2021
FIELD RESEARCH
SCOTT LEARNING CENTER

SCOTT LEARNING CENTER
SCOTT, MISSISSIPPI

Welcome to the 2021 Field Research Book for the Scott Learning Center in Scott, MS. This book summarizes the results from our 2021 field research program. The Scott Learning Center (SLC) targets its research on corn, cotton, and soybean for Southern U.S. crop production.

The 2021 production season presented unique challenges for the Southern U.S. Through pandemics, floods, and drought the staff at the Learning Center continued to plant, maintain, and harvest a robust set of research plots in spite of the difficulties encountered by Southern growers during the season.

This book contains results about cotton product response to plant growth regulator applications, soybean planting date and planting error studies, as well as a variety of corn production practice evaluations. Our 2021 program also included many trials evaluating exciting new germplasm offerings from Asgrow®, DEKALB® and Deltapine®. We welcome you to use this data as part of the decision-making process on your farms.

The SLC continues to focus on grower questions and solutions. Many of the studies conducted were the result of observations made in our area or specific questions asked by customers. Please feel free to call us or provide any feedback on how we can add to or improve our program for 2022. There is a QR code contained in this book leading to a survey that will help us improve the program at Scott.

We hope to welcome visitors during 2022 and would invite anyone interested to contact the Learning Center Staff to schedule a visit. Our contacts are listed below:

Krista Fratesi -- krista.fratesi@bayer.com

Joseph Cummins – joseph.cummins@bayer.com

Jay Mahaffey – jay.mahaffey@bayer.com

Thank you and please call or email to schedule a visit!

The Staff of the Scott Learning Center

QR Code to SLC Survey – Please help us grow our program at the SLC. This QR code leads to a survey about the value to farmers of the data generated by the SLC. Responses to this survey will be anonymous and will help keep the Scott Learning Center moving forward to the benefit of southern agriculture.

Follow us on Facebook and Twitter for agronomic info and tour updates.

@Bayer4CropsScottLC

@ideasgotogrow

CATEGORY:

The reports in this book are arranged by crop. Each report is also tagged with one of these icons to quickly show you what it's about.

TABLE OF CONTENTS

Does the Day of Corn Emergence Matter?

Trial Objective

- Research and experience have shown that uniform corn emergence helps maximize yield potential.
- Although a great effort is spent to establish a uniform corn stand, sometimes emergence delays can occur due to equipment, soil conditions, weather conditions, planting depth, and seed quality.
- Growers would like to know at what point an emergence delay begins to impact yield.
- This trial was established to help evaluate the impact of emergence timing on corn yield potential.

Research Site Details

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (bu/acre)	Seeding Rate (seeds/acre)
Scott, MS	Commerce Silt Loam	Cotton	Conventional	4/7/2021	8/24/2021	250	36,000

- DKC70-27 Brand was planted at a depth of 2.5 inches and a seeding rate of 36,000 seeds per acre using standard parameters with commercial planting equipment.
- Corn emergence began 5 days after planting (DAP).
- A total of 13 samples were taken starting at first emergence. Samples were taken from 20 feet of corn row (Figure 1).
- Every emerged plant was marked at a similar time each day, typically at 9:00 in the morning (Figure 2).
- Plants were marked for 5 days and tagged into sample treatments (Figure 3).
- Corn ears were hand harvested at maturity and separated into samples representing each day of emergence up to 11 DAP or greater. A total of 639 ears were harvested and shelled.
- Ears were hand shelled and samples were weighed in grams and averaged by sample across the experiment to estimate the impacts of day of emergence on corn grain yield.
- All grain weights were corrected to a standard moisture of 15.5%.

Figure 1. Corn row sampled showing marked emerged plants.

Figure 2. Corn plants were marked as they emerged over a 5-day period.

Figure 3. Corn plants were tagged into samples starting at first emergence.

Does the Day of Corn Emergence Matter?

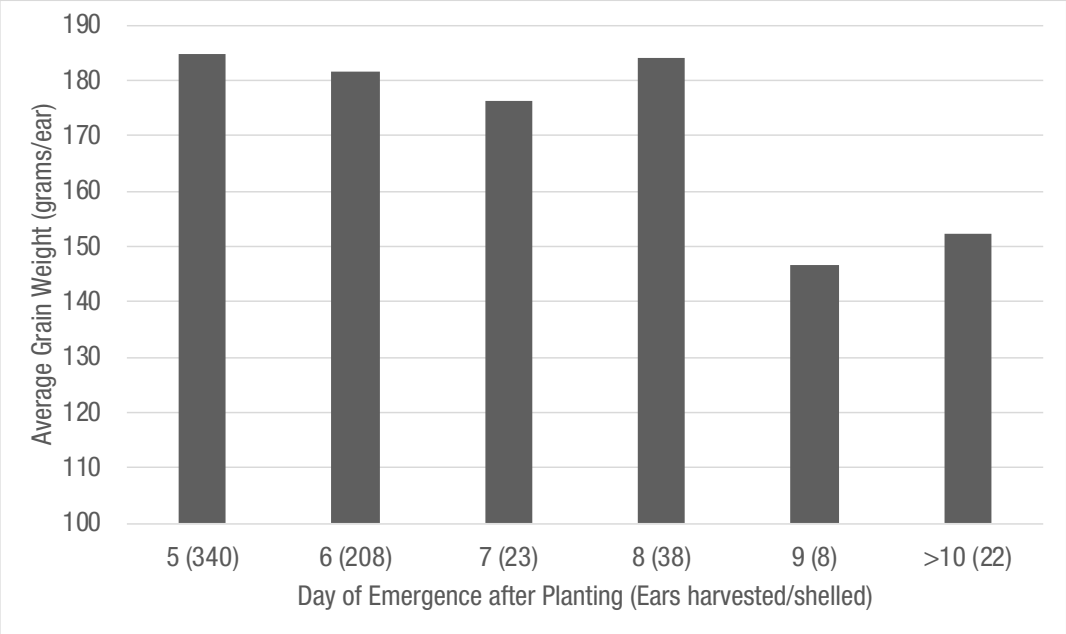

Figure 4. Average corn grain weight per ear as influenced by day of emergence after planting.

Understanding the Results

- Averaged across the samples, 93.4% of the planted seeds established a plant or ear.
- The final stand in the experiment averaged 33,803 plants or ears per acre.
- This experiment had an average yield of 230.9 bushels per acre as calculated from the hand shelled grain weights across the samples. This was very close to the machine harvested field average of a neighboring corn experiment, indicating that the samples were representative of commercial production.
- No reduction in grain weight per ear was observed through the first 4 days of emergence (5 to 8 DAP) (Figure 4).
- On day 5 of emergence (9+ DAP) ear size was reduced by approximately 20% compared to the earlier emerging plants (Figure 4).
- Non-synchronous pollination did not appear to be a factor in this experiment. All of the sampled plants pollinated with some yielding less possibly due to competition and shading effects from neighboring plants. Plant to plant competition likely had a greater impact on later emerging plants.

Key Learnings

- In this trial, yield impacts were not observed between corn plants emerging during the first 8 days after planting.
- Growers should aim for uniform plant emergence; however, based on this trial, a few days of variation in plant emergence may not have a substantial impact on yield potential.

Legal Statements

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I'm ready to plant, but should I? Corn Planting Based on Date, Corn Product, Seeding Rate and Seeding Depth

Trial Objective

- Historically, corn growers in the Southern United States plant as soon as field conditions permit with little regard to forecasted weather conditions.
- Early planting can help promote early pollination, good ear fill conditions, and earlier harvest timing; however, corn is often exposed to cool, wet weather during stand establishment.
- A 2021 trial was planted at Scott, Mississippi on three dates to evaluate planting early into stressful conditions (a typical planting date), planting during favorable conditions, and planting late.
- Corn plants were evaluated for plant emergence, plant characteristics (ear height), and average yield across the treatments.

Research Site Details

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (bu/acre)	Seeding Rate (seeds/acre)
Scott, MS	Commerce Silty Clay Loam	Soybean	Conventional	3/12/2021 4/5/2021 5/10/2021	8/25/2021 8/25/2021 9/8/2021	200 250 200	DKC67-44 Brand: 32,000 and 34,000 DKC65-99 Brand: 34,000 and 37,500

  - » Field work and inputs followed local standards.
  - » 275 lbs of nitrogen was surface applied as a 28-0-0-5 fertilizer product.
  - » Corn was planted in 38-inch single row configuration.
  - » Trial was designed as a single replicate, single location trial.
- Two DEKALB® corn products were planted:
  - » DKC67-44 Brand (VT Double PRO® Technology)
  - » DKC65-99 Brand (Trecepta® Technology)
- Each product was planted on three planting dates:
  - » March 12, 2021 – Planted into cool, wet, marginal conditions.
  - » April 5, 2021 – Planted into ideal conditions.
  - » May 10, 2021 – Ideal conditions but considered late planting for the local area.
- Two seeding rates per corn product were planted. The lower seeding rate represents a lower than recommended rate for the product planted. The higher seeding rate was targeted to exceed ideal seeding rates as indicated by previous experience and data.
- No lodging or bird predation was recorded in the trial. Effects on yield are measured effects on plant development and grain fill during the growing season.

I'm ready to plant, but should I?
Corn Planting Based on Date, Corn Product, Seeding Rate and Seeding Depth

Understanding the Results

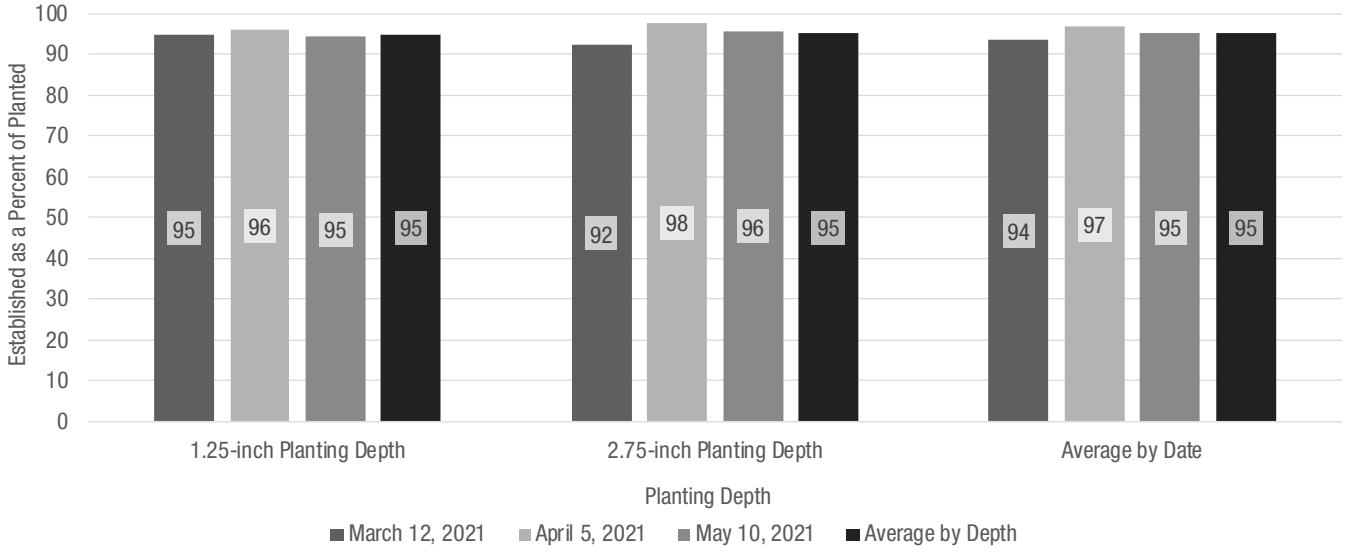

Figure 1. Averaged across populations and both corn products, plant establishment as a percent of planted kernels based on seeding depths and planting dates.

Stand Establishment

- The 2.75-inch planting depth on the March 12th planting date trended lower (92 percent established) compared to other dates (95 to 98 percent established).
- Stand establishment did not vary greatly across planting date by planting depth interactions but was numerically reduced at the deeper planting depth on the early planting date.

