

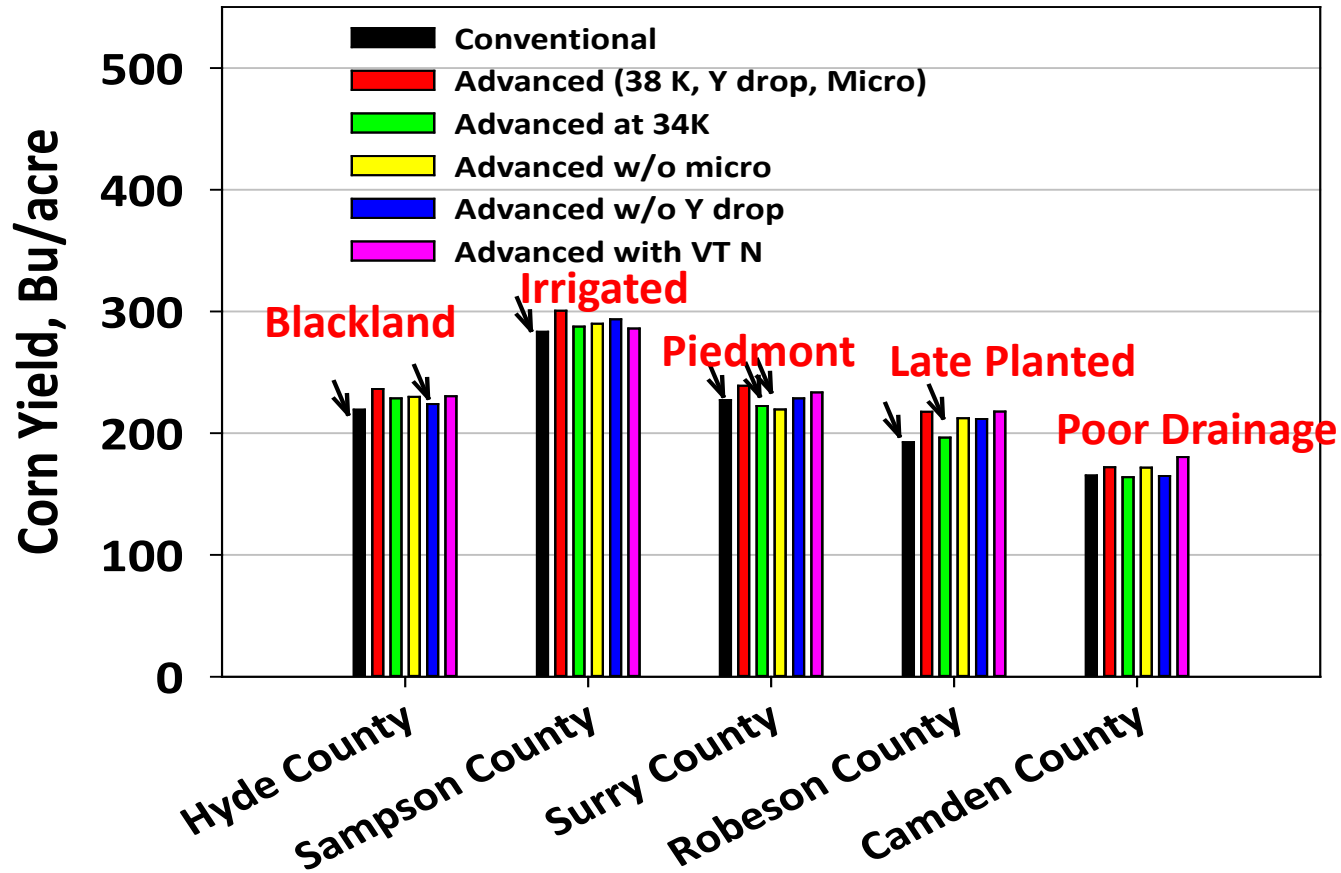
The Five Essentials of Corn Production: Pressing on to Greater Yield



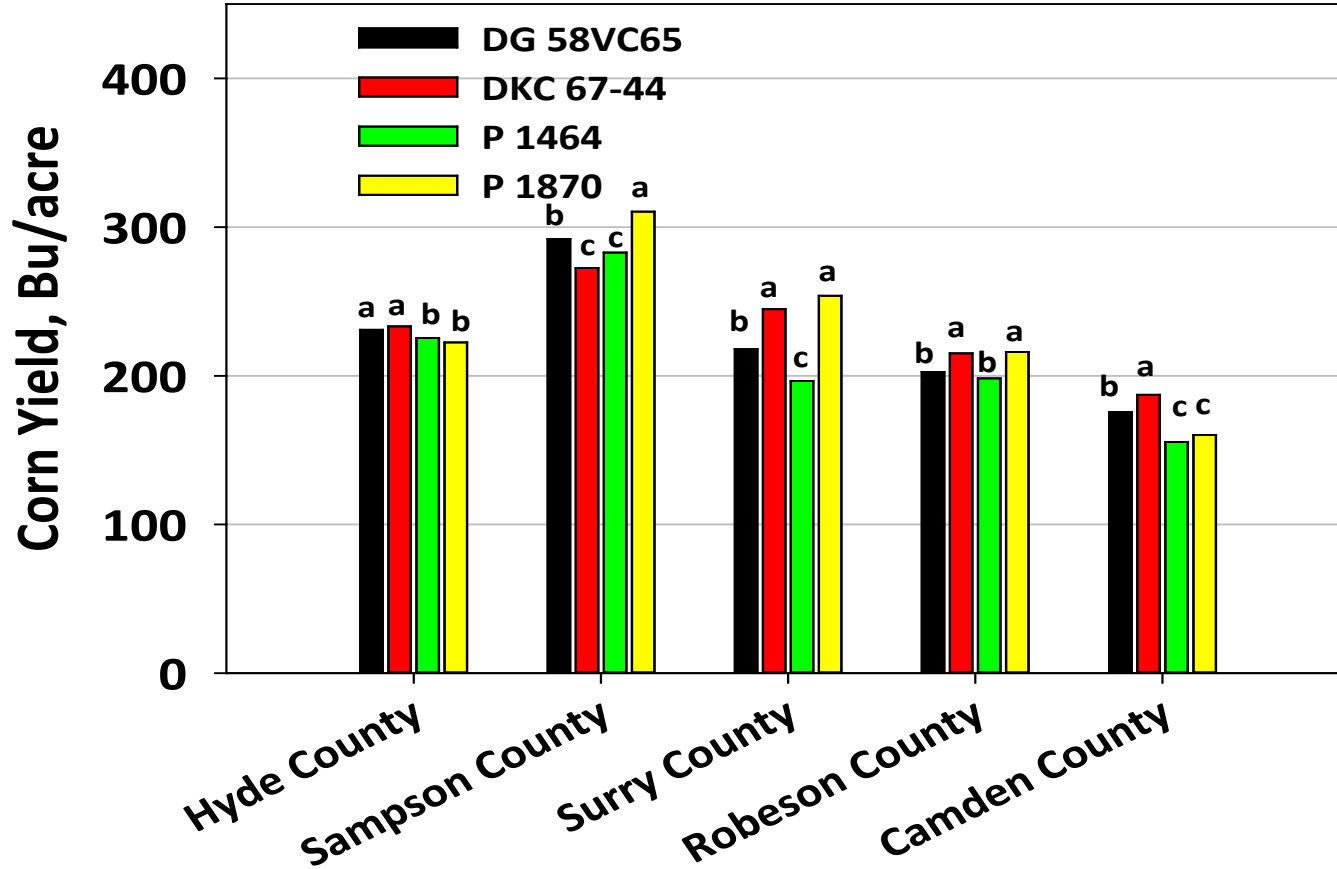
*Dr. Ron Heiniger
Vernon G. James Research Center
North Carolina State University*



Environment is the Key!



