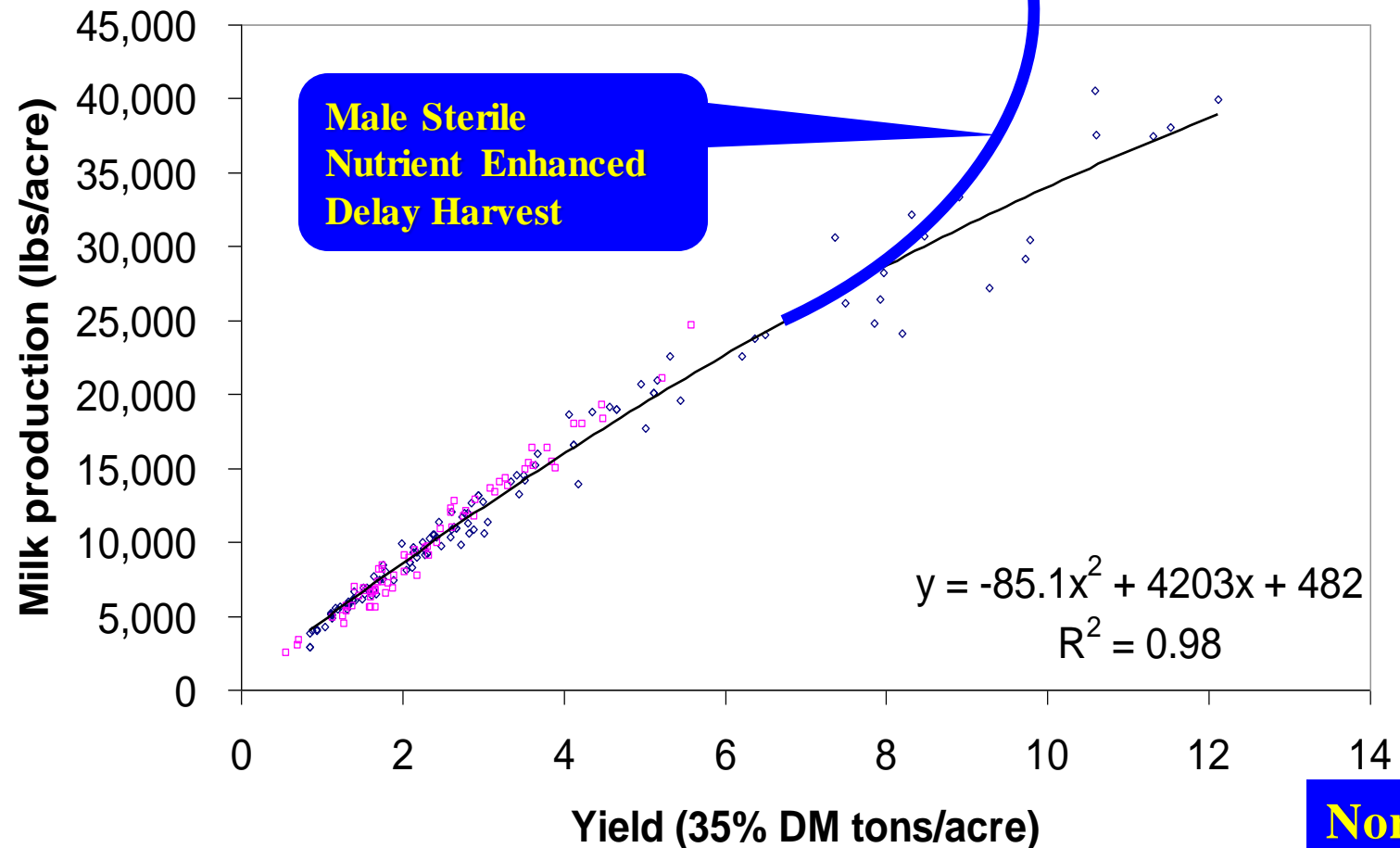
➤ Higher rumen pH so **higher components**

➤ **High Sugar boost protein and fat levels in milk**

➤ **NO processing needed.**

# Interim Research Results

All sites and years



**Northeast  
SARE  
Research**

Kilcer et al. 2003. What's Cropping Up? 13(4): 4-6.