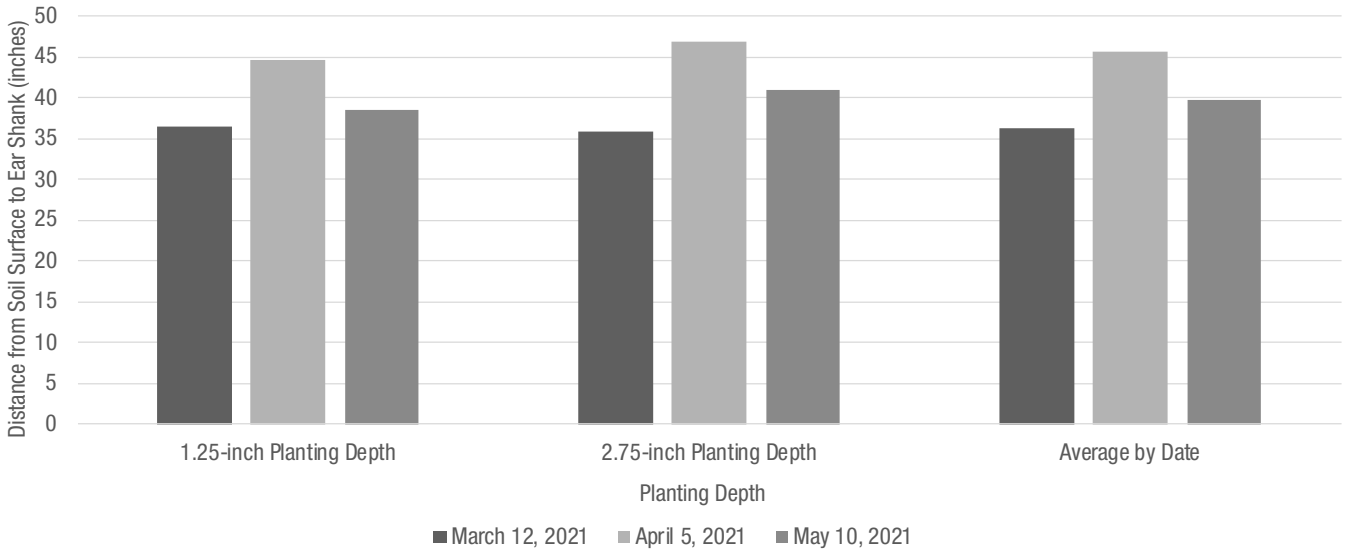

Figure 2. Averaged across both corn products, distance from soil surface to ear shank based on seeding depth and planting date.

I'm ready to plant, but should I?
Corn Planting Based on Date, Corn Product, Seeding Rate and Seeding Depth

Ear Height

- **Planting depth** had minimal, if any, influence on ear height.
- **Planting date** may have had an influence on ear height, which may have been due to either good or stressful conditions that followed.
  - » The early planting date (March 12, 2021) had the lowest ear height at 36 inches.
  - » The mid-planting date (April 5, 2021) had the highest ear height at 46 inches.
  - » The late planting date (May 10, 2021) had an intermediate height at 40 inches from soil surface to ear shank.

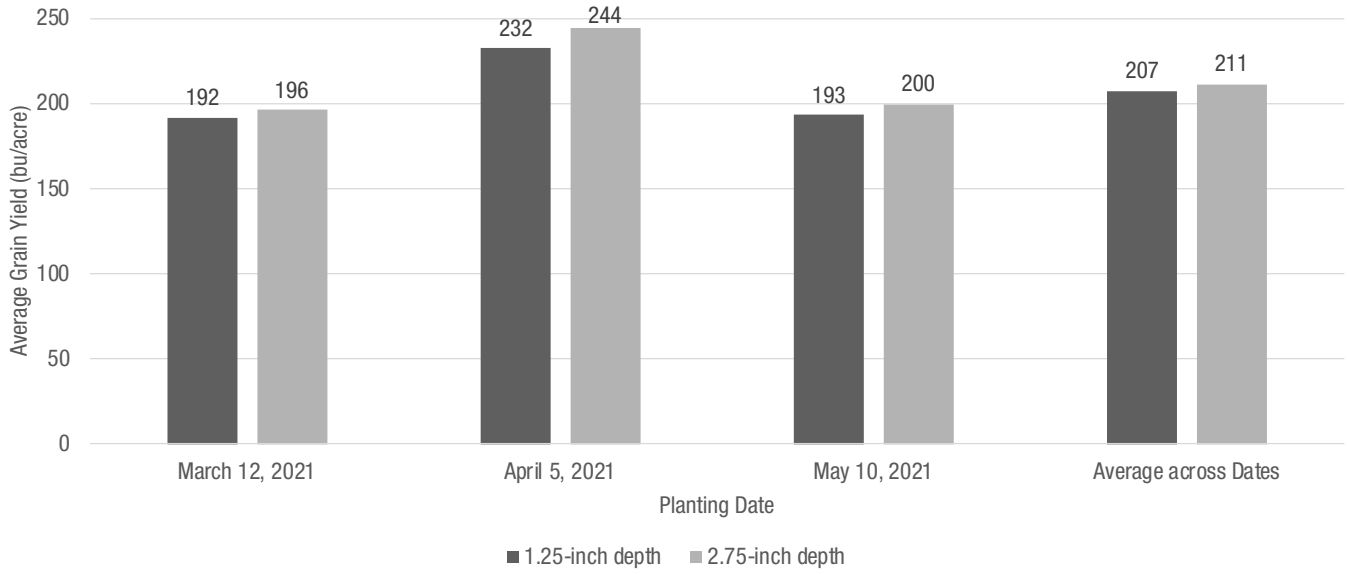

Figure 3. Averaged across both corn products, grain yield (at 15.5% kernel moisture) based on planting date and seeding depth.

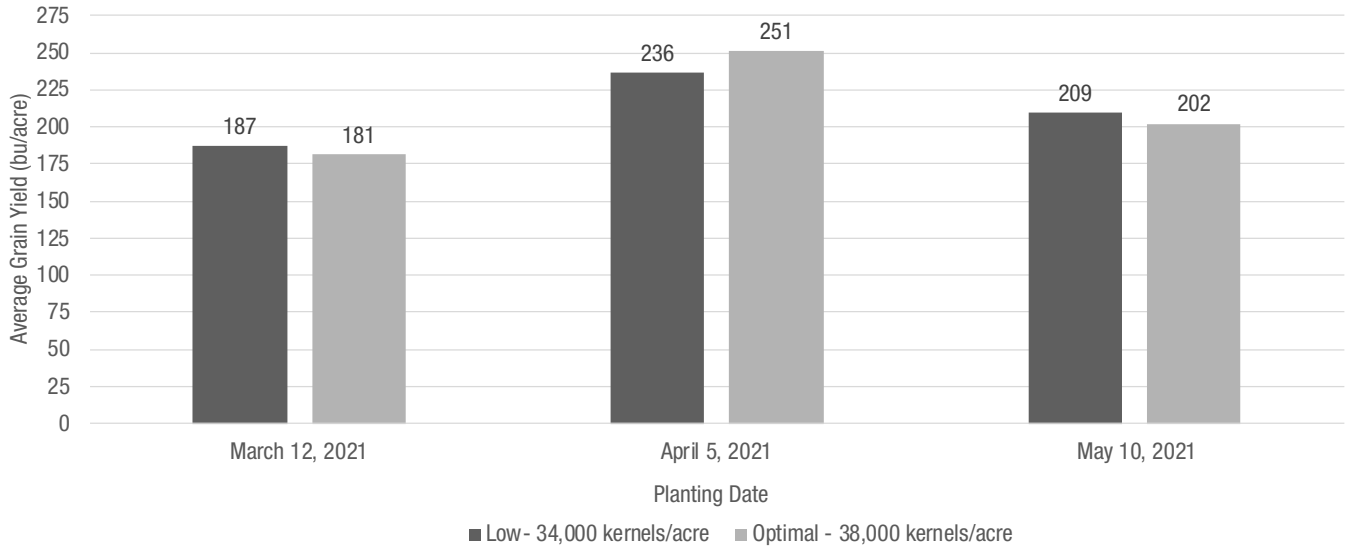

Figure 4. Effect of planting date and seeding rate on average grain yield (at 15.5% kernel moisture) of DKC65-99 Brand.

I'm ready to plant, but should I?
Corn Planting Based on Date, Corn Product, Seeding Rate and Seeding Depth

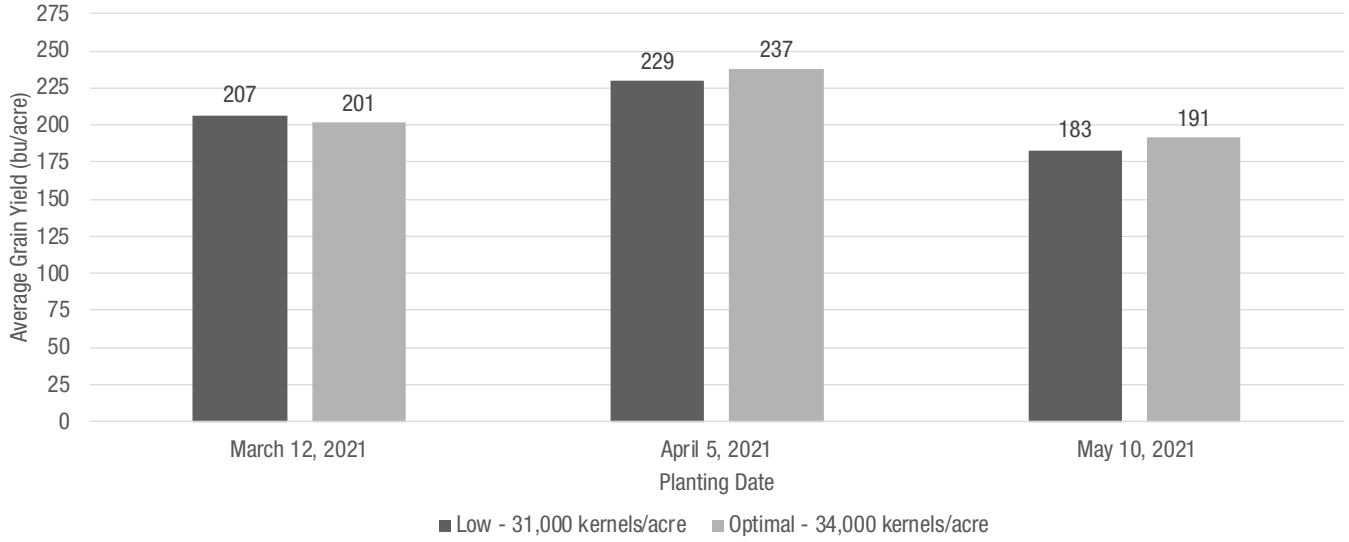

Figure 5. Effect of planting date and seeding rate on average grain yield (at 15.5% kernel moisture) of DKC67-44 Brand.

Grain Yield

- Corn planted with the 2.75-inch **planting depth** yielded numerically more than corn planted at the 1.25-inch depth across planting dates and tested corn products. Yield response ranged from 4 to 14 bu/acre with higher yields at deeper planting.
- **Corn products** tested demonstrated average yields of 179 to 259 bu/acre across the tested treatment combinations.
- Both corn products tested had greater responses to higher **seeding rates** on the April 5th planting date. The March 12th and May 10th dates showed reduced responses to seeding rates but were also lower yielding.
- **Planting date** was the most influential yield factor across this demonstration.
  - » The March 12th planting date averaged 194 bu/acre across all treatments.
  - » The May 10th planting date yielded a similar result at 197 bu/acre.
  - » The April 5th planting date was the highest yielding date for this trial at 238 bu/acre.
    - » A yield gain of 44 bu/acre from the April 5th planting date, combined with $5.38/bu corn prices, provides a potential return or loss of $236.72/acre for timely, well executed planting.
- The yield gain may be due to more favorable growing conditions during germination and establishment. Stands were reduced by 500 and 1200 plants per acre for the March 12th and May 10th dates, as compared to the April 5th date. This does not account for the variations in yield measured here.

I'm ready to plant, but should I?
Corn Planting Based on Date, Corn Product, Seeding Rate and Seeding Depth

Key Learnings

- When possible, growers should avoid determining planting decisions solely on field moisture status or calendar date. These data indicate planting should be delayed until conditions improve if forecast conditions do not favor the development of healthy plants.
- For this demonstration, planting depth did not have a large impact on stand establishment regardless of planting date and conditions. However, previous Scott Learning Center research has demonstrated positive benefits from deeper corn planting: reduced bird predation, increased rooting and standability. For these reasons, growers should consider deeper rather than shallower planting depths.
- Planting depth should be maintained deeper than 2 inches regardless of conditions. This often means setting the planter deeper than targeted to account for field conditions.
- Planting into harsh growing conditions early could lead to an increased risk of replanting. Later planting dates yielded similar to the earliest planting date; therefore, delayed planting could be an acceptable alternative to very early plantings during poor growing conditions.
- Growers should account for equipment factors, 7- to 10-day weather forecasts, and risk tolerance before making planting decisions.

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ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. B.t. products may not yet be registered in all states. Check with your seed brand representative for the registration status in your state.

IMPORTANT IRM INFORMATION: RIB Complete® corn blend products do not require the planting of a structured refuge except in the Cotton-Growing Area where corn earworm is a significant pest. See the IRM/Grower Guide for additional information. Always read and follow IRM requirements.

Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.