Hybrid is Important!



The Environment of Corn

Rank	Factor	Value	
		bu/acre	%
1	Weather	70+	27
2	Nitrogen	70	26
3	Hybrid	50	19
4	Previous Crop	25	10
5	Plant Population	20	8
6	Tillage	15	6
7	Growth Regulators	10	4
Total =		260 bu	100%

FIVE ESSENTIALS OF THE CORN ENVIRONMENT

1. Temperature
2. Water
3. Light
4. Nutrients
5. Genetics

Fred Below, Seven Wonders of the Corn World
University of Illinois

Knowing
What the
Plant
Needs

Light

Capture as Much as Possible for as Long as Possible

**Maximum Corn Yields are Obtained
when:**

**the corn plant collects the maximum
amount of light possible without
stress**

The Good – The Bad – The Ugly



The Good – Increasing Light Use

- Maximizing the length of Growth without stress
- Higher Plant Populations – Season Long Benefits
- Row Spacing – Early Benefits plus Reduced Stress
- Maximizing Daylength/sunlight During Flowering

The Bad – Crop Stress

- Avoid Heat, Water, and Nutrient Stress at Critical Times



The Ugly – Balancing Light and Stress



Six Steps to Careful Hybrid Selection



- 1. Determine the Maturity Class for your primary and secondary hybrids.**
- 2. Pick 10 (or more) hybrids that show consistent yield performance in statewide trials.**
- 3. Identify hybrids that performed well in local trials.**
- 4. Talk to other farmers or dealers who have experience with the hybrids on your list or use yield contest records to flag good hybrids.**
- 5. From this list identify hybrids that have the KEY traits that are important on your farm.**
- 6. Do on-farm comparisons with your current hybrids to confirm superior performance.**

Hybrid Comparisons in Drought and Heat



Grain Yield Under Drought and Heat

Hybrids	Maturity	Yield
	Days	Bu/acre
Exp: A0887	108	54.3
Dekalb DKC 55-85	105	109.1
Dekalb DKC 58-08	108	126.7
Pioneer 1197	111	105.8
Dekalb DKC 64-35	114	101.1
Pioneer 1464	114	158.4
Dekalb DKC 67-44	117	120.1
Pioneer 1847	118	109.7
Pioneer 1870	118	173.1
Augusta Exp: 71-68 VT2PRO	118	204.3

Grain Yield Under A Better Environment

Hybrids	Maturity	Yield
	Days	Bu/acre
Exp: X9105	106	211.1
Dekalb DKC 55-85	105	n/a
Dekalb DKC 58-08	108	203.6
Pioneer 1197	111	259.4
Dekalb DKC 64-35	114	245.5
Pioneer 1464	114	264.7
Dekalb DKC 67-44	117	260.0
Pioneer 1847	118	267.1
Pioneer 1870	118	247.0
Augusta Exp: 71-68 VT2PRO	118	261.5

Grain Yield Under A Better Environment

Hybrids	Maturity	Yield
	Days	Bu/acre
Exp: X19118B	118	55.9
Dekalb DKC 55-85	105	169.6
Dekalb DKC 58-08	108	112.2
Pioneer 1197	111	176.6
Dekalb DKC 64-35	114	158.3
Pioneer 1464	114	153.5
Dekalb DKC 67-44	117	159.5
Pioneer 1847	118	142.6
Pioneer 1870	118	164.1
Augusta Exp: 71-68 VT2PRO	118	143.7

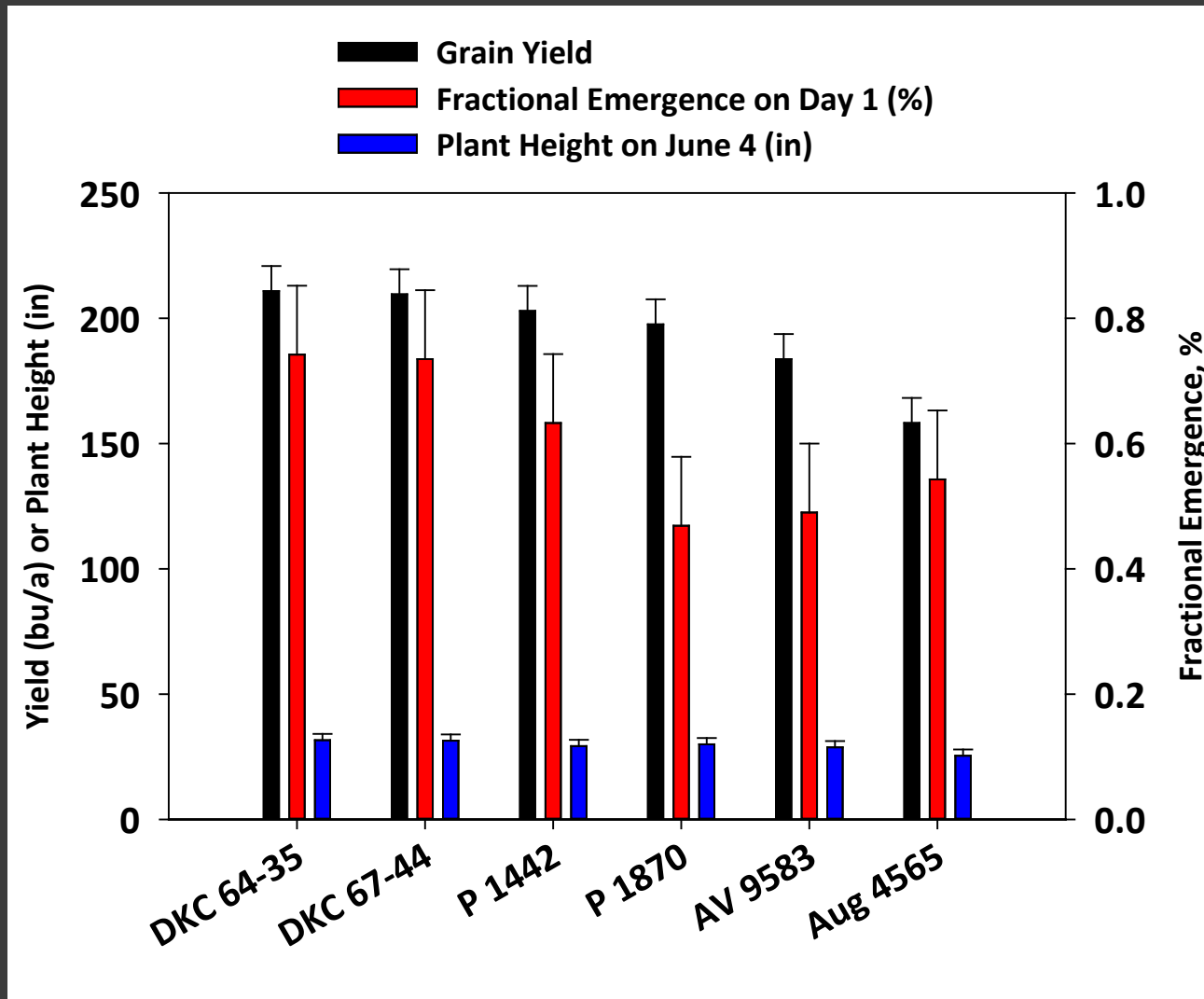
Quote From David Hula World Record 616.2 bu/a

Only when that limit is known will farmers fully understand how much potential yield is left in the field each year, he added. "If that limit is say 800 or 900 bpa, and the country-wide average is only 170 bpa, we have a long way to go," he noted.