**BMR MALE  
STERILE- NO  
SEED**

**24.4 Tons/A  
@35% DM**





# BMR MALE STERILE- NO SEED

**31.6 Tons/A  
@35% DM**



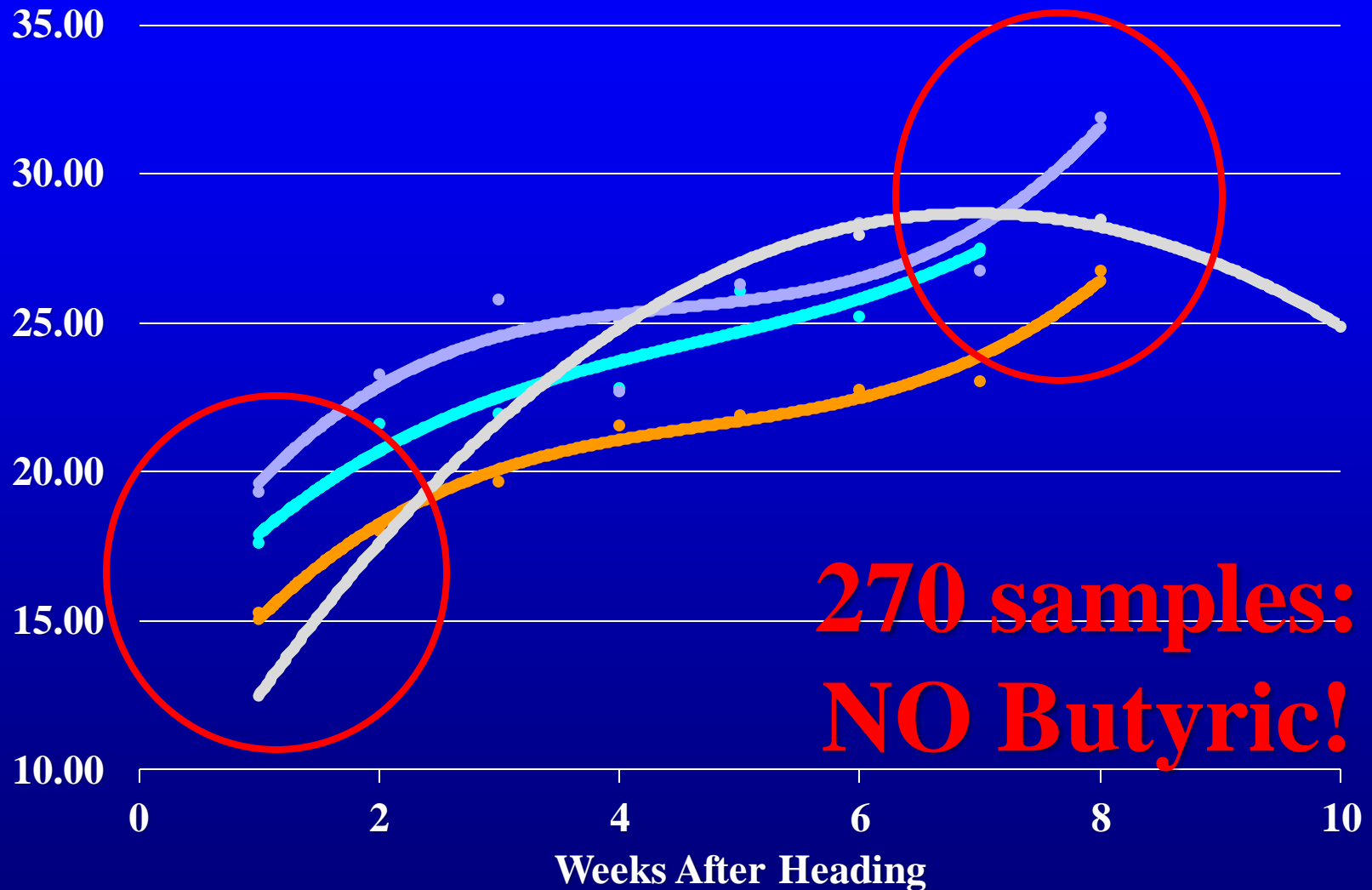






## Dry Matter by Week After Heading

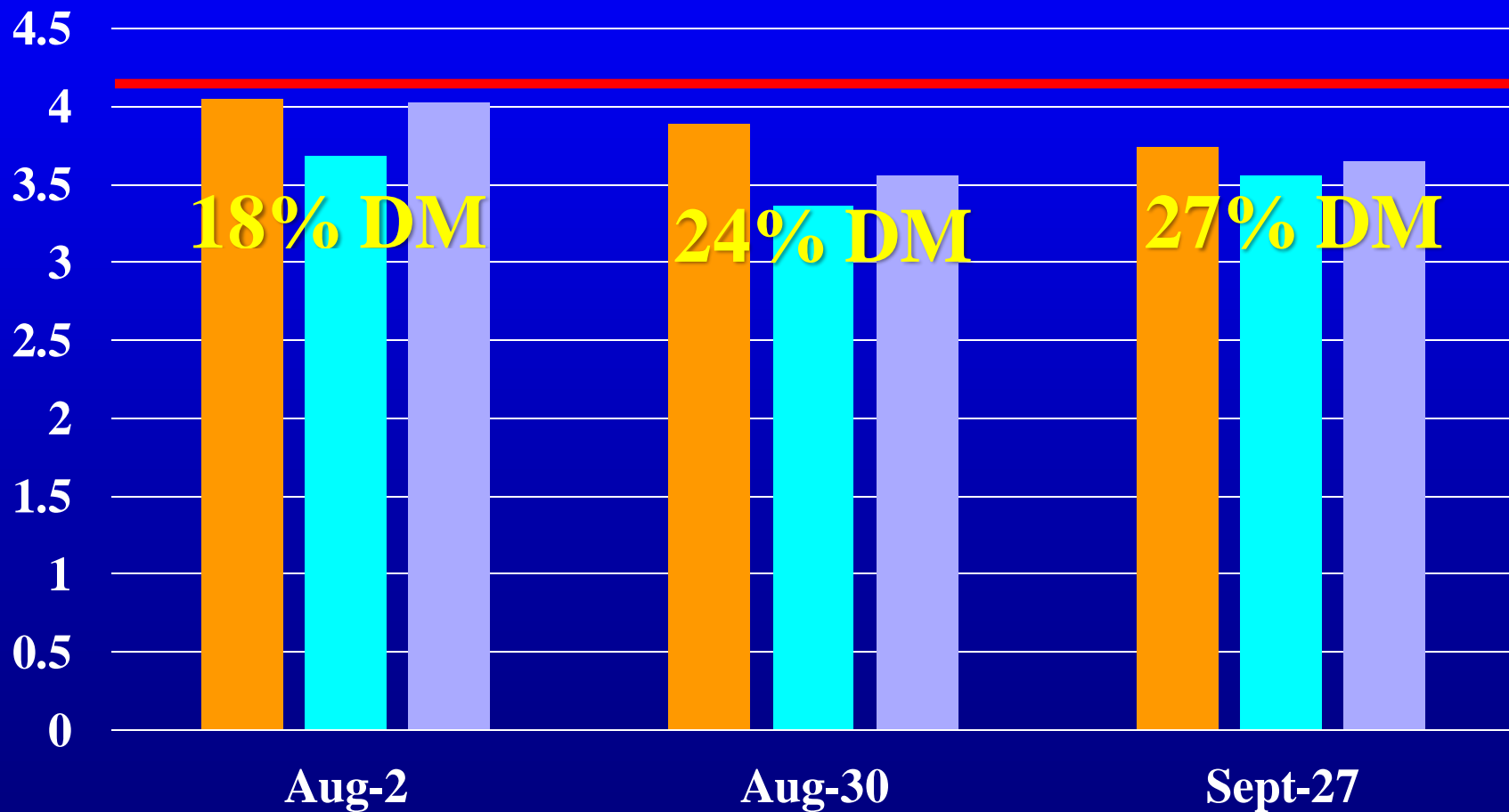
• seeded • 2020 • 2022 • 2023



**270 samples:  
NO Butyric!**

pH

FC MC Control

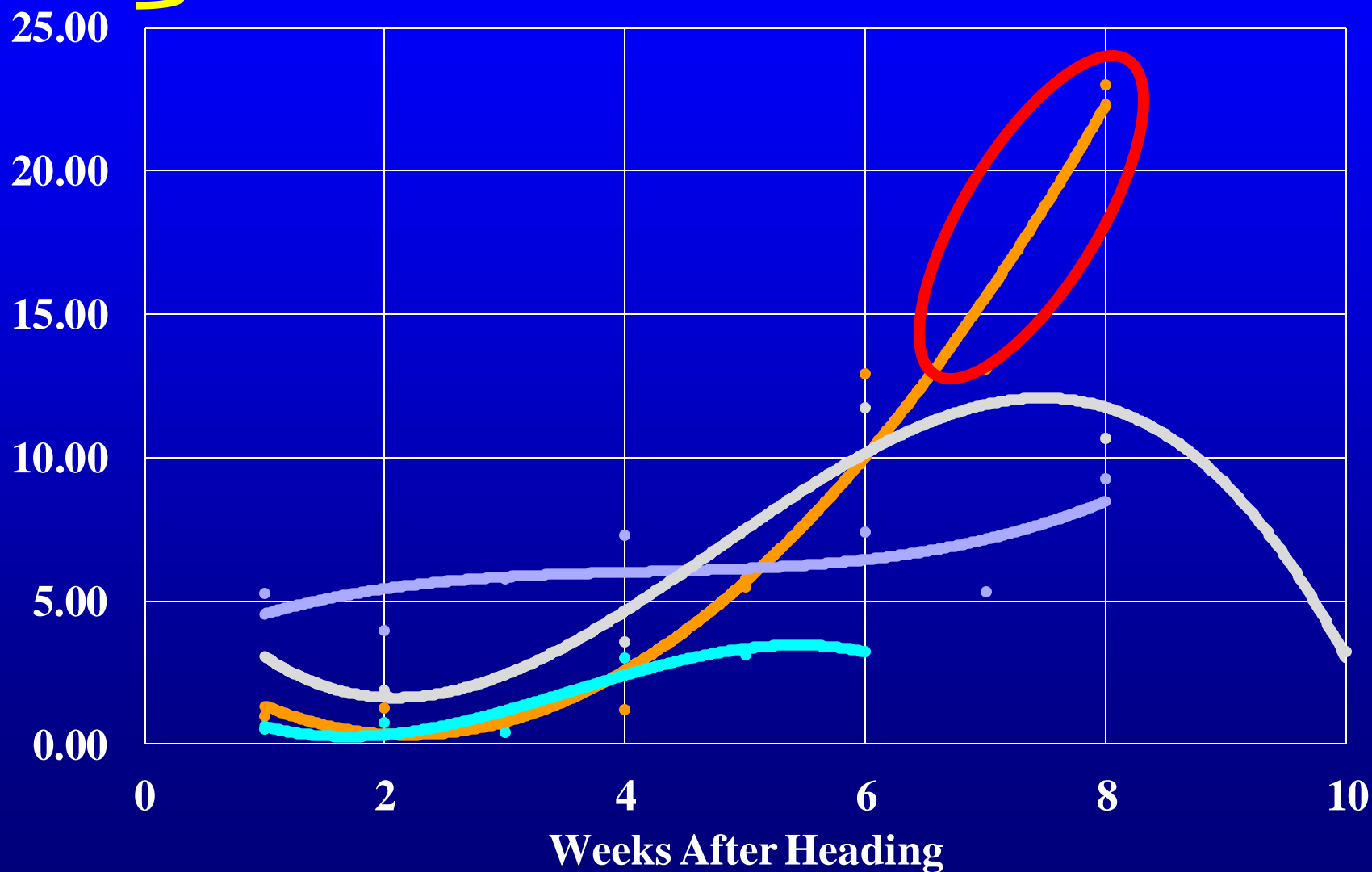


**Corn Silage**

**25 – 39**

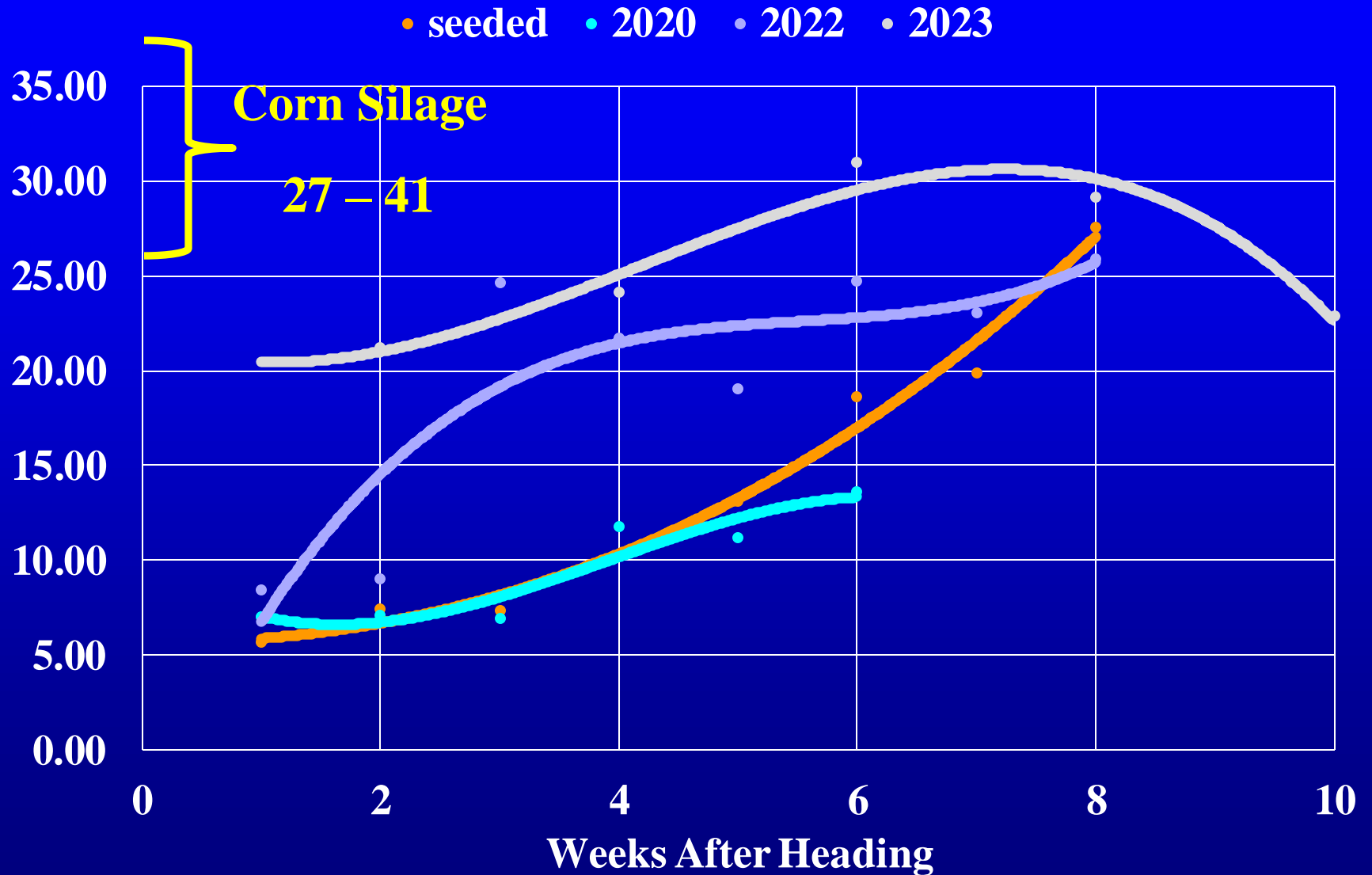