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Insect Resistance Management
Planting Refuges, Preserving Technology

Before opening a bag of seed, be sure to read, understand and accept the stewardship requirements, **including applicable refuge requirements for insect resistance management,** for the biotechnology traits expressed in the seed as set forth in the Monsanto Technology/Stewardship Agreement that you sign. By opening and using a bag of seed, you are reaffirming your obligation to comply with the most recent stewardship requirements.

Roundup Ready 2 TECHNOLOGY

RESPECT THE REFUGE®

ENVIRONMENT

Evaluation of DEKALB® Brand Corn Products –(2021)

Trial Objective

- Each season, the Bayer Learning Center at Scott, Mississippi evaluates market leading corn products for adaptability to the southern corn growing region (Figure 1).
- These experiments are conducted at Scott on different alluvial delta soil types. The Buckshot site is a heavy clay and the Highway site is deep sand.
- Yield potential and plant characteristics (ear height and weight) are important factors to consider when selecting a corn product for your operation.

Figure 1. DEKALB® brand yield trial at Scott, MS (2021).

Evaluation of DEKALB® Brand Corn Products – (2021)

Research Site Details

- » All field work, tillage, and herbicides were per local standards .
- » 275 lbs/acre of nitrogen (N) was applied to both experiments as liquid 28-0-0-5.

- There were 20 DEKALB® Brand products planted:
  - » DKC62-08 Brand (SmartStax® Corn)
  - » DKC62-53 Brand (VT Double PRO® Corn)
  - » DKC62-70 Brand (VT Double PRO® Corn)
  - » DKC62-89 Brand (Trecepta® Corn)
  - » DKC64-35 Brand (VT Double PRO® Corn)
  - » DKC65-84 Brand (SmartStax® Corn)
  - » DKC65-95 Brand (VT Double PRO® Corn)
  - » DKC65-99 Brand (Trecepta® Corn)
  - » DKC66-18 Brand (VT Double PRO® Corn)
  - » DKC66-75 Brand (VT Double PRO® Corn)
  - » DKC66-94 Brand (Roundup Ready® Corn 2)
  - » DKC67-37 Brand (SmartStax® Corn)
  - » DKC67-44 Brand (VT Double PRO® Corn)
  - » DKC67-72 Brand (VT Double PRO® Corn)
  - » DKC67-94 Brand (Trecepta® Corn)
  - » DKC68-48 Brand (SmartStax® Corn)
  - » DKC68-69 Brand (VT Double PRO® Corn)
  - » DKC68-95 Brand (SmartStax® Corn)
  - » DKC69-99 Brand (Trecepta® Corn)
  - » DKC70-27 Brand (VT Double PRO® Corn)
- Plots were single replicate planted in 38-inch wide six row strips.
  Row length varied from 360 to 600 feet long, and ranged from 0.16 to 0.26 acre/plot.

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (bu/acre)	Seeding Rate (seeds/acre)
Scott, MS	Buckshot (45 CEC)	Cotton	Conventional	4/6/2021	8/25/2021	250	37500
Scott, MS	Highway Field (15 CEC)	Cotton	Conventional	4/6/2021	8/25/2021	300	37500

- Data collected:
  - » Buckshot Site
    - » Average yield (bu/acre) determined by harvesting entire plot with commercial combine and moisture content corrected to 15.5%.
  - » Highway Site
    - » Average yield (bu/acre) determined by harvesting entire plot with commercial combine and moisture content corrected to 15.5%.
    - » Ear height – The height of 10 ears per product was measured from the ground to the ear shank.
    - » Ear weight – 10 ears per product were weighed.

Evaluation of DEKALB® Brand Corn Products – (2021)

Understanding the Results

- Plots averaged 92% stand establishment post emergence.
- Buckshot Site
  - » Yields were excellent in these soil types for 2021 with an average yield of 224 bu/acre.
  - » Several products tested had average yields in excess of 230 bu/acre indicating that the DEKALB® Brand offers several new and existing products that can yield well in heavy soils.

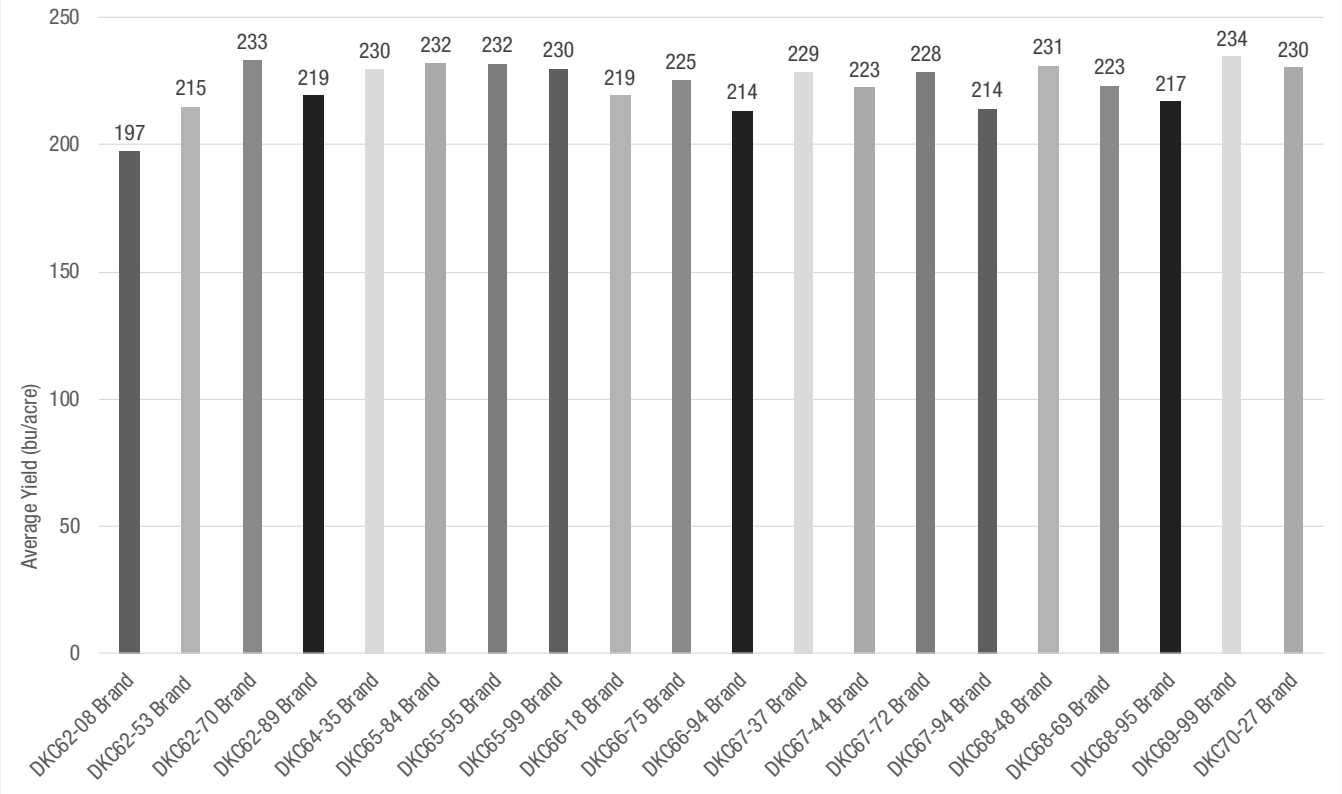

Figure 2. Average DEKALB® brand yield (bu/acre) at the Bayer Learning Center at Scott, MS Buckshot Field (2021) at 15.5% moisture content.

- Highway Site
  - » Yields at this location were higher than the Buckshot location with an average yield of 256 bu/acre.
  - » The highest average yields in this trial were in the 280 bu/acre range with several products (8 of 20) demonstrating average yields in excess of 260 bu/acre. In this trial, 15 of 20 tested products yielded more than 250 bu/acre.
  - » Ear height varied by up to 13 inches (23%) across the tested products.
  - » Ear weight varied by up to 50 grams (21%) across the tested products.

Evaluation of DEKALB® Brand Corn Products – (2021)

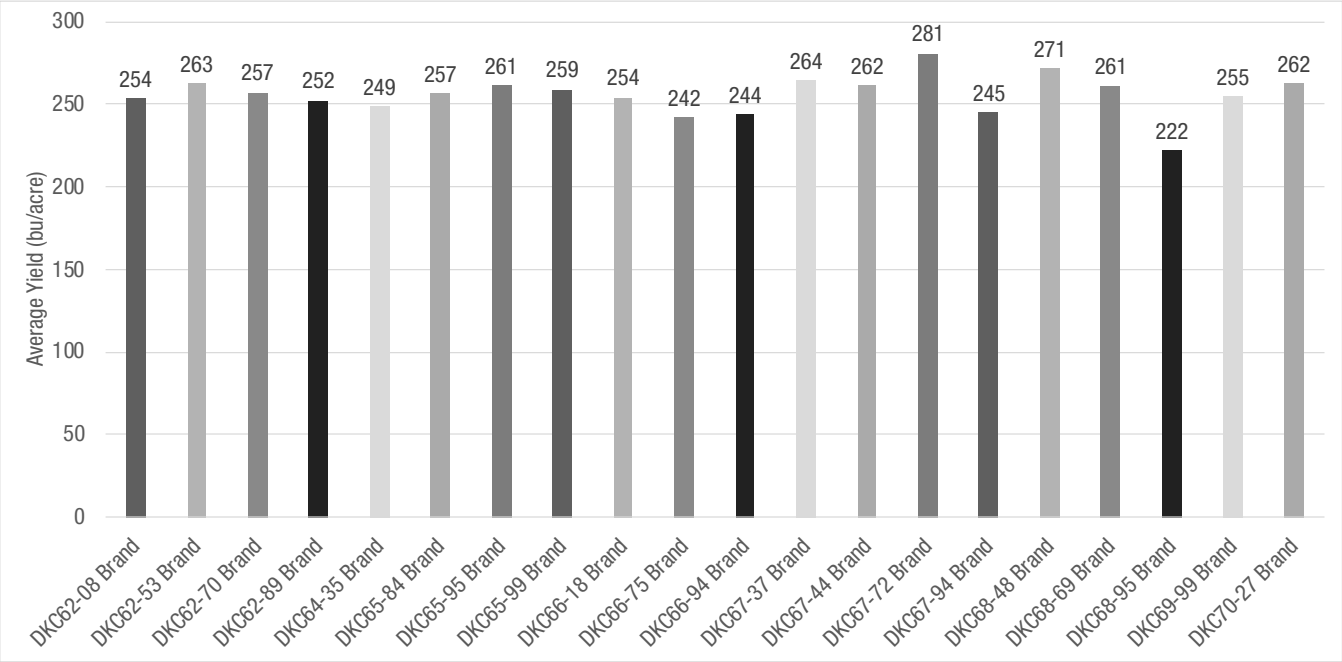

Figure 3. Average DEKALB® brand yield (bu/acre) at the Bayer Learning Center at Scott, MS Buckshot Field (2021) at 15.5% moisture content.

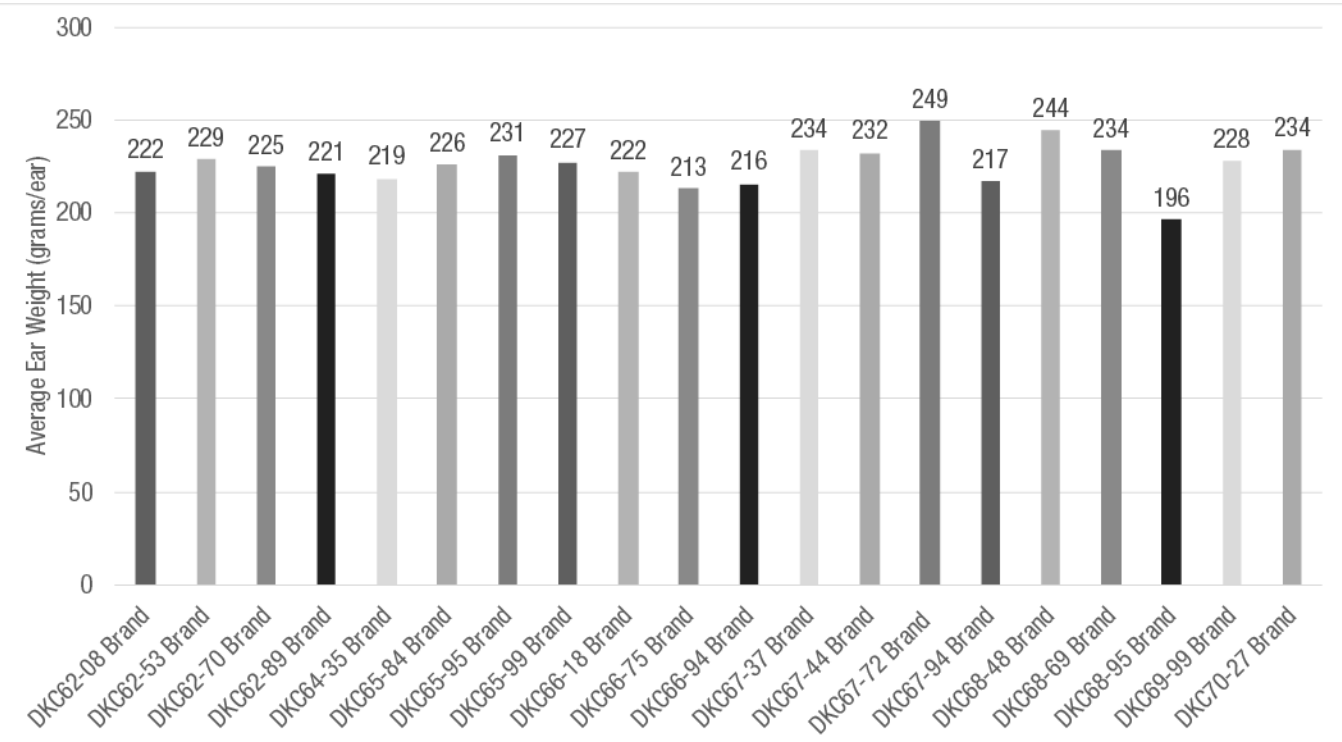

Figure 4. DEKALB® brand average ear weight (grams/ear) of 10 ears per product at the Bayer Learning Center at Scott, MS (Highway Field - 2021).