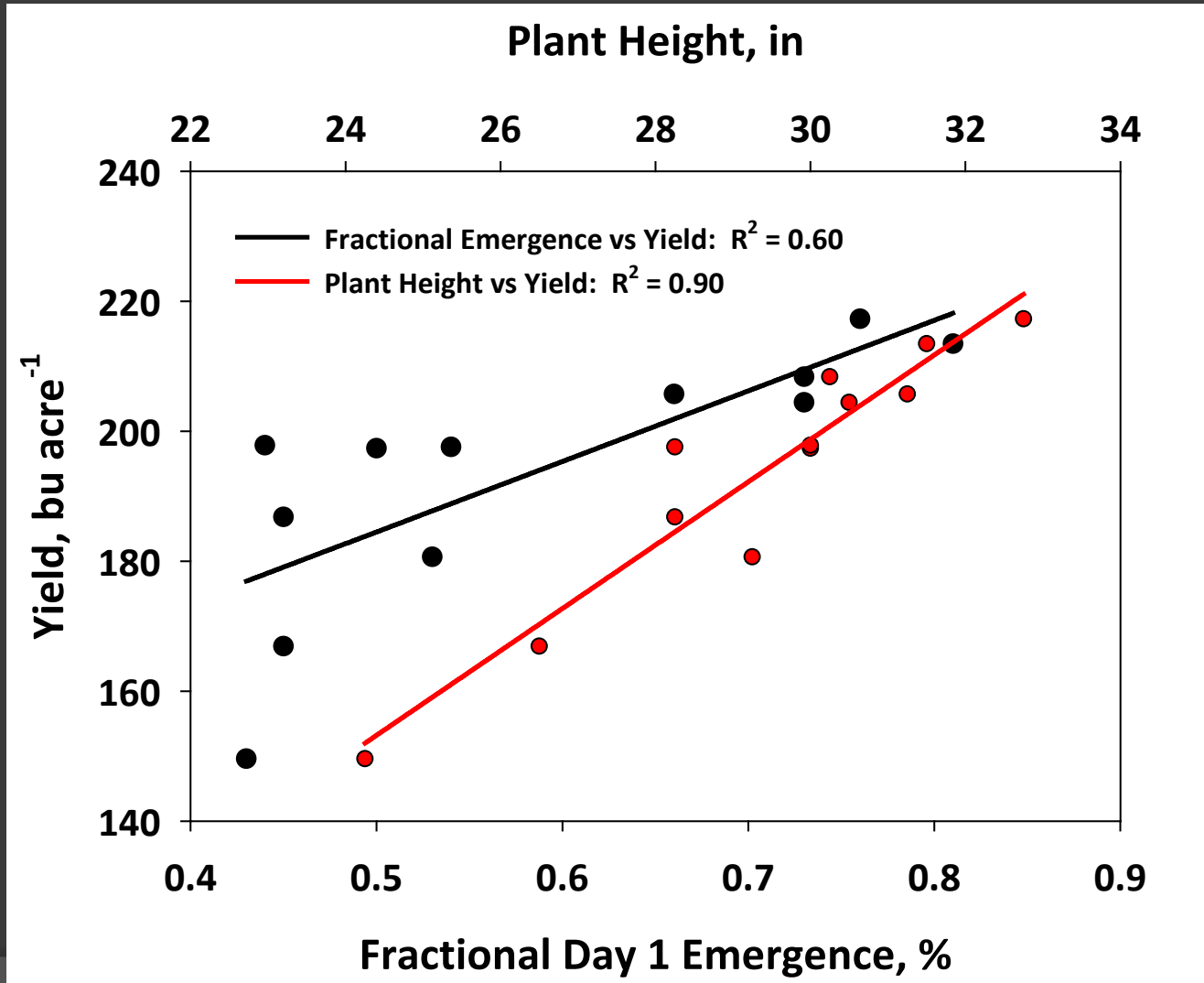
Hula seems to have an affinity for odd-numbered years. His previous world records were set in 2013, 2015 and 2017. But it's no mystery to him why 2019 was a winner of a year again.

"Unlike the rest of the country, we did not have a weather disaster this year," he said of his region in eastern Virginia. "The springtime could not have been more ideal." That was enormously influential, given that **one of the most crucial requirements for high yield is emergence, he has learned. "When the planter leaves the field, so much yield has already been determined," he said.**

Trends in Emergence, Plant Height, and Yield – VJC 2019



Relationship Between Emergence or Early Plant Height and Grain Yield – VJC 2019



Managing The Ugly Through Uniform Emergence



Rapid – Uniform Emergence – Early Growth

Factors Affecting Quick, Uniform Emergence and Early Growth

1. Soil Environment
2. Hybrid
3. Seeding Depth
4. Nutrient Availability
5. Weed Control
6. Pest Control





Managing Temperature And Water Stress

Avoid Stress at Pollination and Grain Fill

1. Seeding to 3-Leaf (V3) -

- Aim to Plant so That 40 to 50 GDD are accumulated over the next four days
- No more than 2" of rainfall for the first 7 days following planting

2. Pollination and Grain Fill – Must occur when Temperatures do NOT exceed 95°F



Managing Temperature And Water Stress

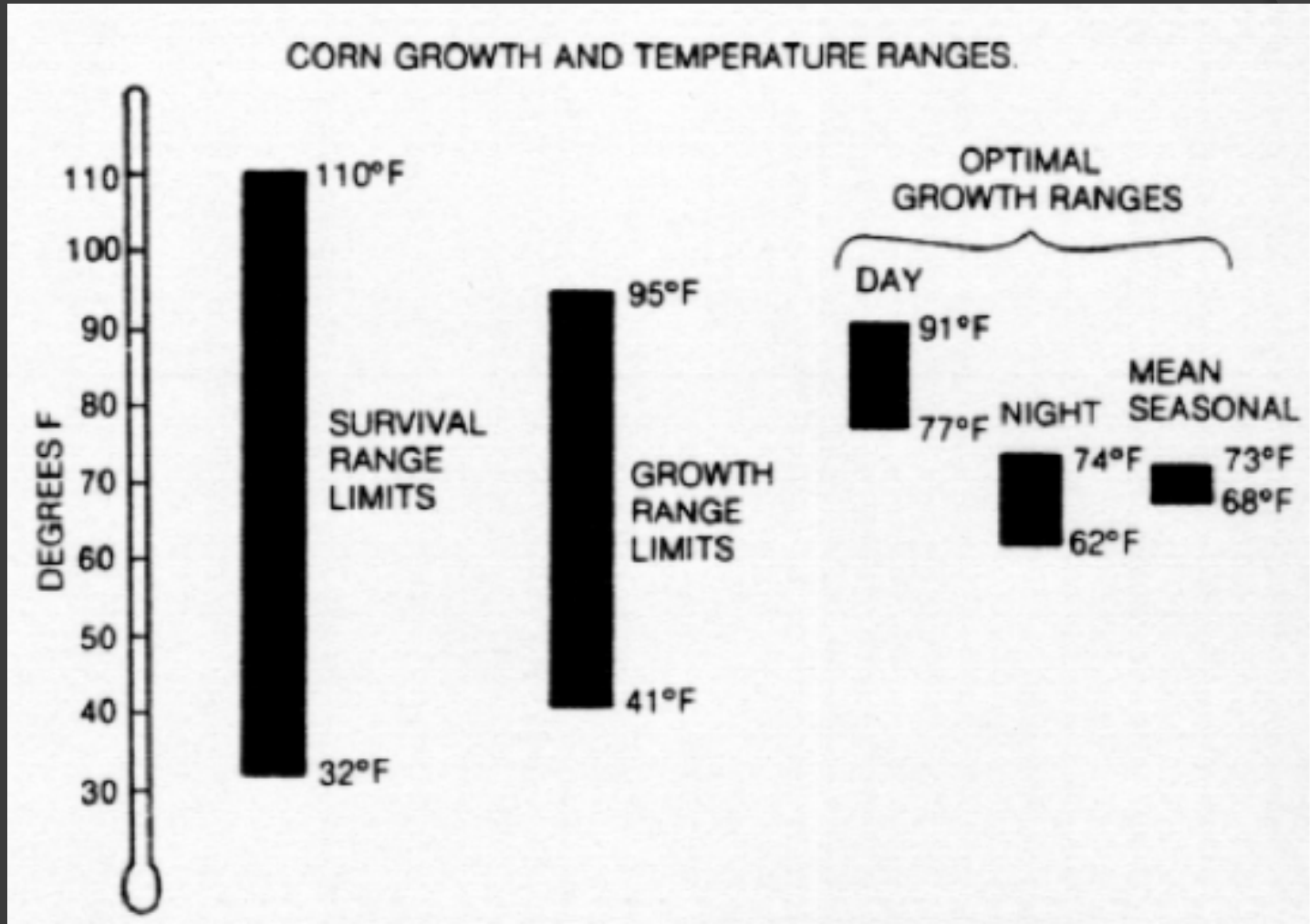
Avoid Stress at Pollination and Grain Fill