**Starch**

• seeded • 2020 • 2022 • 2023



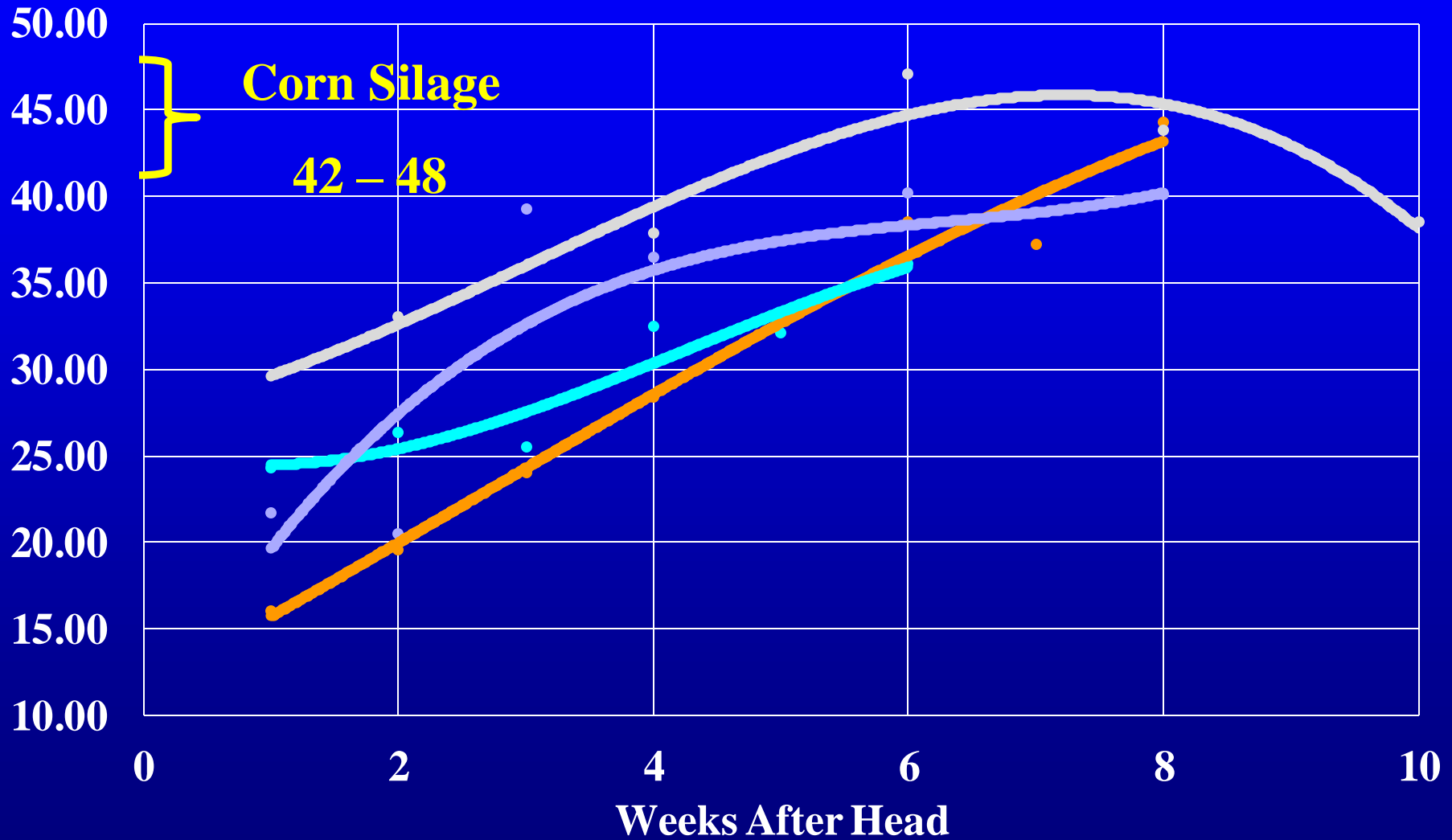


# NSC: Non Structural Carbohydrates



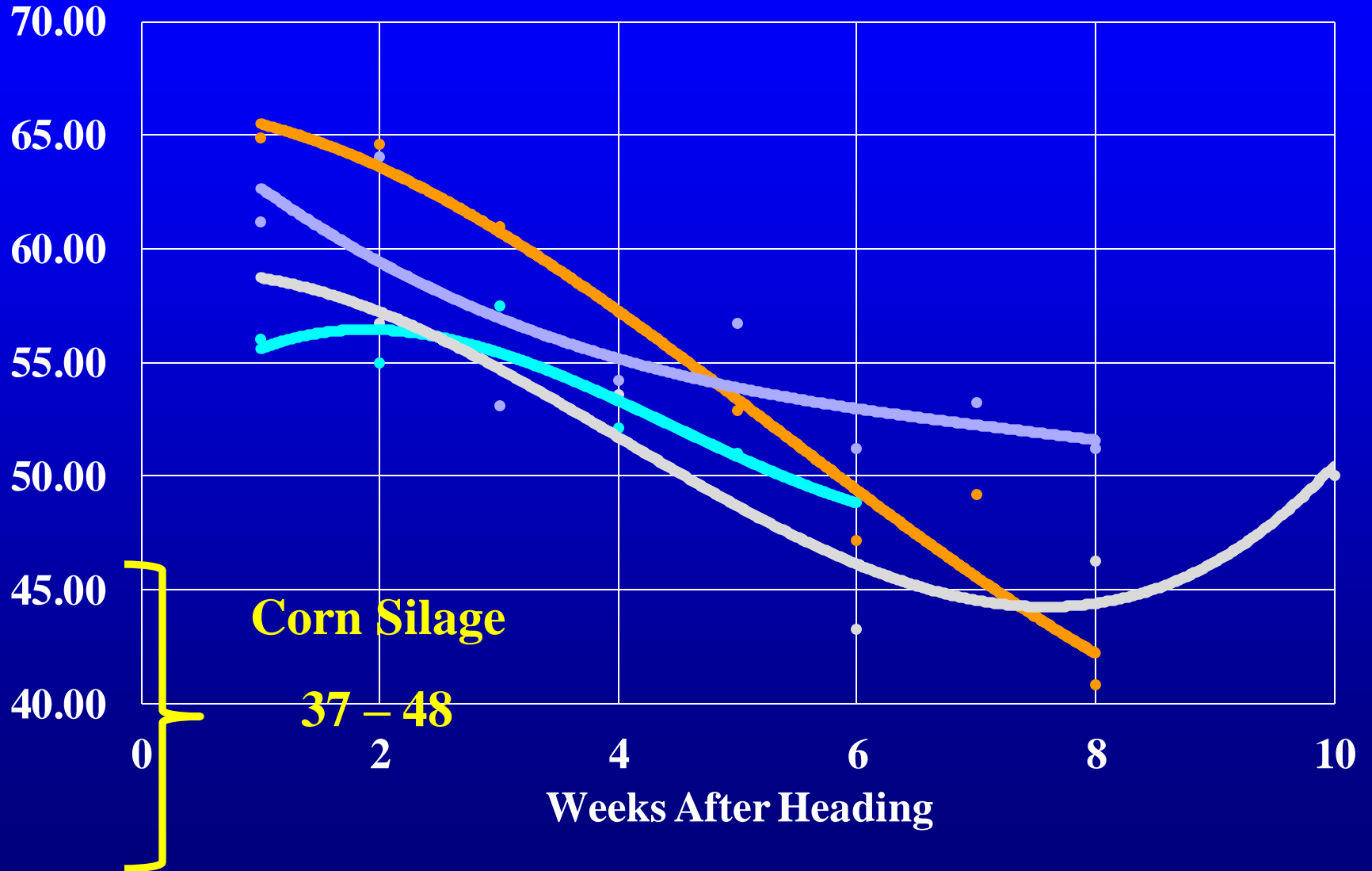
# NFC Non Fiber Carbohydrate

• seeded • 2020 • 2022 • 2023



# NDF

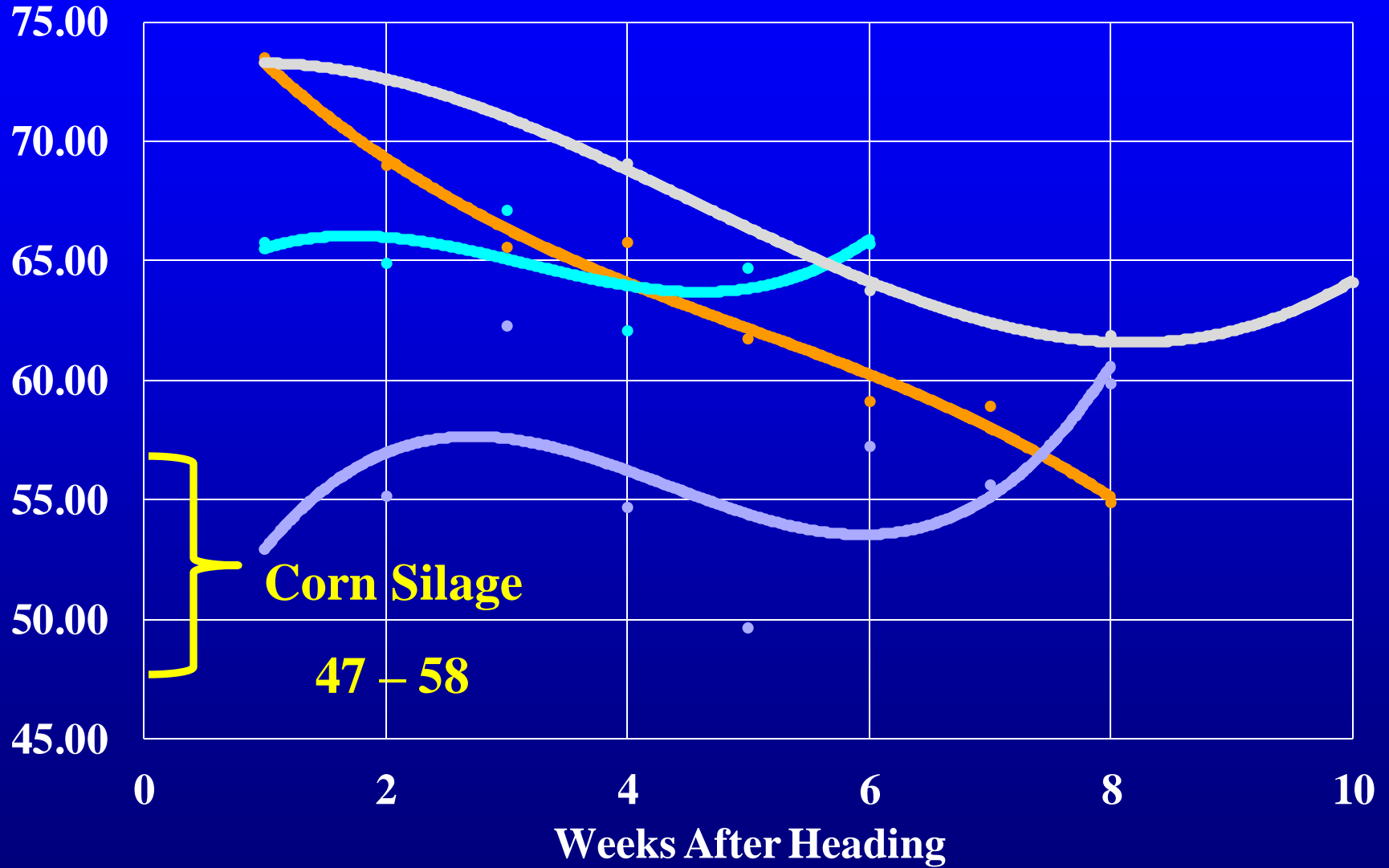
• seeded • 2020 • 2022 • 2023



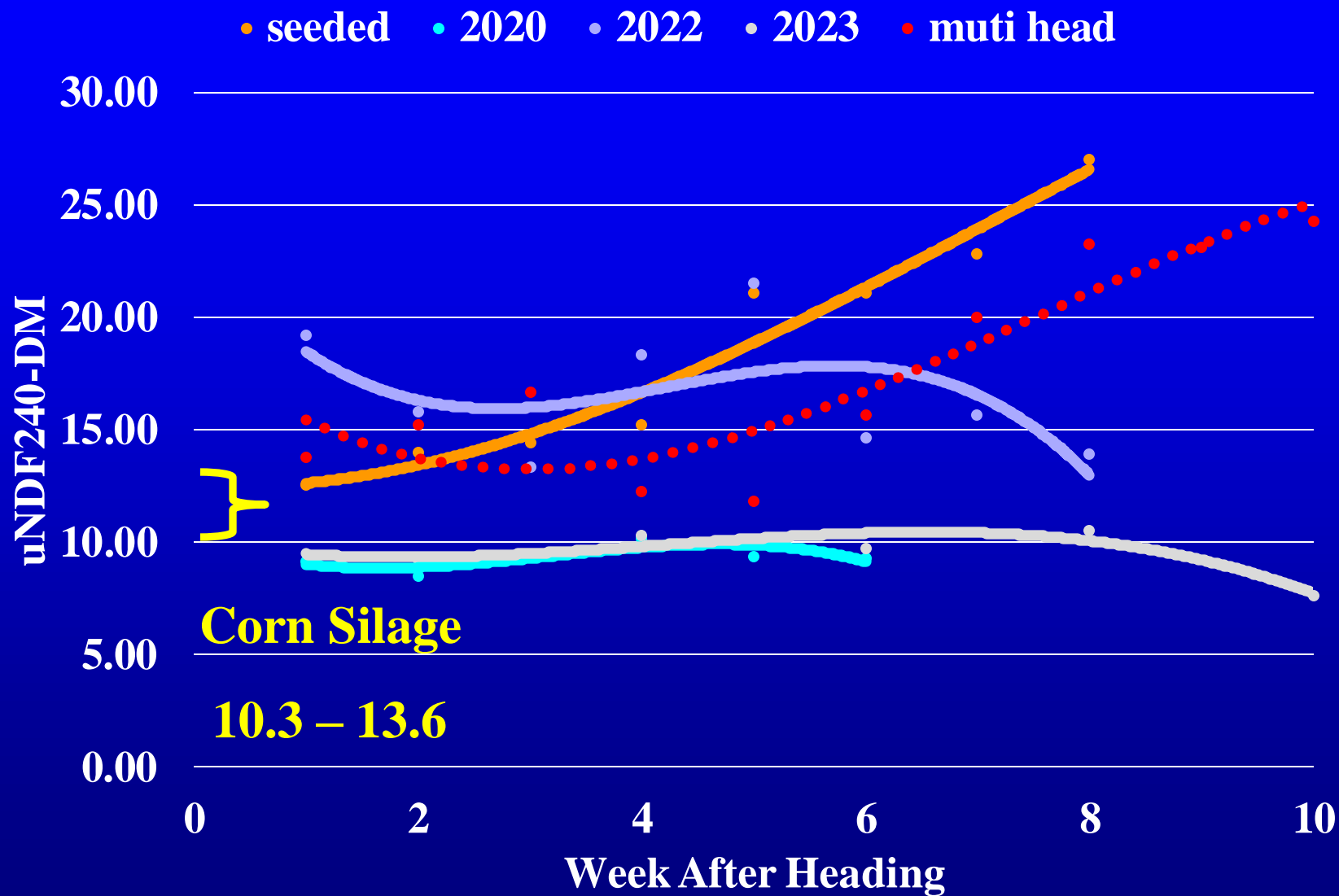


# NDFd30-NDF

• seeded • 2020 • 2022 • 2023

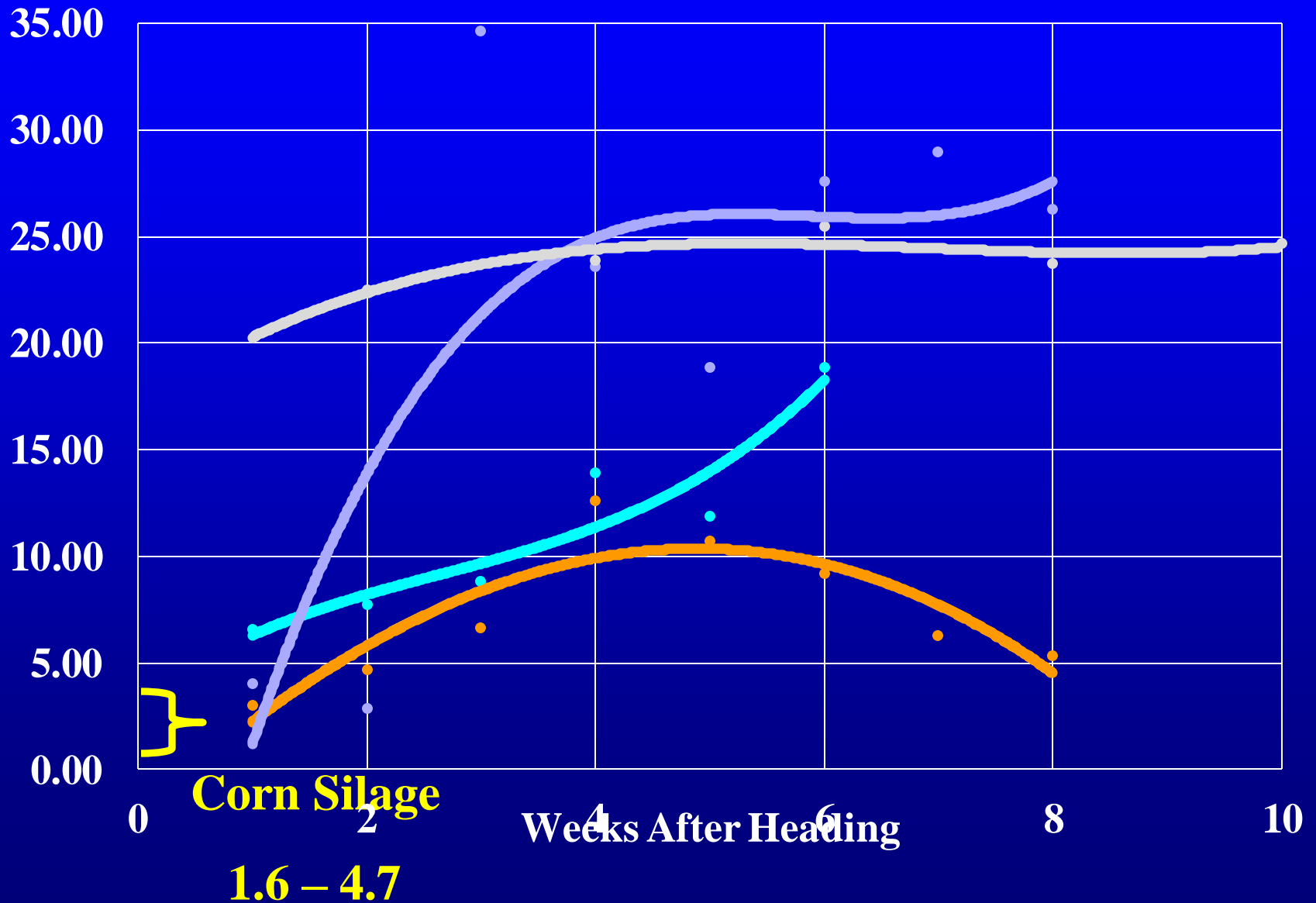