Evaluation of DEKALB® Brand Corn Products – (2021)

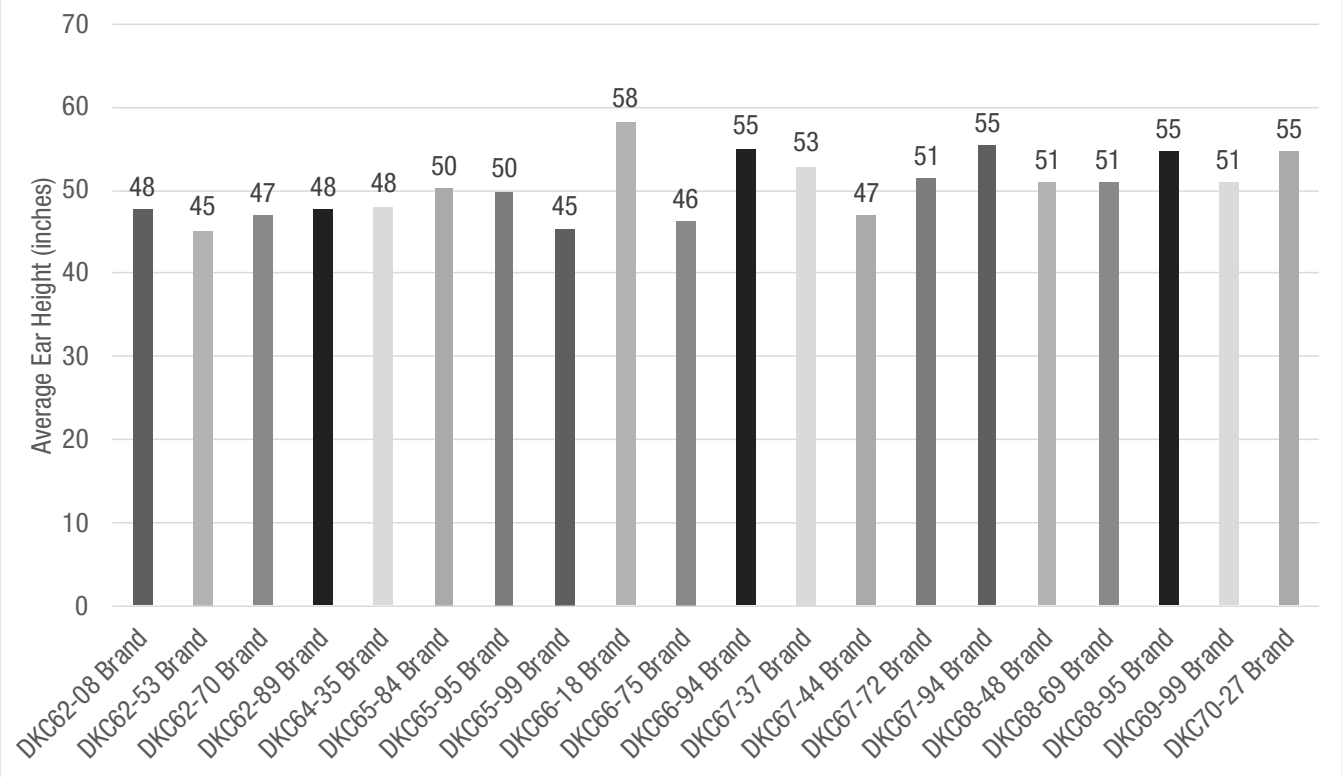

Figure 5. DEKALB® brand average ear height (inches) of 10 ears per product from ground to shank base at the Bayer Learning Center at Scott, MS (Highway Field - 2021).

Key Learnings

- Based on the average ear height, ear weight, and yield data from this trial, the DEKALB® brand offers a robust lineup of corn products that fit the diverse soil types of the Mississippi Delta.
- Growers should consider their personal preferences, product yield potential, and individual plant characteristics when selecting corn products for the 2022 growing season.

Evaluation of DEKALB® Brand Corn Products – (2021)

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Planting Refuges, Preserving Technology

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RESPECT THE REFUGE®

Roundup Ready® 2 TECHNOLOGY

LIBERTY LINK®

Yield Potential of DEKALB® Corn Products to Seeding Rate - 2021

Trial Objective

- Each season the Bayer Learning Center near Scott, Mississippi (SLC) evaluates a new class of corn products for adaptability to the southern corn growing region and their response to planting population.
- The evaluations are conducted at the SLC on soils with very high yield potential which are representative of the alluvial delta.
- Yield potential and plant characteristics (height, ear size) are very important factors to consider when choosing a corn product for your operation. Both height and ear size can have an influence on lodging potential and should be carefully considered when choosing a corn product to plant for 2022.
- The objective of this trial was to evaluate the yield potential and standability of DEKALB® corn products to planting populations.

Research Site Details

  - » All field work, tillage and herbicides were per local standards.
  - » The standard 275 lbs N applied to both experiments as liquid 28-0-0-5
- Products planted
  - » DKC62-70 BRAND
  - » DKC62-89 BRAND
  - » DKC65-84 BRAND
  - » DKC65-99 BRAND
  - » DKC66-18 BRAND
  - » DKC67-94 BRAND
  - » DKC68-48 BRAND
  - » DKC68-69 BRAND
  - » DKC68-95 BRAND
  - » DKC69-99 BRAND
  - » DKC70-27 BRAND
  - » The trial was conducted as a single strip plot and each plot was approximately 0.125 acre.
  - » Commercial harvest machinery
  - » All yields were corrected to 15.5% moisture

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (bu/acre)	Seeding Rate (seeds/acre)
Scott, MS	Commerce/Forrestdale Silt Loam	Cotton	Conventional	4/6/2021	8/25/2021	300	30,500 33,500 37,500 41,500

Yield Potential of DEKALB® Corn Products to Seeding Rate - 2021

- Planted on 38-inch single rows
- Trials averaged 97% stand establishment.
- Plant characteristics were measured since many growers often ask those questions. They can combine with other corn product characteristics to have an influence on lodging potential.
- Data collected as follows:
  - » Yield obtained by commercial combine via whole plot harvest – corrected to 15.5% moisture
  - » Established plant population counted on two 10 foot sections of row mid-season and converted to plants per acre.
  - » Ear height (inches) – Prior to harvest ear height from the soil line to the ear shank was measured on 10 ears per plot.
  - » Ear weight (grams shelled corn/ear) – Prior to harvest 10 ears were collected and shelled for ear weight estimations by corn product.

Understanding the Results

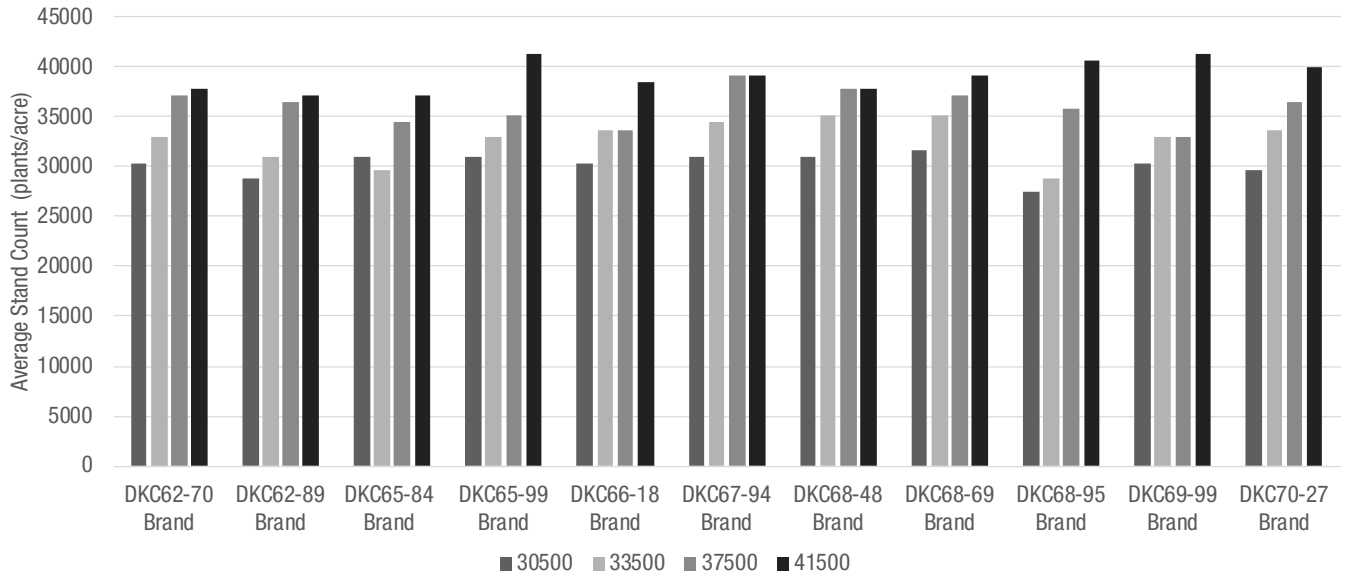

Figure 1. 2021 average stand count of 11 DEKALB® corn products by planting population near Scott, Mississippi.

Yield Potential of DEKALB® Corn Products to Seeding Rate - 2021

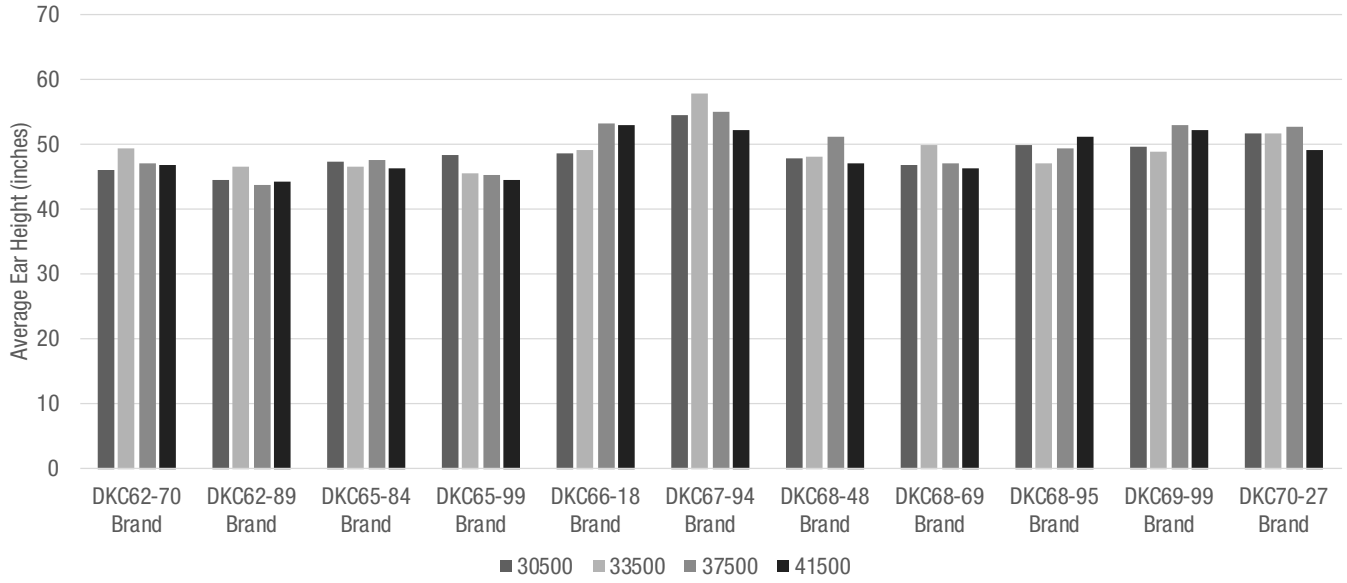

Figure 2. 2021 average ear height of 11 DEKALB® corn products by planting population near Scott, Mississippi.