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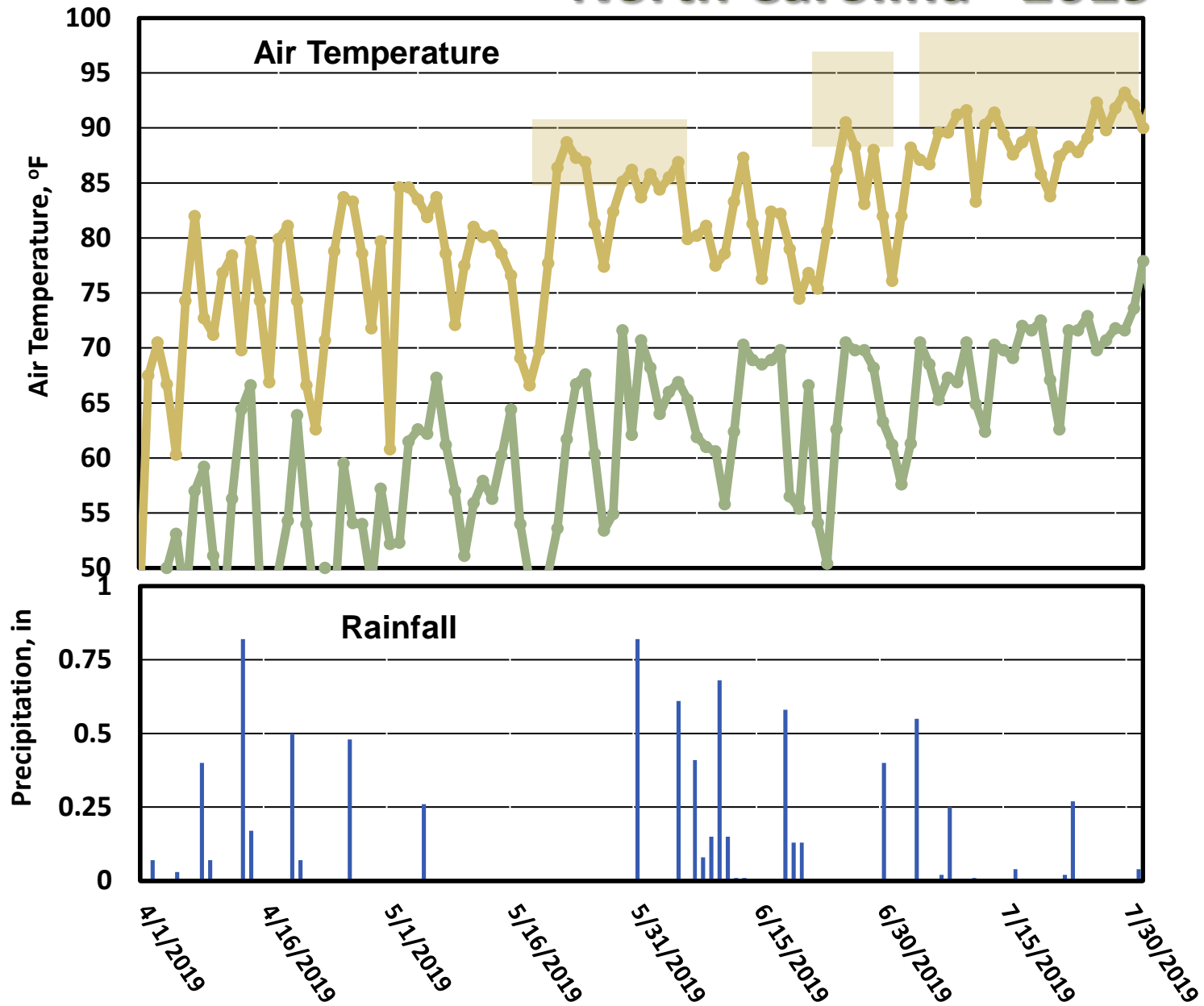
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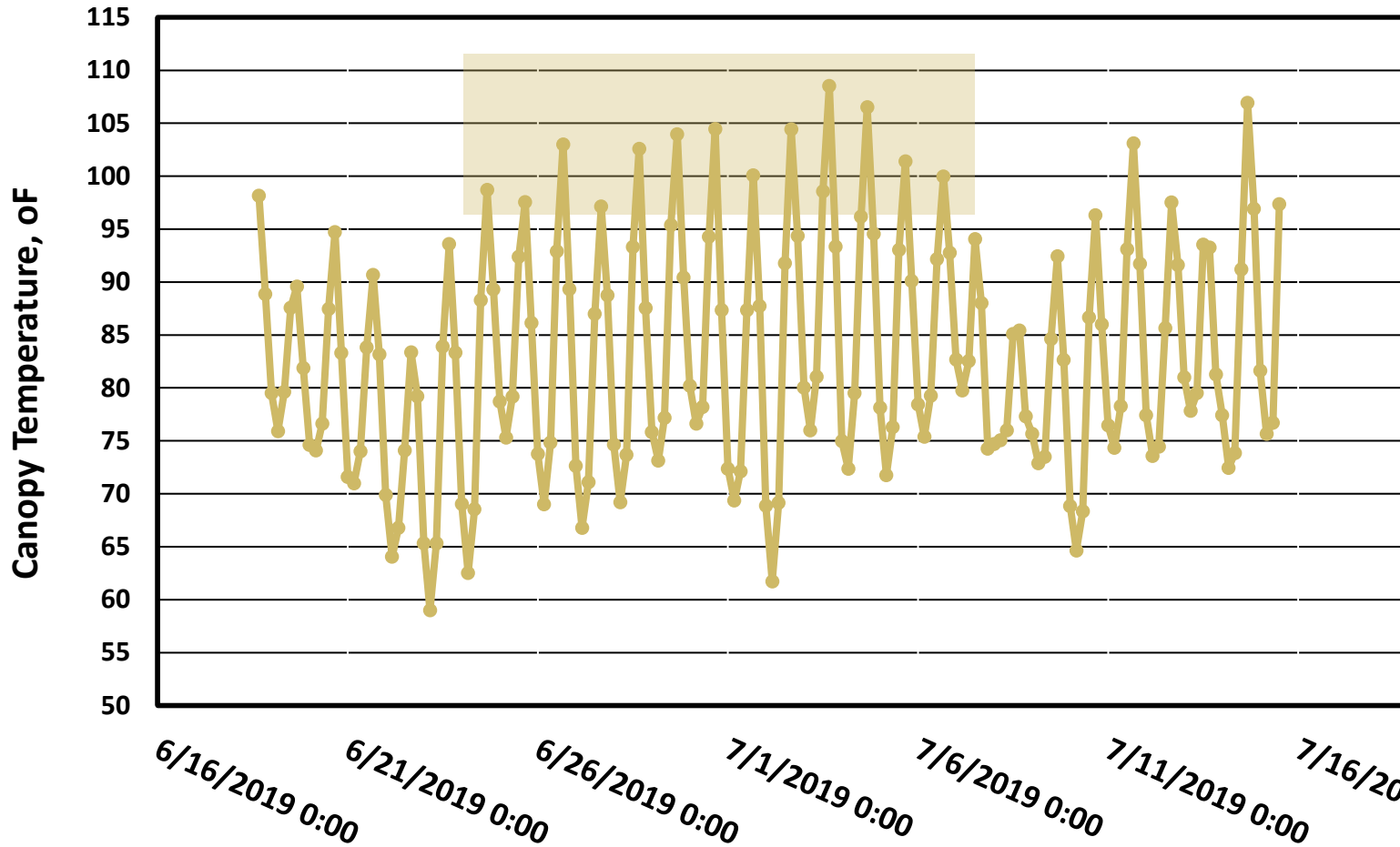