## uNDF240-DM



# Water Soluble Carbohydrate: Sugar (wet chem)

• seeded • 2020 • 2022 • 2023



# **Journal of Dairy Science, Emanuele, 2015**

## **Control**

- **Added 1.5% - 3% sugar**
  - **3 – 5% Sugar**
    - **5-7% sugar added**

**High-producing cows made 4.7 pounds more milk with added sugar**

**Pennsylvania Farm 150 acres of male sterile**

**Feeding just over a month**

**Fat and Protein up 0.2**



Ration	ME Milk	MP Milk
Base Corn Silage	85.5	87.9
August 10 sorghum	<div> <b>Sorghum is <u>NOT</u></b>  <b>Corn Silage</b> </div>	
August 17 sorghum		
August 24 sorghum		
August 31 sorghum		
Sept. 7 sorghum		
Sept. 14 sorghum		
Sept. 21 sorghum	79.4	87.5

Ration	ME Milk	MP Milk
Base Corn Silage	85.4	85
August 10 sorghum	84.1	91.8
August 17 sorghum	84.5	93.6
August 24 sorghum	84.6	92.3
August 31 sorghum	85.6	93.1
Sept. 7 sorghum	83.5	88.7
Sept. 14 sorghum	85.4	93.1
Sept. 21 sorghum	85.5	92.1