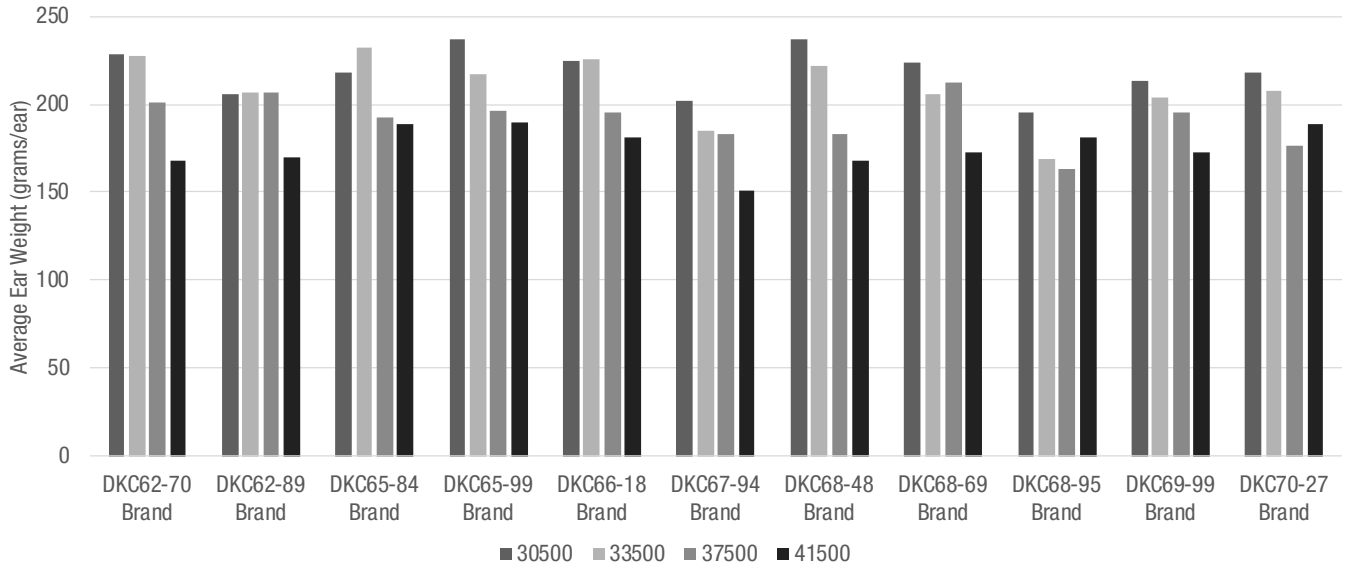

Figure 3. 2021 average ear weight of 11 DEKALB® corn products by planting population near Scott, Mississippi.

Yield Potential of DEKALB® Corn Products to Seeding Rate - 2021

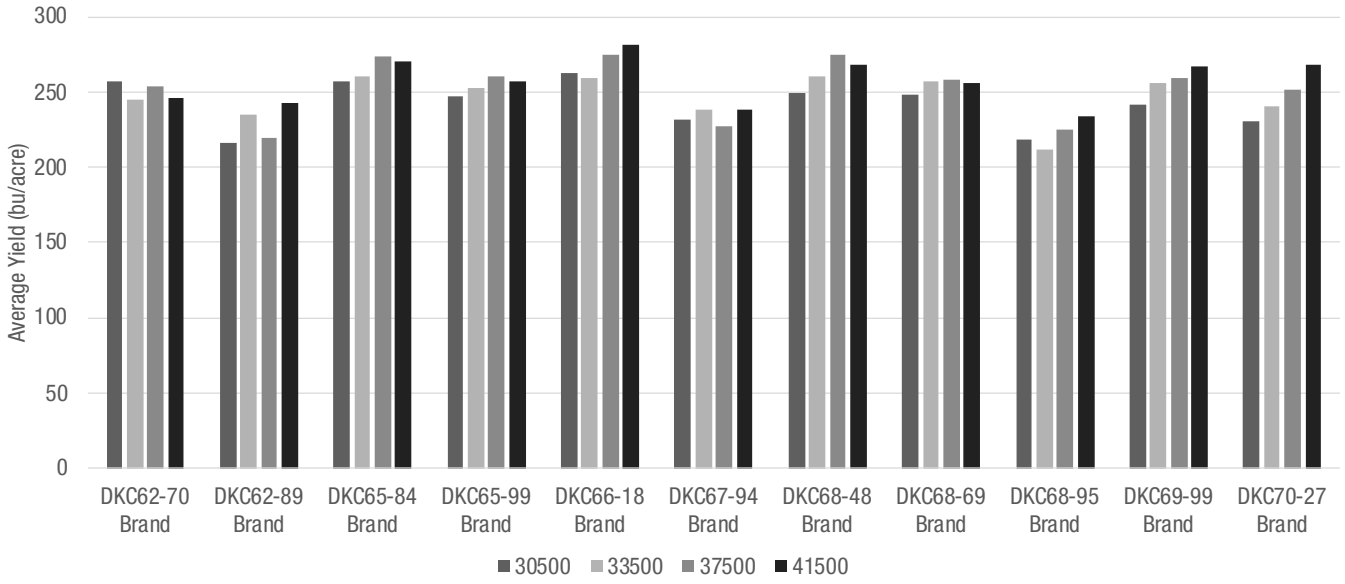

Figure 4. 2021 average yields of 11 DEKALB® corn products by planting population near Scott, Mississippi.

Table 1. 2021 economic effect of seeding rate on corn productivity near Scott, Mississippi. This data is from a single site, non-replicated trial. Average gross income was adjusted for seed cost using an estimated $3.75 per 1,000 seed across all corn products, and corn price at $5.82/bu.

	Corn Seeding Rate (seeds/acre)							
DEKALB® Corn Brand	30500	33500	37500	41500	30500 vs 37500 Average Yield Difference (bu/acre)	$ Gross Increase (or Decrease) per acre	Seed Cost (per 7000 seeds)	Net return on investment 30500 vs 37500 seeds per acre
DKC62-70 Brand	256.9	245.3	254.2	246.5	(2.72)	$ (15.83)	$26.25	$ (42.08)
DKC62-89 Brand	215.8	235.0	219.8	242.8	4.00	$ 23.26	$ 26.25	$(2.99)
DKC65-84 Brand	256.7	260.2	274.1	270.7	17.40	$101.26	$26.25	$75.01
DKC65-99 Brand	247.3	253.0	260.4	257.2	13.17	$76.66	$26.25	$50.41
DKC66-18 Brand	262.9	259.4	275.3	281.4	12.46	$72.51	$26.25	$46.26
DKC67-94 Brand	232.1	238.0	227.1	238.3	(4.98)	$(28.98)	$26.25	$(55.23)
DKC68-48 Brand	249.2	260.0	274.8	268.2	25.61	$149.07	$26.25	$122.82
DKC68-69 Brand	248.2	257.6	258.1	255.5	9.91	$57.67	$26.25	$31.42
DKC68-95 Brand	218.7	212.2	225.5	234.1	6.87	$39.97	$26.25	$13.72
DKC69-99 Brand	242.1	255.9	259.8	266.9	17.78	$103.50	$26.25	$77.25
DKC70-27 Brand	230.7	240.3	251.7	267.7	20.99	$ 122.16	$26.25	$95.91

Yield Potential of DEKALB® Corn Products to Seeding Rate - 2021

Yields across this entire study averaged 250 bu/acre across all corn products and populations. This is exceptional corn for the delta system. A typical grower would expect an average yield of 200 to 220 bu/acre on this soil type.

- **Stand Establishment** – This entire experiment averaged 97% for final stand (Figure 1).
- **Plant Population** – Across all planted products and populations, typical responses to population were observed in that, yield generally increased as population increases. However, individual corn products did respond somewhat differentially to increasing population.
  - » Across all the tested products, an average increase of 11 bu/acre was observed when increasing population from 30,500 to 38, 500 seeds/acre (Figure 4).
  - » Considering seed costs of $3.75/1000 seeds and $5.82/bu (cash price at harvest) the net return improvement is $37.50 for all tested products (Table 1). Net gain is higher for some products than others and growers should carefully evaluate each product for response to plant population.
  - » Negative consequences from increasing population can also be present. They were not present in this demonstration, but growers should also carefully consider population effects on fertility management and potential standability issues with corn products chosen for their operations.
- **Ear Height** – Up to 14 inches variability (32%) in ear height was recorded across the tested corn product by population combinations (Figure 2).
- **Ear Weight** – Up to 86.7 grams variability (57.6%) in ear weight was recorded across the tested products with ears typically being reduced in size as population increases (Figure 3).
- **Yield** - The top end yields in this environment for 2021 were around 280 bu/acre with a range from 212 to 281 bu/acre (Figure 4).

Key Learnings

- Knowing the optimal seeding rate of a corn product can help maximize yield potential and profitability. This research can help growers evaluate DEKALB® corn product seeding rates for their operations.
- Our observations at Scott Learning Center show that corn products can and do respond favorably to higher seeding rates. However, high plant populations can result in lodging and exacerbate harvest difficulties. Conversely, full yield potential may not be realized with lower than optimal seeding rates.
- Growers should carefully evaluate each new corn product planted for its response to population in standability, yield and net return with multiple years and locations used for reference.
- Seeding rate should be adjusted based on field yield potential levels and soil types, as well as the potential return on investment.
- From 2021 ear height, ear weight and yield data we can infer that DEKALB® offers a robust lineup of corn products well suited to the Mississippi Delta region.

Growers should consider personal preferences and yield potential in combination with plant characteristics when choosing corn products. Contact your local Field Sales Representative or Technical Agronomist for planting recommendations for the current situation and year.

Legal Statements

Response of DEKALB® Brand Roundup Ready® Corn 2 Products to Seeding Rate

Trial Objective

- When planting DEKALB® brand *Bt* (*Bacillus thuringiensis*) technology insect resistant corn products in cotton growing regions, 20% of a grower's corn production area must be planted with a non-*Bt* (refuge) corn product. Because DEKALB® brand *Bt* products are resistant to glyphosate, the refuge corn product should be a Roundup Ready® Corn 2 technology product.
- Yield potential and plant characteristics (plant and ear height, ear size, population adaptability) are important factors to consider when selecting *Bt* and refuge corn products for your operation. These characteristics can have an influence on lodging potential and should be carefully considered when selecting a refuge corn product to plant along with *Bt* products in 2022.

Research Site Details

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (bu/acre)	Seeding Rate (seeds/acre)
Scott, MS	South 40 Field – 30 CEC – Commerce Silty Clay Loam	Soybean	Conventional	4/6/2021	8/25/2021	300	30000 34000 38000 41000

- Experiments were conducted on the South 40 Field at the Bayer Learning Center at Scott, MS on soils with very high yield potential and representative of the alluvial delta.
- All field work, tillage, and herbicides were per local standards.
- 275 lbs/acre of nitrogen was applied to both experiments as liquid 28-0-0-5.
- This trial was designed as a single replicate strip plot planted as six rows 1300 feet long, or around 0.625 acre/plot.
- There were seven DEKALB® brand products planted:
  - DKC62-05 Brand (Roundup Ready® Corn 2)
  - DKC65-93 Brand (Roundup Ready® Corn 2)
  - DKC65-99 Brand (Trecepta® Corn)
  - DKC66-94 Brand (Roundup Ready® Corn 2)
  - DKC67-70 Brand (Roundup Ready® Corn 2)
  - DKC68-24 Brand (Roundup Ready® Corn 2)
  - DKC70-25 Brand (Roundup Ready® Corn 2)
- Each product was planted on 38-inch single rows at four different seeding rates:
  - 30,000 seeds/acre
  - 34,000 seeds/acre
  - 38,000 seeds/acre
  - 41,000 seeds/acre

Response of DEKALB® Brand Roundup Ready® Corn 2 Products to Seeding Rate

- Data were collected as follows:
  - » Whole plots were harvested with the use of a commercial combine and corrected to 15.5% moisture content to determine yield data.
  - » Established plants/acre for each product was determined mid-season by counting the number of plants in ten feet at two locations and averaged.
  - » Ear height was determined by measuring the height (in inches) from the soil line to the ear shank of 10 plants per product and averaged.
  - » Ear weight was determined by shelling 10 ears per product, measuring the weight, and providing an average.