North Carolina - 2019



Canopy Temperature at 32,000 seeds/acre



Planting Dates and GDD to Silking to Avoid

Planting Date	Hybrid Maturity – Growing Degree Days to Silking			
	1200	1300	1400	1500
	----- First Day of Silking -----			
April 5	June 17	June 21	June 25	June 29
April 10	June 18	June 22	June 27	June 30
April 15	June 21	June 25	June 29	July 3
April 20	June 23	June 28	July 2	July 6
April 25	June 26	June 30	July 3	July 8
April 30	June 29	July 3	July 7	July 11
May 5	July 2	July 6	July 10	July 14
May 10	July 5	July 9	July 13	July 18
May 15	July 8	July 12	July 16	July 20



What to Expect: Fall 2019 – Summer 2020

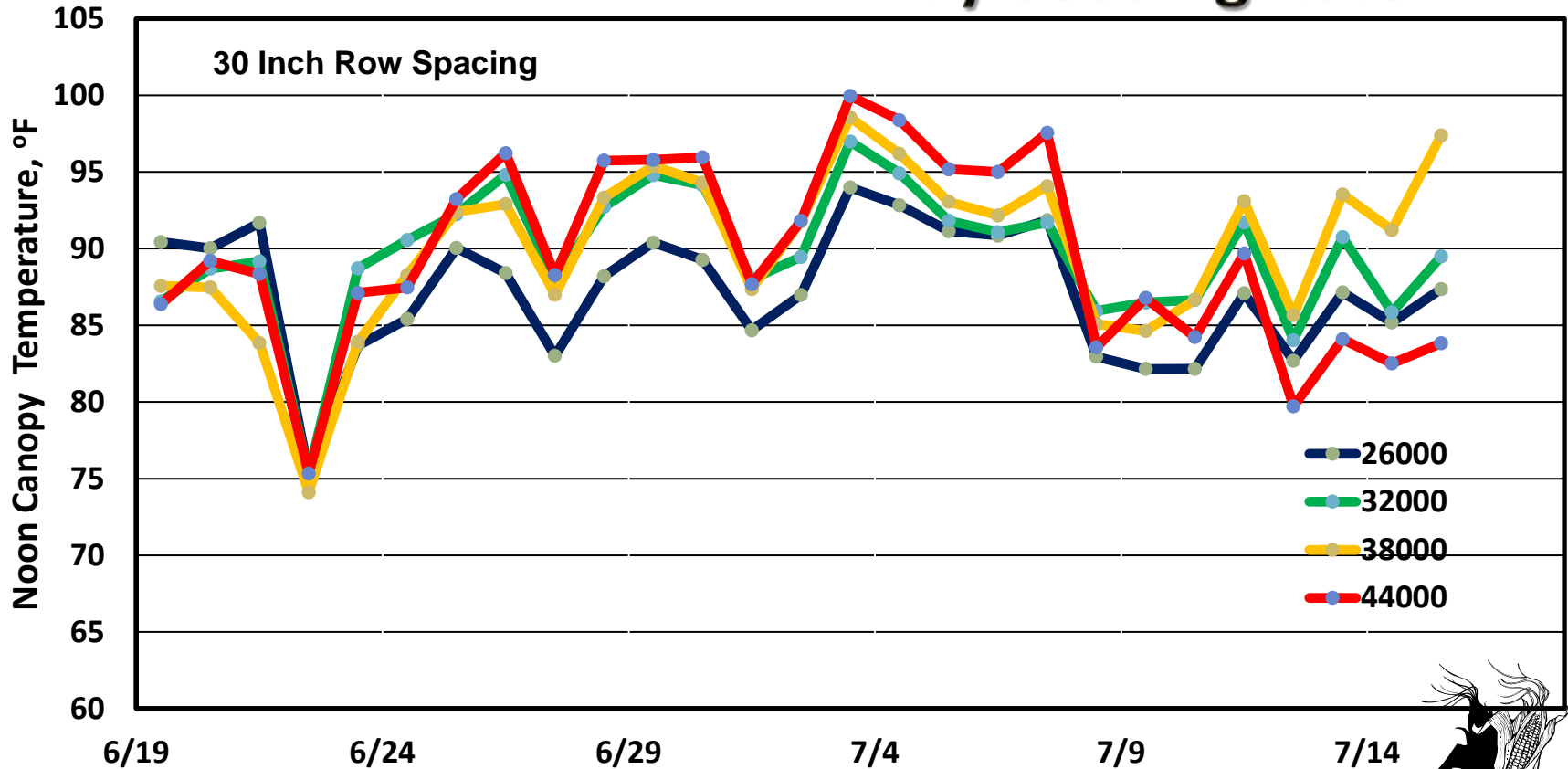
- El Nino is over. Outlook for **neutral** conditions. Possibility that El Nino will return in spring is only 30%.
- Return of Bermuda high pressure has restricted heavy rainfall pattern we saw in 2017 and 2018.
- Mild weather in November with cold temperatures delayed until late December – increasing chance of rainfall from late Nov through Dec
- Cold temperatures and average rainfall in January into Late March
- Cool weather with above average rainfall in April through July highest probability of stress from June 25 to July 4.
- Dryer conditions set in in late July with Hot temperatures the last two weeks in July through August