Item	Base CS 2022	Sorghum-PA 2022	Sorghum-NY 2022	Base CornSilage 2020	Sorghum-NY 2020
Corn silage, lbs. DM	20		0	20	0
Alfalfa silage, lbs. DM	13.5	13.5	13.5	15	15
Sorghum silage, lbs. DM		20	20		18.8
Corn, lbs. DM	5.8	6.4 (+.6)	6.4 (+.6)	6	6.9 (+.9)
Soy Plus, lbs. DM	3.2	3.4	3.8	3.5	2.4 (-1.1)
Diet sugar, % (WSC)	3.8	12.5	13.7	\$5,000/100 cows	
Predicted ME- Milk, lbs.	85.5	85.2	85.9	85.5	87.9
Predicted MP- Milk, lbs.	85.1	85	85.4	85.5	92.1
Advanced Ag Systems LLC					

**BUT!**

**BUT!**

**BUT!**

**How to Screw it UP!**









**Uniformity of Stand is Critical in  
Corn, Sorghum, and Winter Forage**

**Phil Needham**

**270-785-0999**

**<http://needhamag.com>**













400	E	400
300	D	300
200	C	200
100	B	100
0	A	0



# Distance Between Plant In-Row

row width	Seeds/Acre			
	30000	60000	90000	120000
7.5	27.9	13.9	9.3	<b>7.0</b>
10	20.9	10.5	<b>7.0</b>	5.2
15	13.9	<b>7.0</b>	4.6	3.5
30	<b>7.0</b>	3.5	2.3	1.7

# Seeds/Acre when planting pounds of seed

	seed/lb	
seed/acre	13500	19000
70,000	5.19	3.68
80,000	5.93	4.21
90,000	<u>6.67</u>	<u>4.74</u>
100000	7.41	5.26
110000	8.15	5.79
120000	8.89	6.32