Understanding the Results

- Yield: Average yield of all products in the study was 241 bu/acre which was exceptional for the Delta system. The highest yield was 274.58 and the lowest was 212.51 (Table 1 and Figure 1).
- Seeding Rates: Across all planted products and seeding rates, a typical response to seeding rate was observed in that yield generally increased as seeding rate increased. However, individual corn products responded differently as seeding rates increased.
  - » Across all tested products, an average increase of 11 bu/acre was observed when seeding rates were increased from 30,000 to 38,000/acre (Table 1 and Figure 1).
    - » Considering seed costs of $3.75/1,000 seeds (VT Double PRO® Corn) and $3.00/1,000 seeds (Roundup Ready® Corn 2) and $5.82/bu (recent cash price) the gross return improvement is $67.14 for all tested products (Table 1). Net gain is higher for some products than others. Growers should carefully evaluate each product.
    - » Negative consequences from increasing seeding rates can be present. They were not present in this demonstration; however, growers should carefully consider the effects of seeding rates on fertility management and potential standability issues for the products selected for their operations.
- Stand Establishment: This experiment averaged 98% stand establishment (Figure 2).
- Ear Height: Up to 14 inches of variability (32%) in ear height was recorded across the tested products and seeding rate combinations (Figure 3).
- Ear Weight: Up to 108.3 grams variability (44%) in ear weight was recorded across the tested products with ears typically becoming smaller as seeding rates increased (Figure 4).

Response of DEKALB® Brand Roundup Ready® Corn 2 Products to Seeding Rate

DEKALB® Brand Corn Product	Average Yield (bu/acre at 15.5% Moisture Content) and Four Seeding Rates				Average Yield (bu/acre)	Gain in bu/acre from 30,000 to 38,000 seeds/ acre	Gross $ Return from 30,000 to 38,000 seeds/acre	Seed Cost ($) (1000 seeds)	Average Net $ Return from 30,000 to 38,000 seeds/acre
	30,000	34,000	38,000	41,000					
DKC62-05	221.77	226.92	236.37	239.37	231.11	14.60	84.98	24.00	60.98
DKC65-93	246.80	250.86	257.15	264.84	254.91	10.35	60.26	24.00	36.26
DKC65-99	253.57	260.92	269.79	274.58	264.71	16.22	94.40	30.00	64.40
DKC66-94	212.51	219.70	229.17	231.73	223.28	16.66	96.96	24.00	72.96
DKC67-70	239.61	247.42	242.91	248.46	244.60	3.30	19.20	24.00	-4.80
DKC68-24	219.33	215.71	235.94	219.46	222.61	16.61	96.65	24.00	72.65
DKC70-25	239.95	241.02	242.96	249.60	243.38	3.02	17.56	24.00	-6.44
Averages	233.36	237.51	244.90	246.86	240.66	11.54	67.14	24.86	42.29

Table 1. Yield (bu/acre) performance and gross and net dollar return for seven DEKALB® brand products when seeding rates/acre were increased from 30,000 to 41,000 at the Bayer Learning Center at Scott, MS (South 40 Field – 2021).

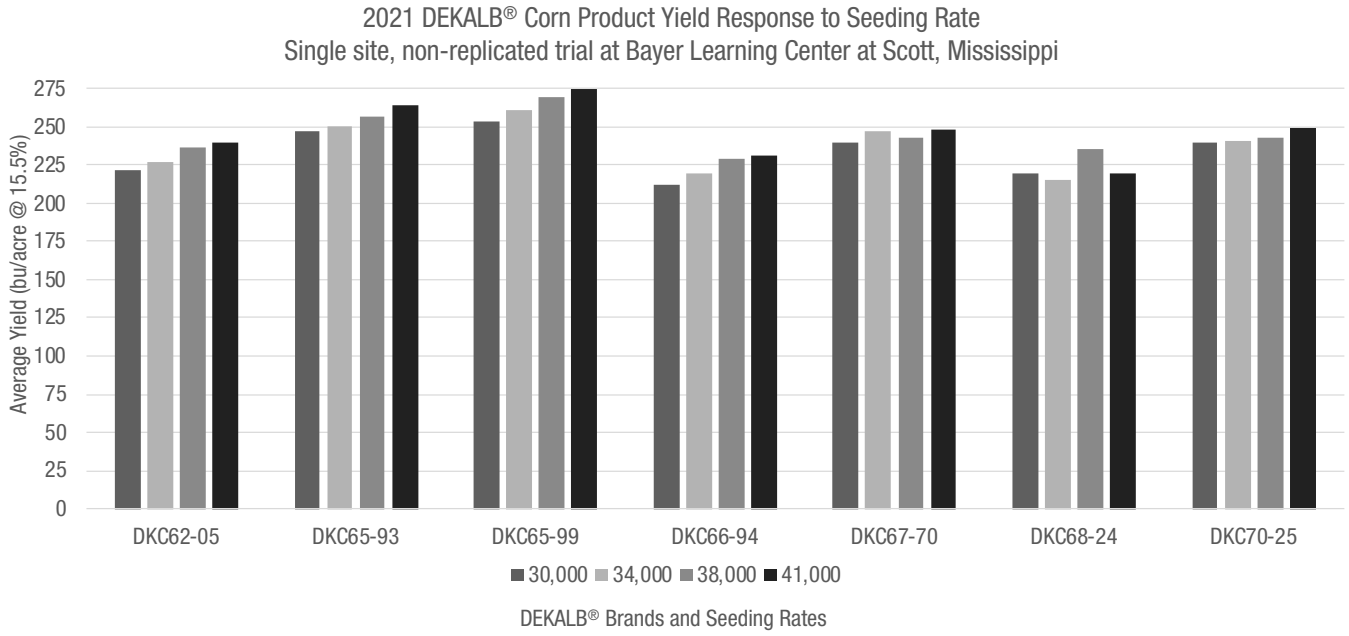

Figure 1. Yield (bu/acre at 15.5% moisture content) of seven DEKALB® brand corn products at four seeding rates at the Bayer Learning Center at Scott, MS (South 40 Field – 2021).

Response of DEKALB® Brand Roundup Ready® Corn 2 Products to Seeding Rate

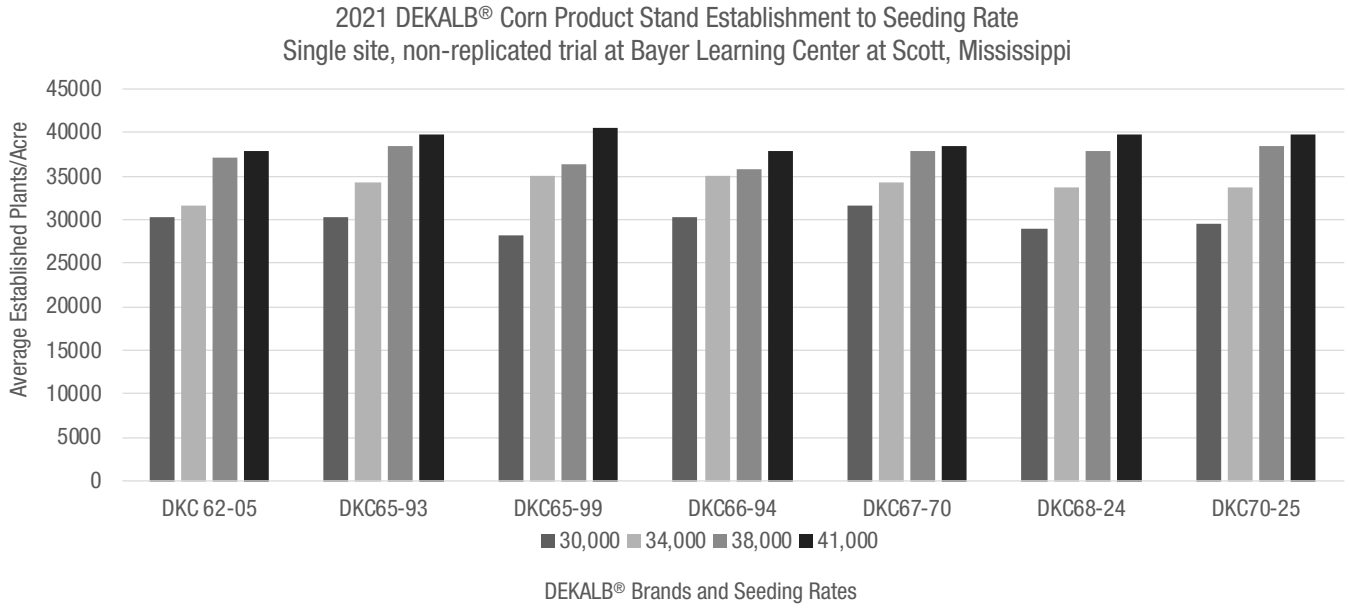

Figure 2. Average established plants/acre for each DEKALB® brand product at four seeding rates at the Bayer Learning Center at Scott, MS (South 40 Field – 2021).

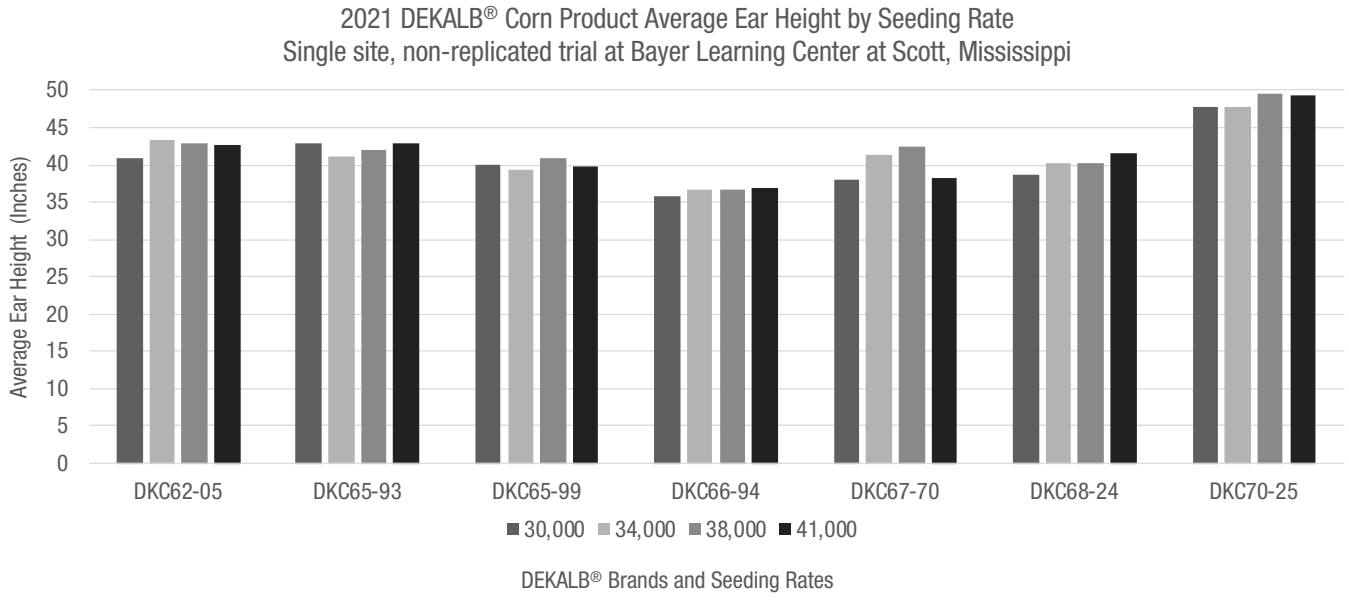

Figure 3. Average ear height (inches from ground to ear shank) for each DEKALB® brand product at four seeding rates at the Bayer Learning Center at Scott, MS (South 40 Field – 2021).