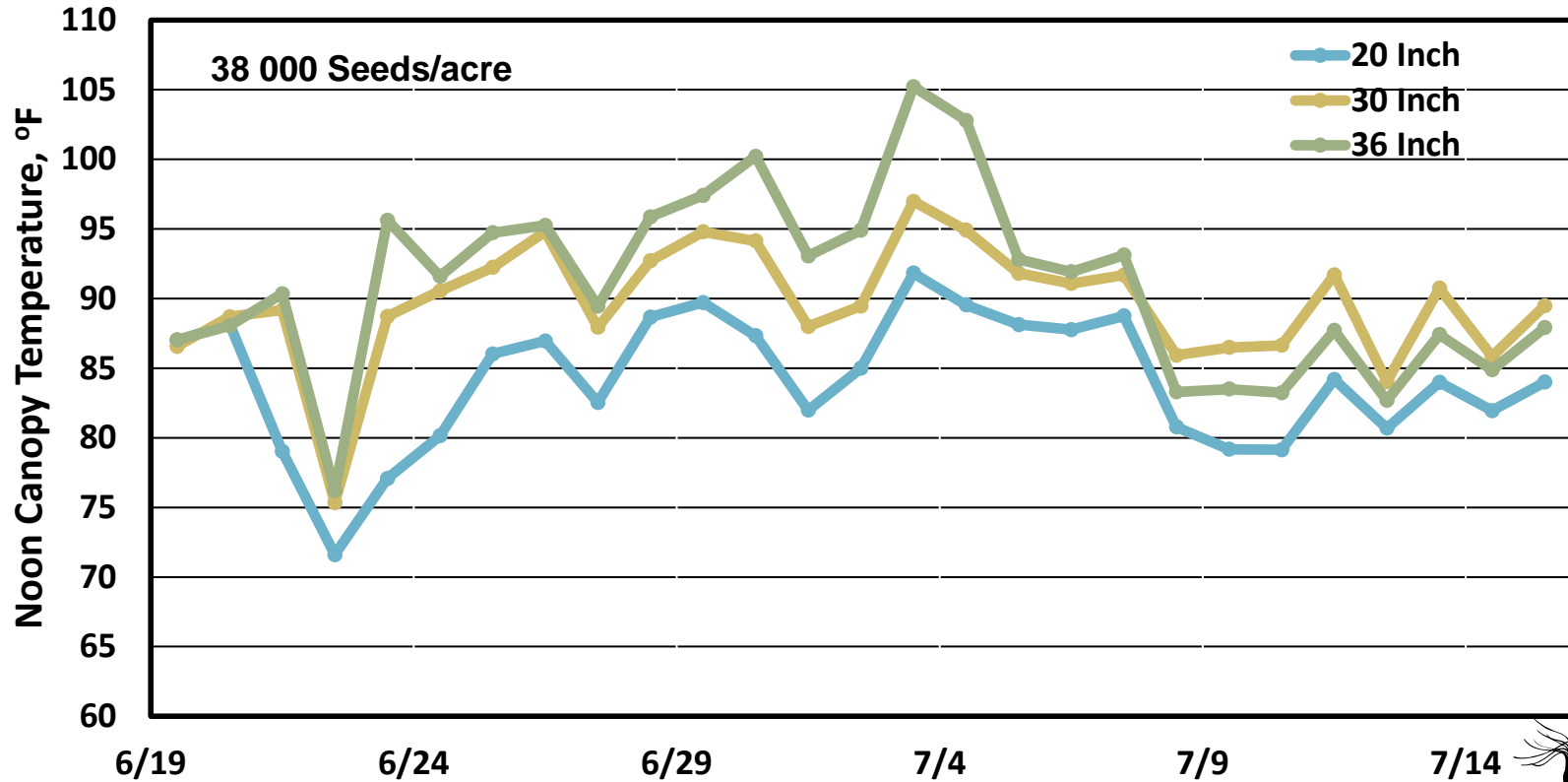
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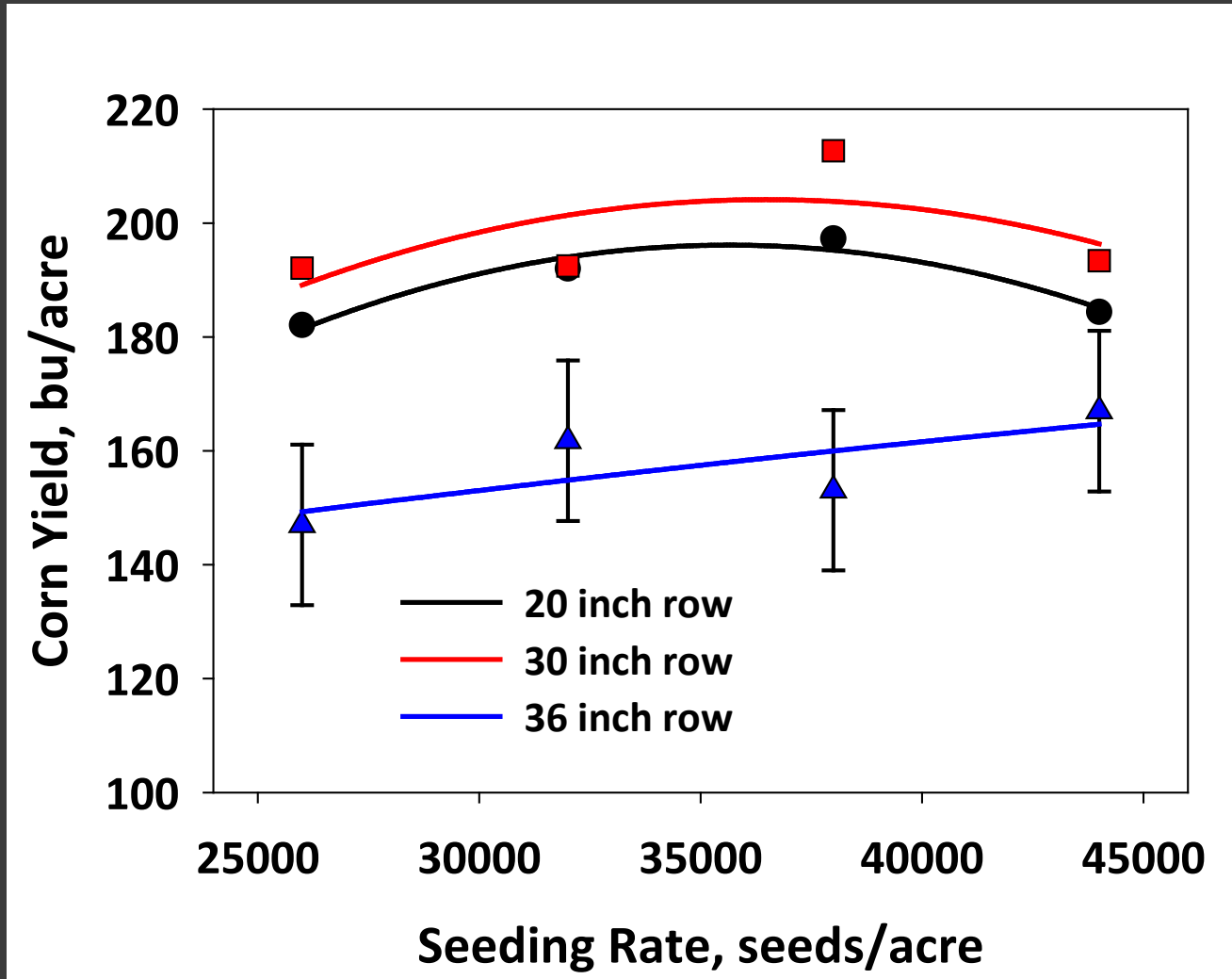
Canopy Temperature at Noon By Seeding Rate



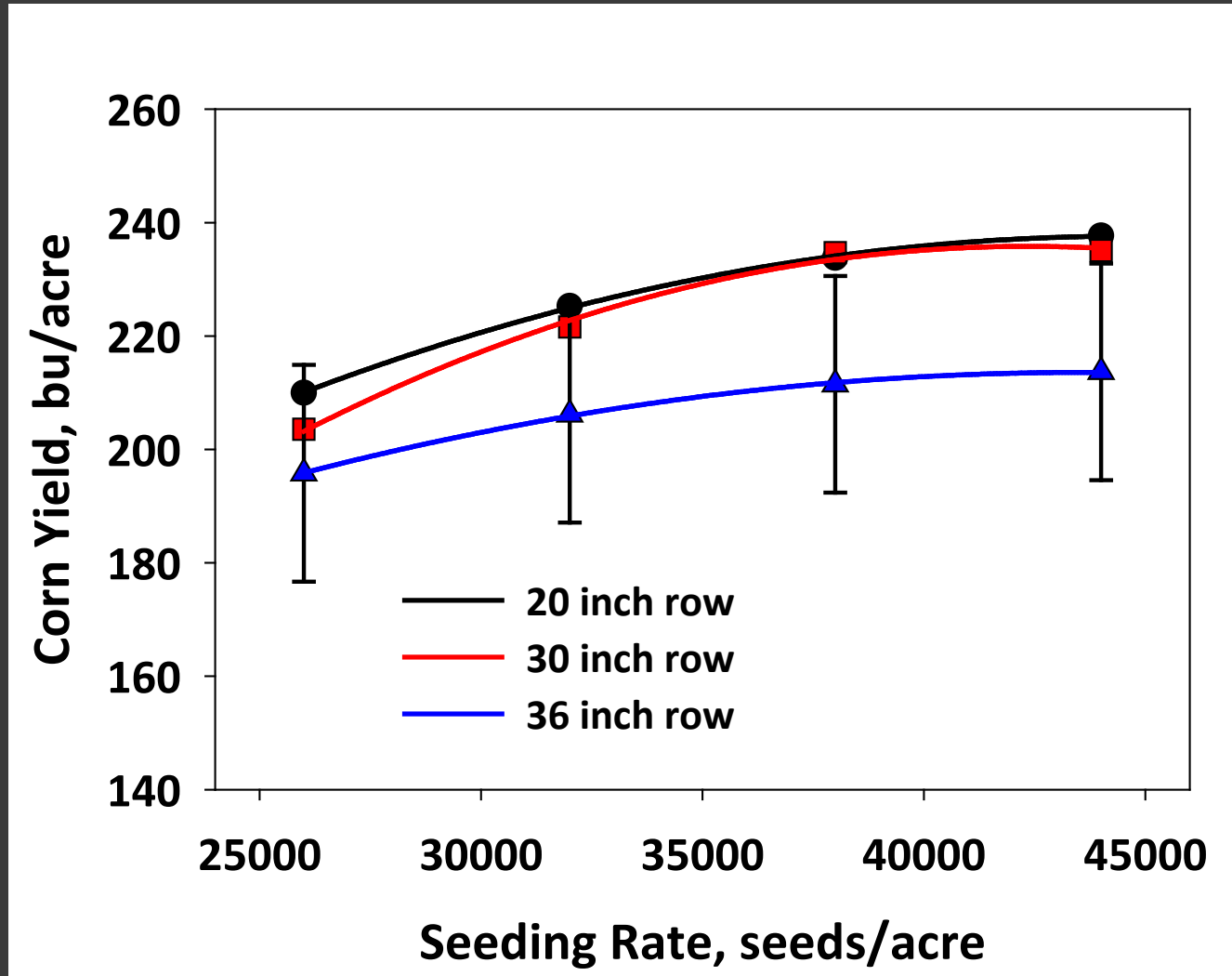
Canopy Temperature at Noon By Row Spacing