**40% Over Planted**

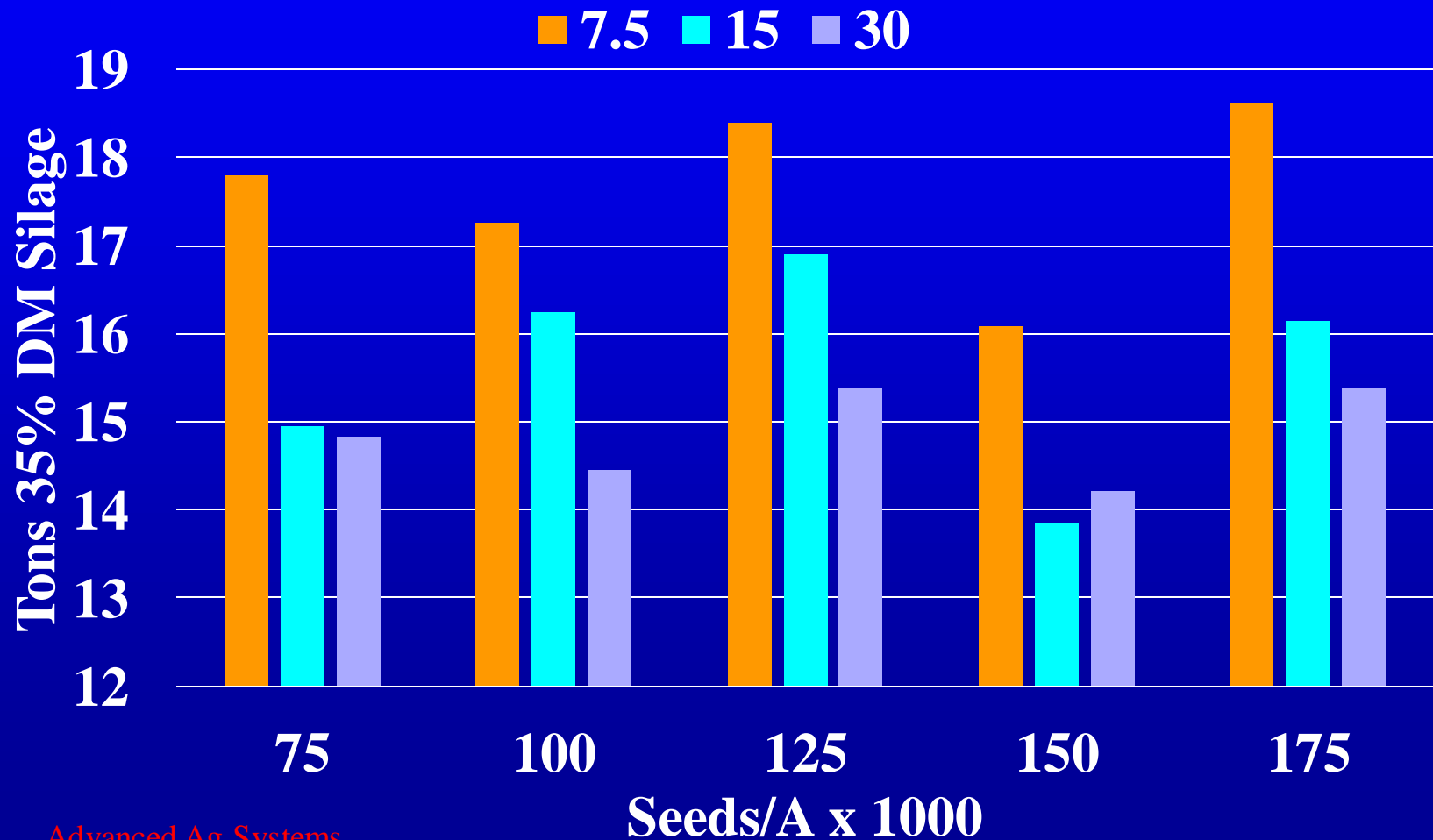


**Narrow row,  
equidistant plant spacing  
better the standability and yield**



# 18% More Yield Better Standability, Less Weeds

Tons Silage by Row Width & Seeding Rate





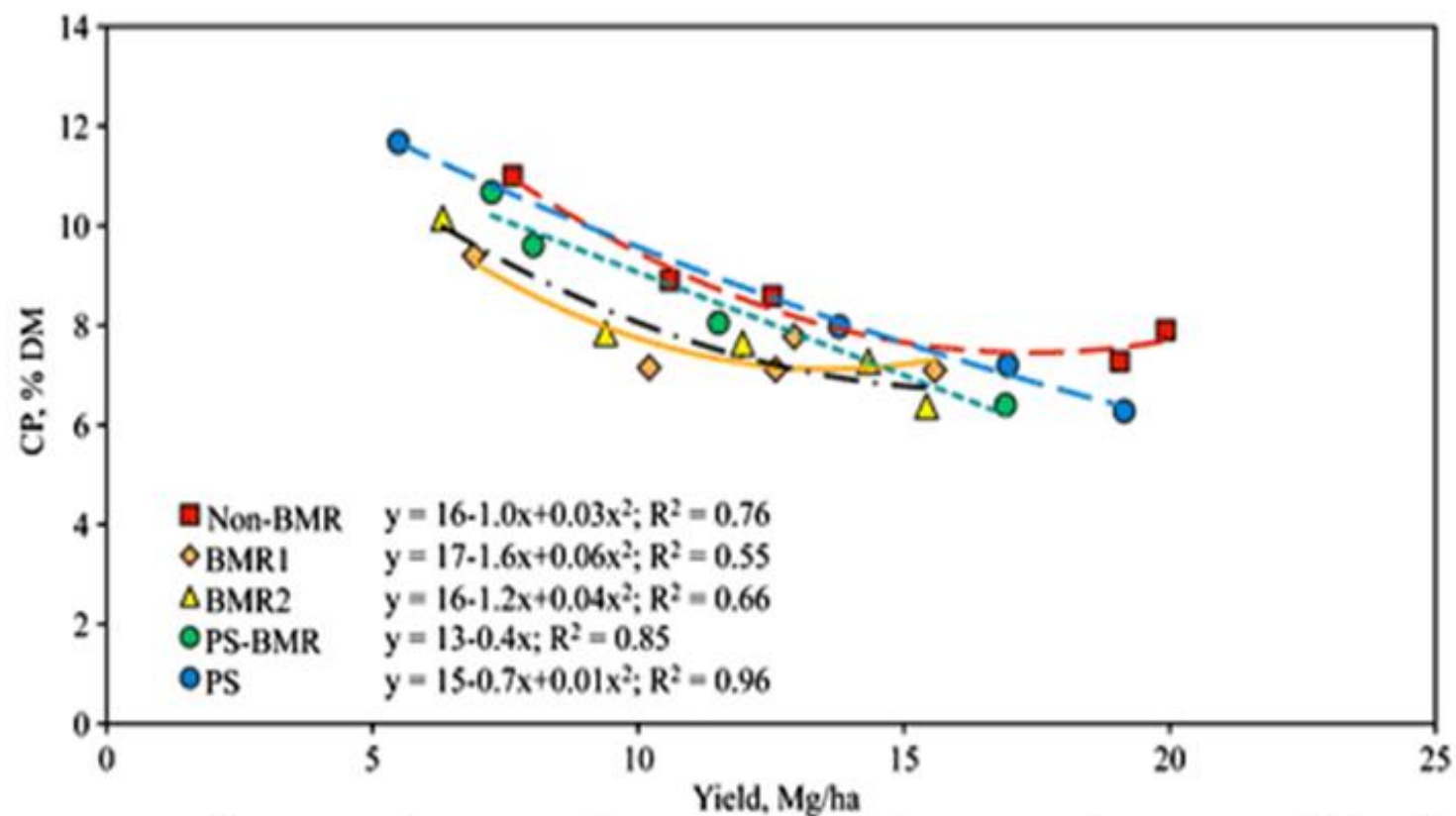
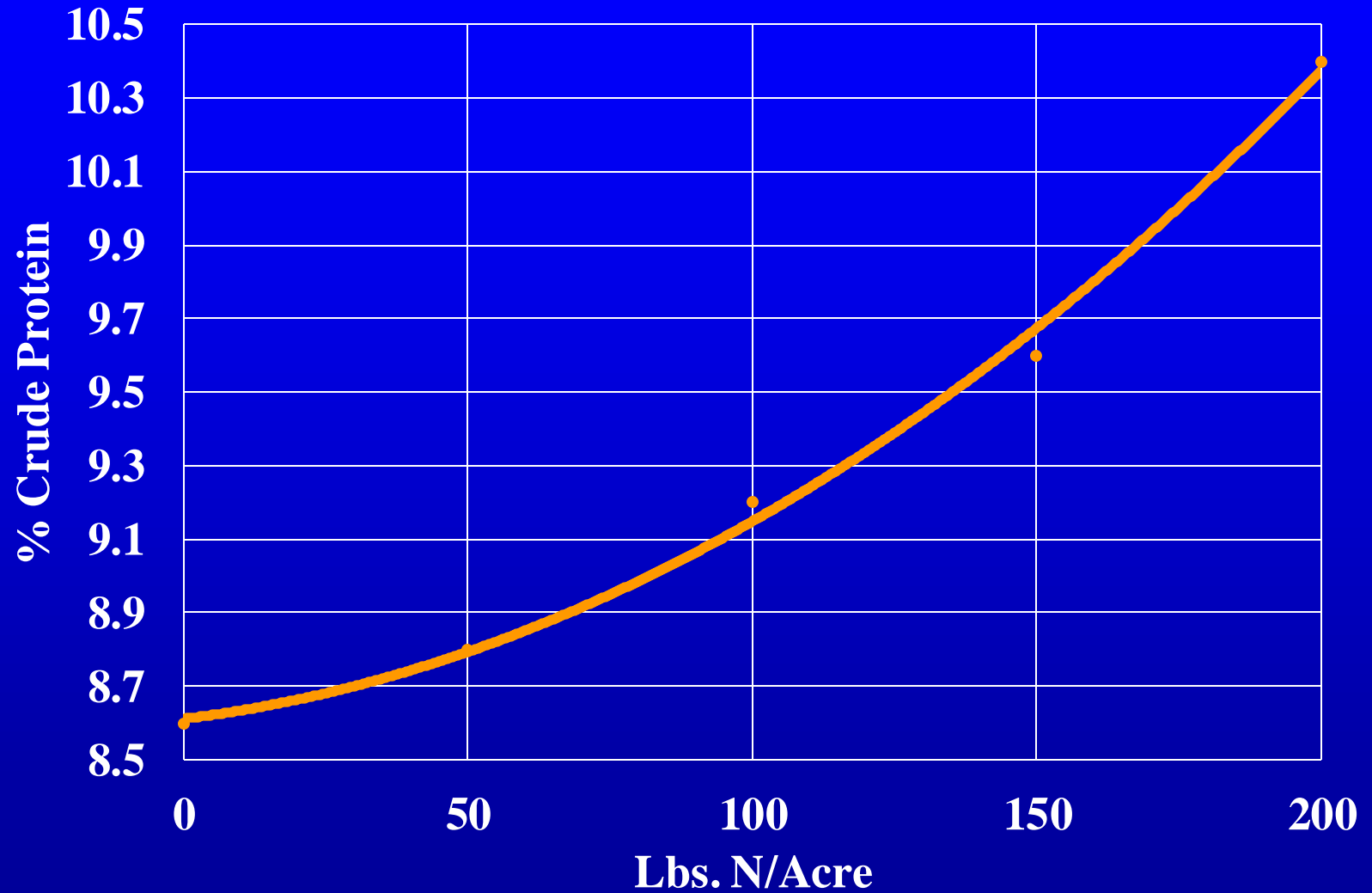


Fig. 4. Crude protein (CP, % DM) in response to forage sorghum DM yield (Mg/ha).