Response of DEKALB® Brand Roundup Ready® Corn 2 Products to Seeding Rate

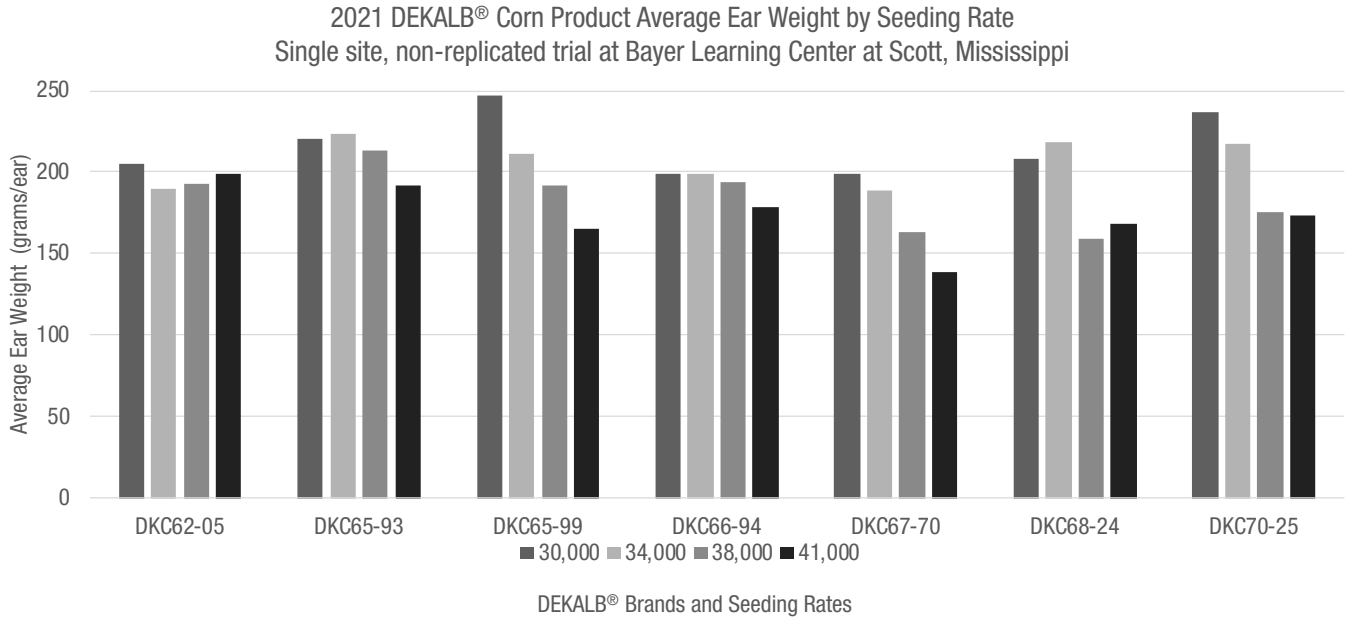

Figure 4. Average ear weight (grams/ear) for each DEKALB® brand product at four seeding rates at the Bayer Learning Center at Scott, MS (South 40 Field – 2021).

Key Learnings

- Plant characteristics were measured to provide useful information to growers. This information along with other product characteristics, such as disease resistance, can help growers select products that can help reduce the potential for lodging.
- As demonstrated in previous research at the Bayer Learning Center at Scott, MS, seeding rate continues to be a primary contributor (along with product selection) to help increase yield potential across most of the tested products. For this reason, growers should carefully evaluate the potential net return for increased seeding rates when selecting products to plant on their farms.
- From the 2021 ear height, ear weight, and yield data, we can infer that the DEKALB® brand offers a robust lineup of corn products well suited to the Mississippi Delta.
- Growers should consider their personal preferences and the product yield potential in combination with the plant characteristics measured in this study when choosing a product for the 2022 growing season.
- Adherence to the Insect Resistance Management (Refuge) program is paramount for maintaining access to and viability of corn and cotton traits in the cotton growing region into the future.

Response of DEKALB® Brand Roundup Ready® Corn 2 Products to Seeding Rate

Legal Statements

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ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. B.t. products may not yet be registered in all states. Check with your seed brand representative for the registration status in your state.

IMPORTANT IRM INFORMATION: RIB Complete® corn blend products do not require the planting of a structured refuge except in the Cotton-Growing Area where corn earworm is a significant pest. See the IRM/Grower Guide for additional information. Always read and follow IRM requirements.

Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.

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Insect Resistance Management
Planting Refuges, Preserving Technology

Before opening a bag of seed, be sure to read, understand and accept the stewardship requirements, **including applicable refuge requirements for insect resistance management,** for the biotechnology traits expressed in the seed as set forth in the Monsanto Technology/Stewardship Agreement that you sign. By opening and using a bag of seed, you are reaffirming your obligation to comply with the most recent stewardship requirements.

RESPECT THE REFUGE®

Roundup Ready® 2 TECHNOLOGY

How do Twin Rows and Plant Population Impact Corn Yield Potential? 2021

Trial Objective

- Twin row planting for corn production continues to come up as a decision point in southern corn production.
- Bayer Learning Center at Scott, Mississippi has evaluated twin row vs single row plantings in corn production for several seasons. Previous studies showed only a marginal benefit to twin row configuration in most cases.
- During 2021, a non-replicated plot was established at the Bayer Learning Center at Scott, Mississippi to evaluate the response of DEKALB® Brand corn products to various populations as well as single versus twin row production systems.

Research Site Details

- Study planted on Field B2 at the Bayer Learning Center at Scott, MS (SLC). All Agronomic inputs per local standards.
- 275 lb/acre of nitrogen (N) surface applied as 28-0-0-5.
- Four DEKALB® Brand products planted.
  - » DKC65-95 Brand
  - » DKC67-37 Brand
  - » DKC67-44 Brand
  - » DKC70-27 Brand
- Plots were single replicate, planted in single row 38-inch row crop planting units with Precision Planting® VSet2 Meters and plates installed.
- Twin row plots planted on 38-inch rows x 7.5-inch twins with Precision Planting VSet2 meters. This planter does not stagger as a traditional Monosem planter.
- Seeding rates of products planted included 32,000, 35,000 and 38,000 seeds per acre.
- Average yield (bu/acre) determined by harvesting entire plot with commercial combine and moisture content corrected to 15.5%.

Understanding the Results

- Relatively small differences were observed when comparing yield potential between the twin row and single row planting system (Figure 1). And while no penalty for planting twin rows was observed it should be noted that no advantage existed in this case regardless of planting population or corn product planted (Figure 2).

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (bu/acre)	Seeding Rate (seeds/acre)
Scott, MS	Commerce silty clay loam	Soybean	Conventional	4/19/2021	9/9/2021	225	32000 35000 38000

How do Twin Rows and Plant Population Impact Corn Yield Potential? 2021

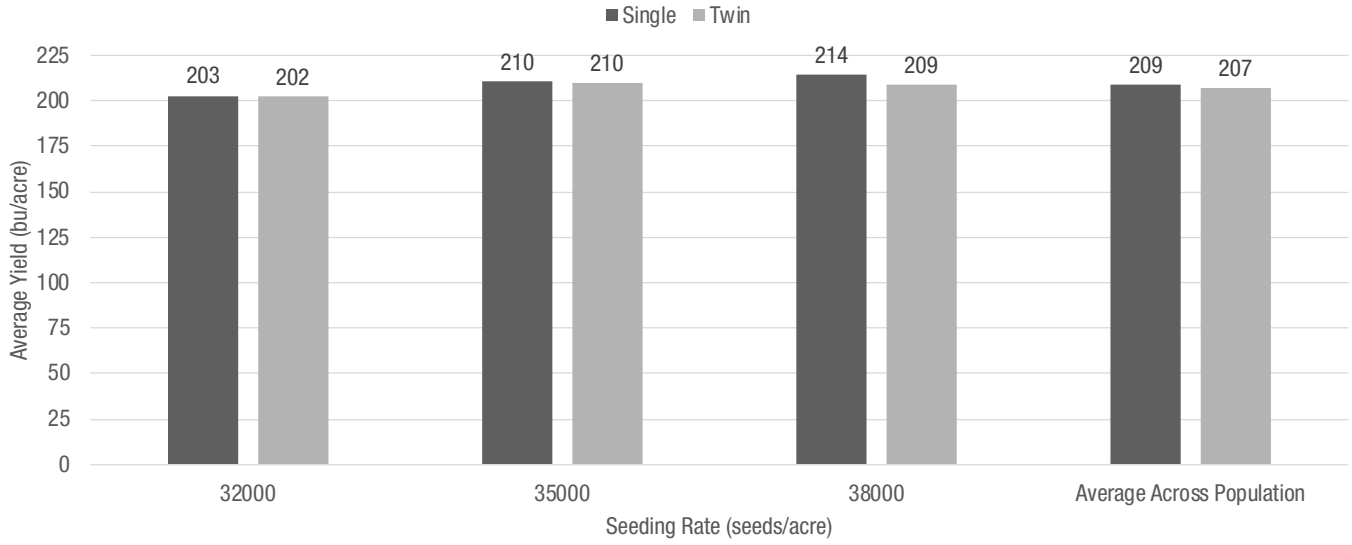

Figure 1. Average yield (bu/acre at 15.5% moisture content) over all products for twin row and single row planting systems and seeding rates of 32,000, 35,000, and 38,000. Bayer Learning Center, Scott, MS (2021).

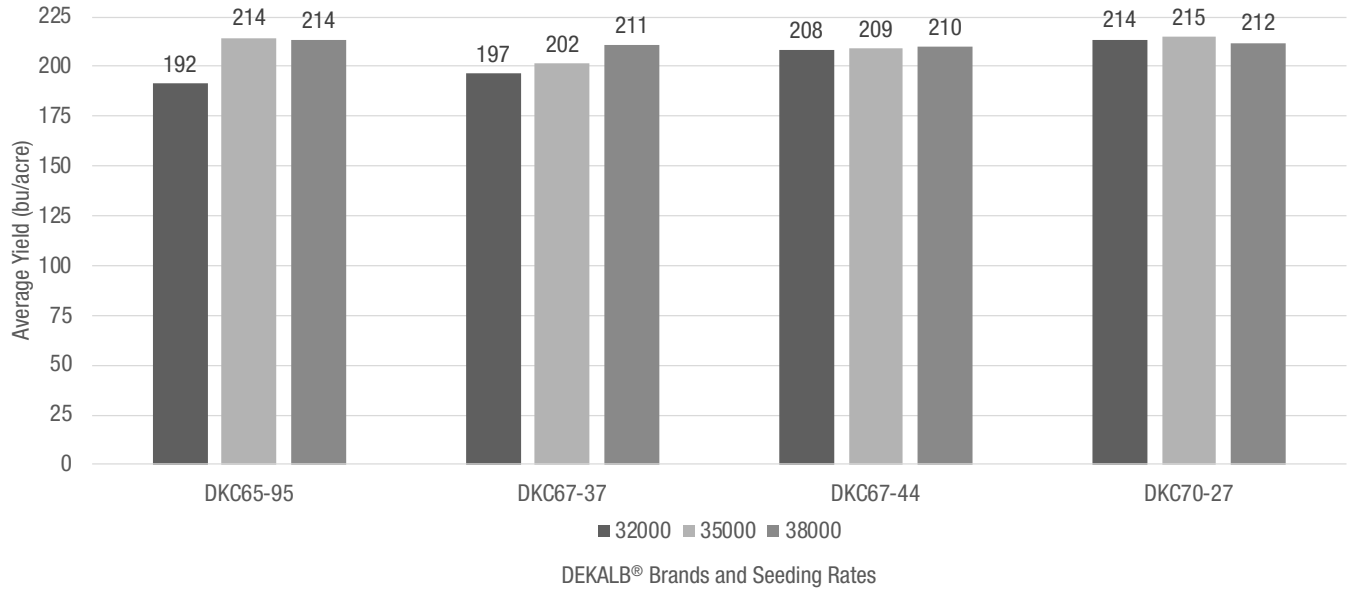

Figure 2. Average product yield (bu/acre at 15.5% moisture content) based on seeding rates 32,000, 35,000, and 38,000 and planting systems of twin row and single row planters. Bayer Learning Center, Scott, MS (2021).

How do Twin Rows and Plant Population Impact Corn Yield Potential? 2021

Key Learnings

- The twin row corn planting system can be difficult to use due to concerns with equipment setup, bed preparation, planting depth and corn product selection. Yield data can vary from year to year with various row spacings depending on environmental conditions. Data from this 2021 study indicated that well-adjusted single row planters yielded as well as twin row, in most cases, and are generally easier to use on a practical basis.
- In this study, there was a positive response to population observed with some of the tested corn products. The most important decisions to make, regardless of row spacing, are those of product selection and planting population.

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RESPECT THE REFUGE®

Roundup Ready® 2 TECHNOLOGY

Evaluating the Interaction of Corn Product, Seeding Rate, and Planting Depth

Trial Objective

- Two of the most important factors to consider when planting corn are product yield response to population and regional responses to planting depth.
- These factors can only be established at planting and should be carefully considered at that time.
- Maximum yield potential can be limited when plant population is reduced intentionally by planting a low population or from bird predation, poor rooting, lodging, or other agronomic factors.

Research Site Details

- Study planted on Field D5 at the Bayer Learning Center at Scott, MS (SLC).
- All agronomic, herbicide, and fertility practices were per local standards.
- Study was planted on 38-inch single rows as a single replicate strip plot design (0.35 acres/plot).
- A total of 275 lb/acre of nitrogen (N) was applied.
- Products planted
  - » DKC67-44 Brand (VT Double PRO® Corn)
  - » DKC70-27 Brand (VT Double PRO® Corn)
- Plot area is sandy with a cation exchange capacity (CEC) averaging less than 10 which can be a very stressful environment for crops.
- Plots were harvested using commercial machinery and grain weights were adjusted to 15.5% moisture content.
- Plant establishment averaged about 93% across all planted plots.