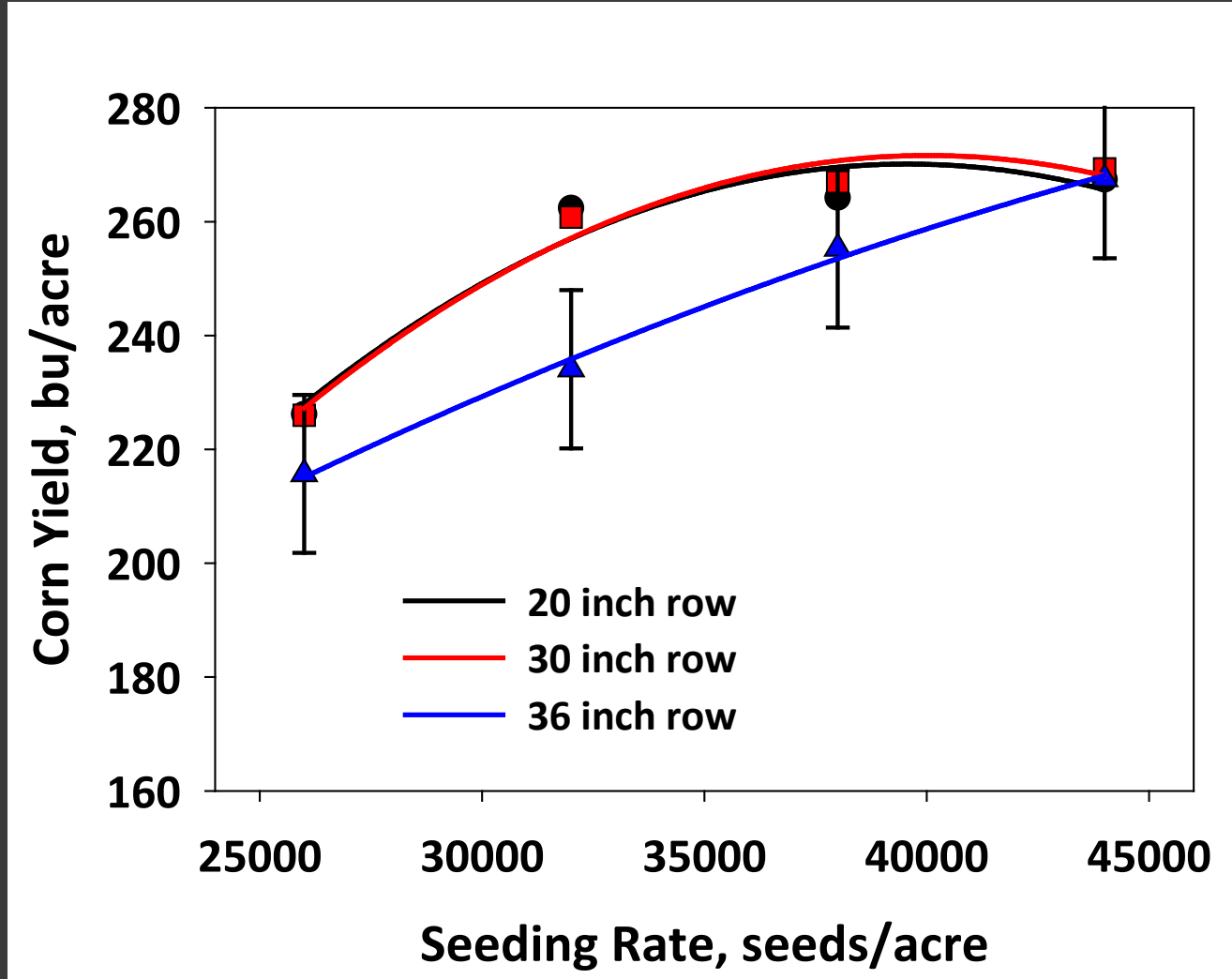
Corn Yield with Heat and Drought Stress

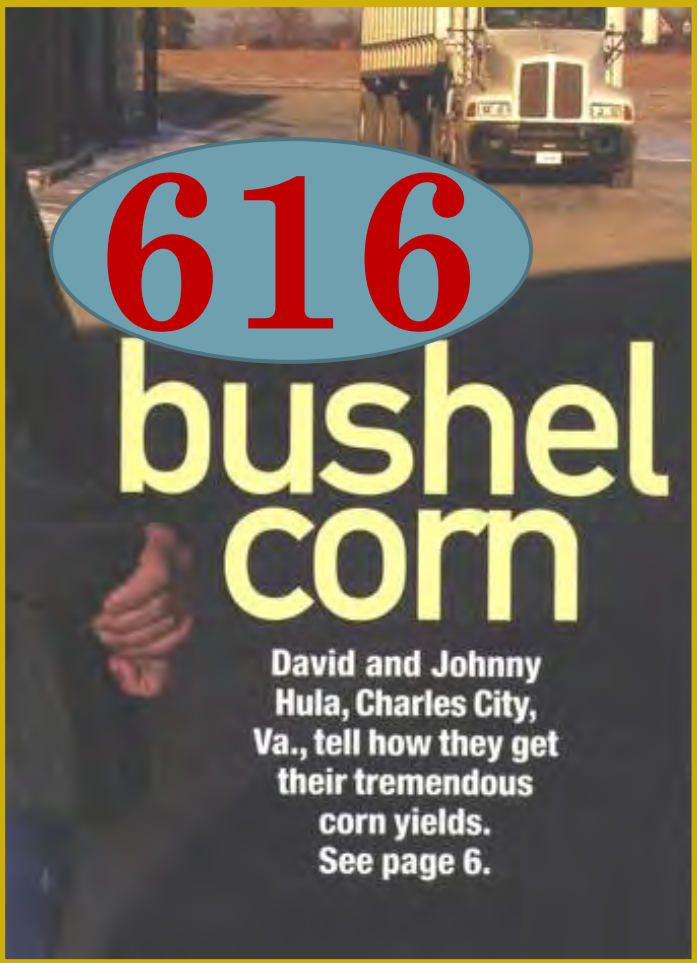
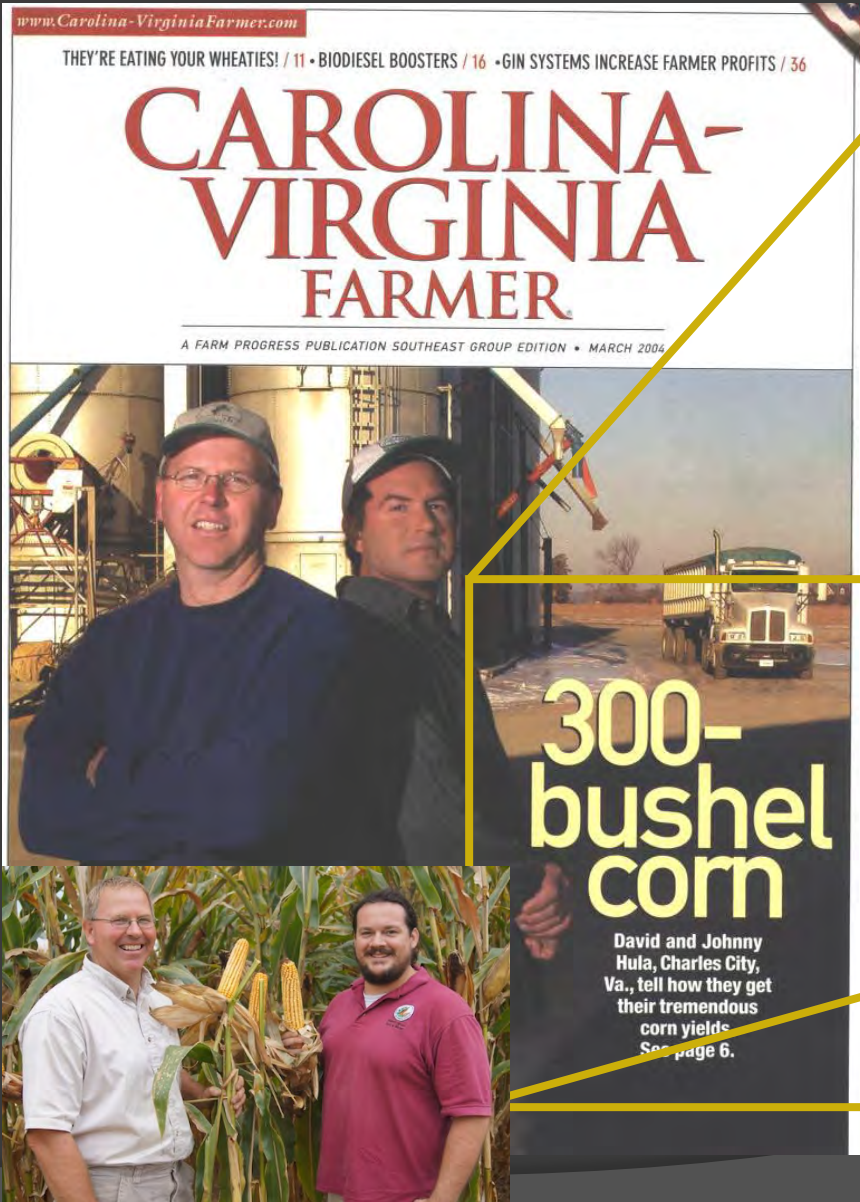


Corn Yield with Irrigation – Planted May 8



Corn Yield with Irrigation – Planted April 16





Complex World of Soil



Indicators of Soil Health

1. Porosity - > 50%
2. Water—Air balance
3. Soil Carbon (Organic Matter)
4. Structure
5. Microbial and Root Activity
6. Exudates
7. Available Nutrients



Nutrient Environment: The Right Uptake

Controlling the Seedling Environment

- ❖ Drainage / pH – Right ratio of air to water in soil pores
- ❖ Soil Biology/Health
- ❖ Starter Fertilizer with P
- ❖ Nitrogen at Planting
- ❖ Micronutrients





Treatment	Hyde County	Sampson County	Lenior County	Robeson County	Over All Sites
	----- Yield (bu/acre) -----				
MST (Seed trmt) @ 4 oz/cwt + SP1 (biological stimulator) @ 3 gpa + 10-27-0 @ 10 gpa	272.5	252.9	130.5	202.8	214.7
Albit (plant enzyme stimulator) @ 0.4 oz/a	270.9	242.0	144.0	196.8	213.4
Levitate (5-15-5 + Zn + biological catalyst) @ 3 gpa	270.9	255.2	126.7	194.8	211.9
10-27-0 @ 10 gpa	264.7	242.6	142.3	191.9	210.4
Levitate @ 3 gpa + Radiate (root growth hormone) @ 4 oz/a	271.9	249.5	122.7	197.3	210.3
Midnight (foliar 10-8-4-3 + Fe and Zn) @ 5 gpa	269.2	246.4	127.7	193.2	209.1
BioStrain (microbial strains/bacteria) @ 1 qt/a	263.7	249.1	127.8	192.7	208.3
Monty's Liquid Carbon (Humic acid) @ 2qt/a	255.9	246.6	131.6	195.1	207.3
Accomplish (Biological catalyst) @ 2 qt/a	276.8	244.7	n/a	191.1	205.1