# Crude Protein



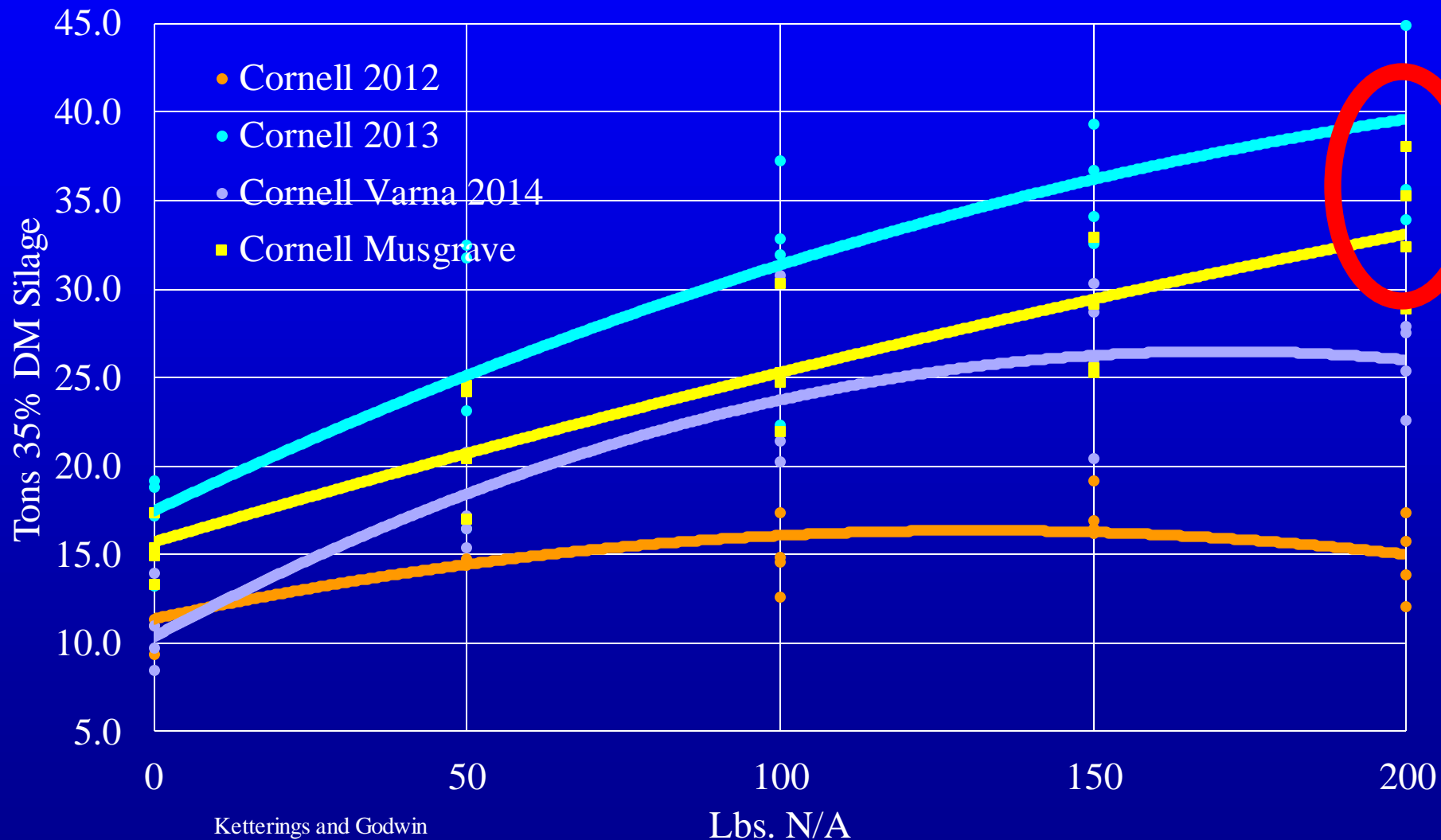


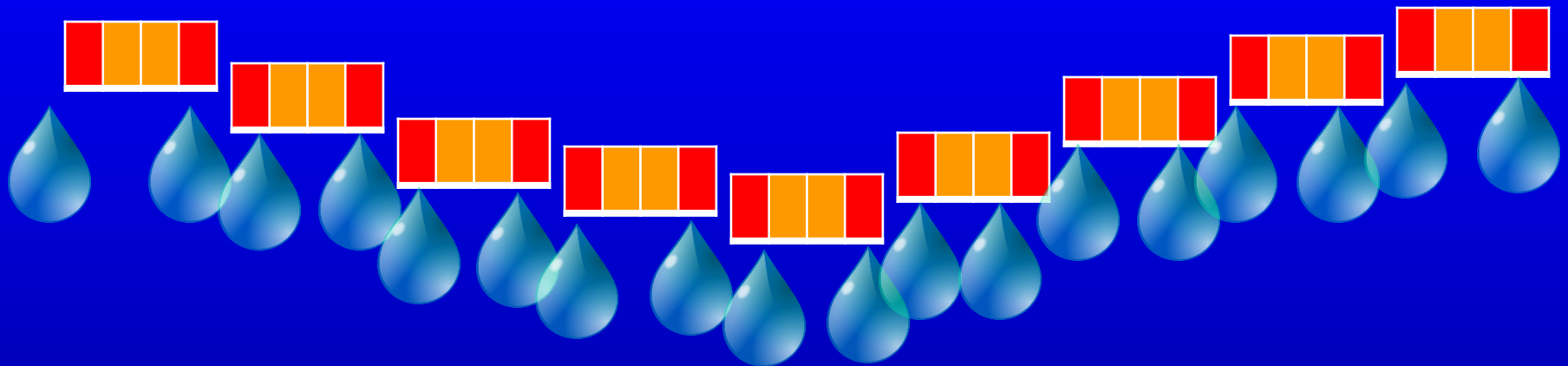
**25 Tons of Silage/Acre =  
17,500 lbs. of DM/A**

**17,500 @ 11% Crude Protein  
= 1925 lbs of Protein**

**2464 lbs of Protein = 308 lbs. N/A**

# Sorghum N Trial Cornell





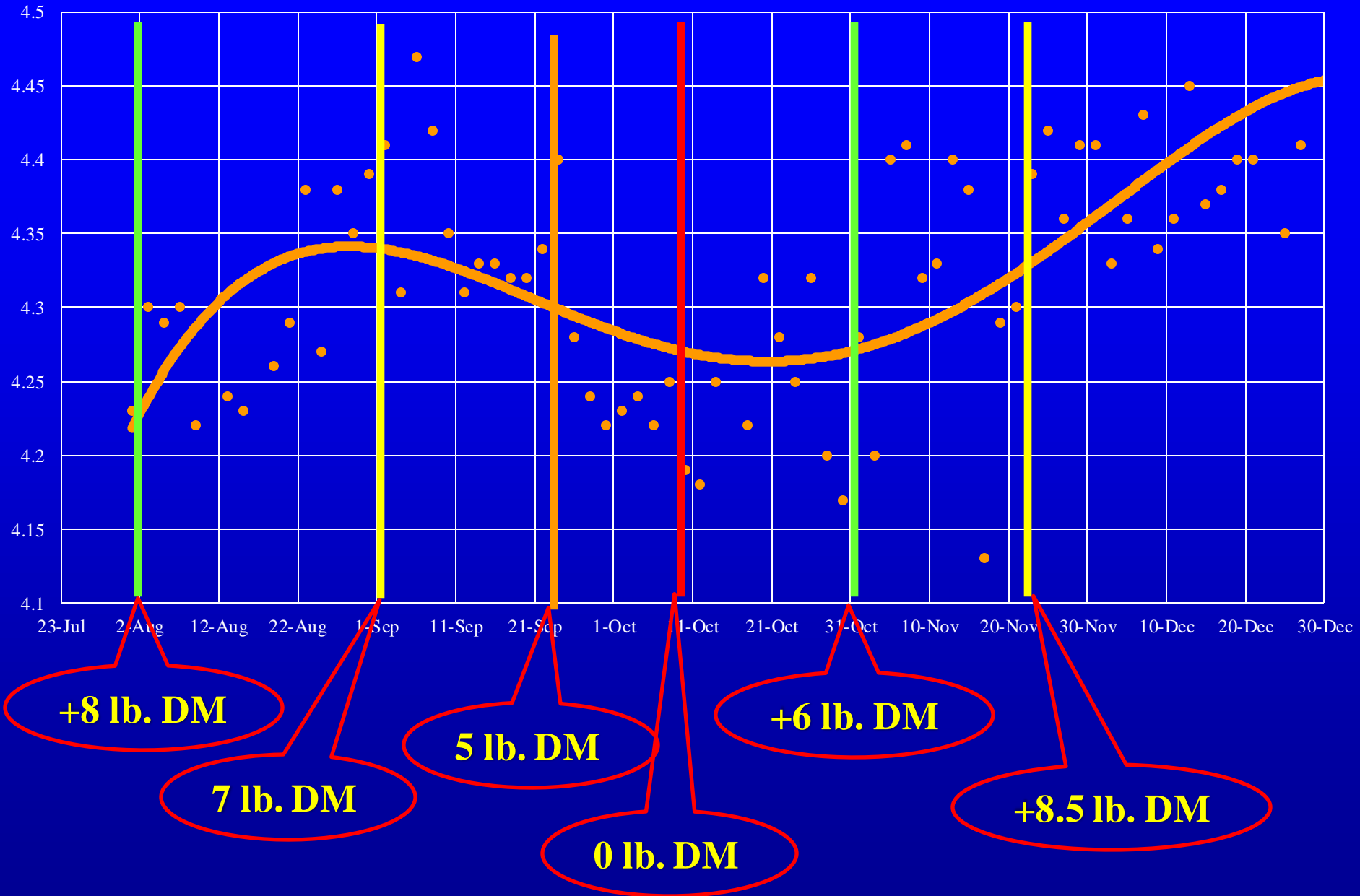
**1 – 1.25 inch cut length**

# High Sugar High Moisture Fermentation

- Longer cut less sugar lost in fermentation
- Longer cut less leachate
- Homolactic NOT buchneri bacteria
- Perfect fermentation @ 16 – 18% DM
- More water/weight to haul
- Can silo walls handle the hydraulic pressure?



## Butterfat Production





# Cows Don't Lie





# Questions??

**Advanced Ag Systems LLC.**

**<http://www.advancedagsys.com>**

**tfk1@cornell.edu**

**32 Tons of Silage/Acre =  
22,400 lbs. of DM/A**

**22,400 @ 11% Crude Protein  
= 2464 lbs of Protein**

**2464 lbs of Protein = 394 lbs. N/A**



# Enhanced Nutrition Sorghum

## A Major Forage Quality Advance

*One of the greatest pains to human nature  
is the pain of a new idea*

*It makes you think that after all,  
your favorite notions may be wrong  
Your firmest beliefs ill-founded.*

*Naturally.. Men hate a new idea and are disposed  
more or less to ill treat the original man who brings it*

*Walter Bagehot Physics and Politicsill-treat*