Select (Seed Trmt) @ 6 oz/a Ag Formula (plant enzyme stimulator) @ 16 oz/a	255.0	240.4	129.5	190.2	203.8
Untreated Check	262.2	236.1	107.6	183.4	199.2

Treatment	Yield +/- over check	Gross Return @ \$5.00/bu	Cost of Treatment	ROI over check	Yield Over All Sites
	Bu/a	\$	\$	\$	Bu/a
MST (Seed trmt) @ 4 oz/cwt + SP1 (biological stimulator) @ 3 gpa + 10-27-0 @ 10 gpa	+ 15.5	\$77.50	\$67.70	\$9.80	214.7
Albit (plant enzyme stimulator) @ 0.4 oz/a	+ 14.2	\$71.00	\$5.38	\$65.62	213.4
Levitate (5-15-5 + Zn + biological catalyst) @ 3 gpa	+ 12.7	\$63.50	\$36.00	\$27.50	211.9
10-27-0 @ 10 gpa	+ 11.2	\$56.00	\$24.70	\$31.30	210.4
Levitate @ 3 gpa + Radiate (root growth hormone) @ 4 oz/a	+ 11.1	\$55.50	\$46.00	\$9.50	210.3
Midnight (foliar 10-8-4-3 + Fe and Zn) @ 5 gpa	+ 9.9	\$49.50	\$45.00	\$4.50	209.1
BioStrain (microbial strains/bacteria) @ 1 qt/a	+ 9.1	\$45.50	\$14.00	\$31.50	208.3
Monty's Liquid Carbon (Humic acid) @ 2qt/a	+ 8.1	\$40.50	\$12.50	\$28.00	207.3
Accomplish (Biological catalyst) @ 2 qt/a	+ 5.9	\$29.50	\$15.00	\$14.50	205.1
Select (Seed Trmt) @ 6 oz/a Ag Formula (plant enzyme stimulator) @ 16 oz/a	+ 4.6	\$23.00	\$34.44	-\$11.44	203.8
Untreated Check	0	0	0	0	199.2

Achieving Greater Yield

KNOW YOUR GENETICS

- How will your hybrid stand up to stress?
- Good Hybrid can Yield under a range of environmental and management conditions

KNOW HOW TO MANAGE TEMPERATURE

- Manage Temperature by Managing Timing and Water

KNOW YOUR SOIL

- Are You Improving Soil Health?



Questions



Romans 8:28 And we know that God works all things together for the good of those ... who are called according to His purpose.