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (bu/acre)	Seeding Rate (seeds/acre)
Scott, MS	Cravasse loamy sand/Mhoon silt loam	Cotton	Conventional	4/7/2021	8/28/2021	250	28000 32000 36000 40000

Understanding the Results

Planting Depth (Figure 1)

- Planting depth did not have a major impact on the yield of either product across populations.
  - » This should not be viewed as an endorsement of shallow planting. This study had limited bird predation, bed erosion, and lodging prior to harvest. These factors typically favor deeper planting depths.
  - » The primary conclusion regarding planting depth should be that deeper planting did not penalize yield in 2021. Previous SLC work has shown great advantage to deeper planting in previous years. Deeper plantings depths should be the rule not the exception.

Evaluating the Interaction of Corn Product, Seeding Rate, and Planting Depth

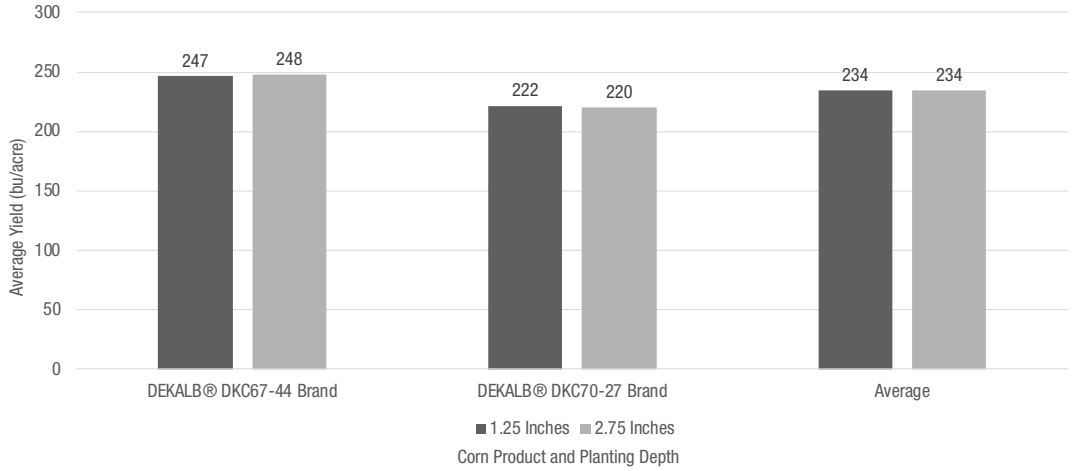

Figure 1. Average product yield (bu/acre @ 15.5% moisture content) based on planting depths of 1.25 and 2.75 inches and seeding rates of 28,000, 32,000, 36,000, and 40,000. Bayer Learning Center at Scott, MS (2021) (D5 Field).

Population (Figure 2)

- In this trial, neither product responded greatly for yield at seeding rates over 32,000 seeds/acre and planting depths of 1.25 and 2.75 inches.
  - » Both products responded positively to an increase in seeding rate from 28,000 to 32,000 seeds/acre.
  - » This is a typical result for DEKALB® DKC67-44 Brand; however, previous work has shown DEKALB® DKC70-27 Brand respond positively to population increases. This result may be due to the stressful nature of this field and the adaptation of DEKALB® DKC67-44 Brand to stressful environments.
  - » A primary conclusion from this study is that 32,000 seeds/acre should be the minimum seeding rate for both products tested.

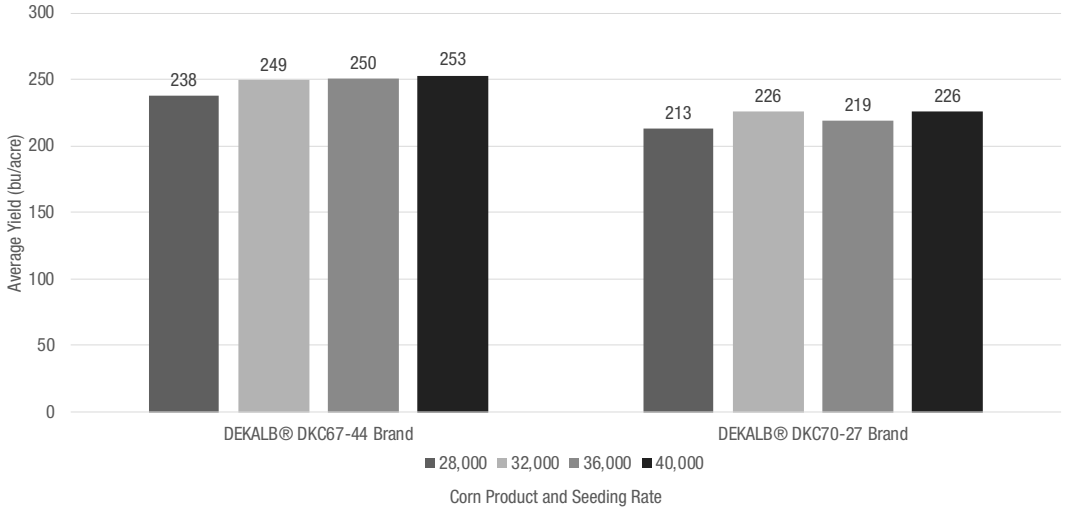

Figure 2. Average product yield (bu/acre @ 15.5% moisture content) based on seeding rates of 28,000, 32,000, 36,000, and 40,000 and planting depths of 1.25 and 2.75 inches. Bayer Learning Center, Scott, MS (2021) (D5 Field)

Evaluating the Interaction of Corn Product, Seeding Rate, and Planting Depth

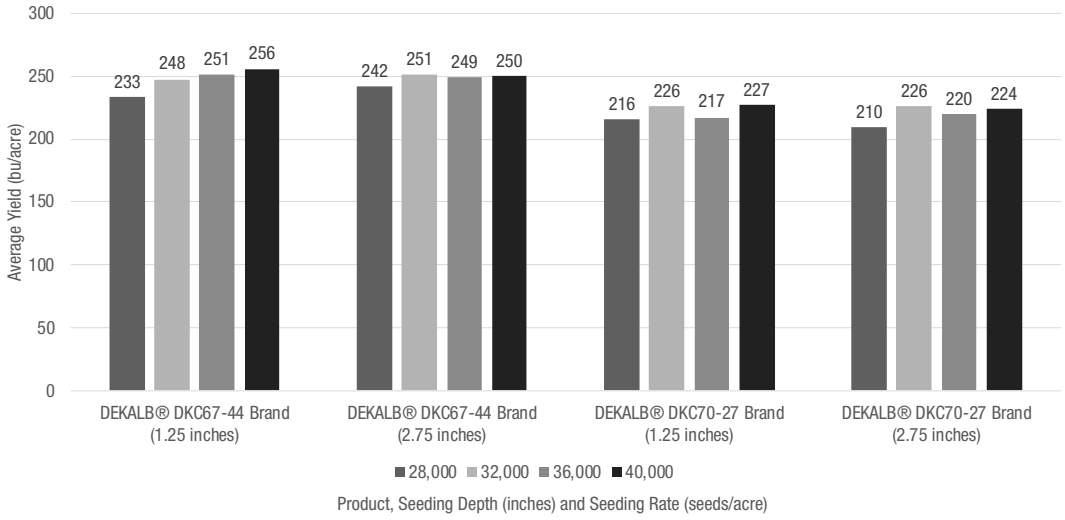

Figure 3 . Average product yield (bu/acre @ 15.5% moisture content) for each product based on seeding rates of 28,000, 32,000, 36,000, and 40,000 and planting depths of 1.25 and 2.75 inches. Bayer Learning Center, Scott, MS (2021) (D5 Field)

Key Learnings

- At this location, average yields were not penalized by deeper planting with any population and product combination in 2021.
- The long-term benefits from deeper planting can include better rooting, reduced bird predation, and more uniform stand establishment. For these reasons planting depth should be carefully considered when planting corn.
- Corn product adaptation should be carefully considered when selecting a product based on region, soil type, and stress tolerances.

Legal Statements

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ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. B.t. products may not yet be registered in all states. Check with your seed brand representative for the registration status in your state.

IMPORTANT IRM INFORMATION: RIB Complete® corn blend products do not require the planting of a structured refuge except in the Cotton-Growing Area where corn earworm is a significant pest. See the IRM/Grower Guide for additional information. Always read and follow IRM requirements.

Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.

Roundup Ready® 2 Technology contains genes that confer tolerance to glyphosate. Glyphosate will kill crops that are not tolerant to glyphosate. Respect the Refuge and Corn Design® and Respect the Refuge® are registered trademarks of National Corn Growers Association. Bayer, Bayer Cross, DEKALB and Design®, Roundup Ready 2 Technology and Design™, Roundup Ready® and VT Double PRO® are trademarks of Bayer Group. All other trademarks are the property of their respective owners. ©2021 Bayer Group. All rights reserved. 3013_R6_21

Skips and Planting Errors in Soybean (2021) Bayer Learning Center at Scott, MS

Trial Objective

- Each season many soybean growers are faced with making replanting decisions.
- Skippy stands from weather events, equipment malfunctions, and various other difficulties introduce skips, gaps, and variability into many soybean fields.
- Previous work has shown that a soybean stand has tremendous ability to compensate for stand variability. Particularly when gaps are generally smaller than the row spacing (30 to 40 inches).
- This study was undertaken to consolidate previous experience and revalidate older data when applied to newer germplasm.
- In many cases, replanting can likely be avoided thereby saving the associated expense and trouble.

Research Site Details

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (bu/acre)	Seeding Rate (seeds/acre)
Scott, MS	Commerce Silt Loam	Corn	Conventional	5/26/2021	9/8/2021	75	Various

- All agronomic decisions and crop inputs were per local standards.
- Planted on 38-inch beds in a twin row configuration 7.5 inches apart.
- Products planted:
  - Asgrow® AG46XF0 Brand
  - Asgrow® AG47XF0 Brand
  - Planting Configuration Treatments
  - 120,000 seeds/acre (Untreated Check (UTC))
  - 105,000 seeds/acre (Missing Twin)
  - 90,000 seeds/acre (2 Missing Twins)
  - 90,000 seeds/acre (Missing Row)
  - 80,000 seeds/acre (20-inch skips)
  - 80,000 seeds/acre (30-inch skips)
  - 80,000 seeds/acre (40-inch skips)
  - 60,000 seeds/acre (30-inch skips)
  - 60,000 seeds/acre (40-inch skips)
  - 40,000 seeds/acre (40-inch skips)
- In field variability was introduced using a variety of techniques. For the missing row and missing twin treatments, rows were simply not planted.

Skips and Planting Errors in Soybean (2021) Bayer Learning Center at Scott, MS

Figure 1. Picture of missing twin treatment which was seeded to represent 105,000 seeds/acre. Scott, MS (2021).

Figure 2. Picture of two missing twin rows treatment which was seeded to represent 90,000 seeds/acre. Scott, MS (2021)

Figure 3. Picture of missing row treatment which was seeded to represent 90,000 seeds/acre. Scott, MS (2021)

Figure 4. Example of the uniformly skippy stands can be planted with the "skipulator". This picture is an example of the 20-inch skip treatment at 80,000 seeds/acre.

Figure 5. Measurement to demonstrate accuracy of the "skipulator" planting system. In this case, the target was a 40-inch skip and was close.

Figure 6. Measurement to demonstrate accuracy of the "skipulator" planting system. In this case, the target was a 40-inch skip and was close.

- For skip treatments, a spread sheet, referred to as the "Skipulator" (vs a calculator) was used to calculate planting parameters to introduce the desired skip treatments into plots. In short, it takes the desired skip size or seeding rate into account and generates the number of planter plate cells to block or provides the seeding rate to enter into the planting equipment to achieve the target seeding rate with the skips desired for each treatment (Figures 1 thru 6).
- Harvested using commercial equipment and yields were corrected to 13.5% moisture content for reporting.

Understanding the Results

- Across the trial, the average yield ranged from 62.4 to 74.2 bu/acre at 13.5% moisture content (Figure 7).
- On average, the soybean plants demonstrated an ability to compensate for much of the introduced variability in the missing row and in-row skip treatments (Figures 7, 8, and 9).
- Numerically, the highest yielding treatments in the demonstration tended to be some of the skippy treatments as compared to the untreated check. This is likely due to the miscellaneous foliar diseases that developed during the season. Skips and missing rows tended to minimize some of these disease issues during 2021. Regardless of the favorable yields associated with skips and missing rows, skips should not be introduced as a planting practice.

Skips and Planting Errors in Soybean (2021) Bayer Learning Center at Scott, MS

- This data reinforces the ability of soybean plants to compensate for planting errors and skippy stands.
- There was one low yielding plot in this demonstration (60,000 seeds/acre with 40-inch skips in Asgrow® AG46FX0 Brand) that had a hot sandy spot across the plot (Figure 9).

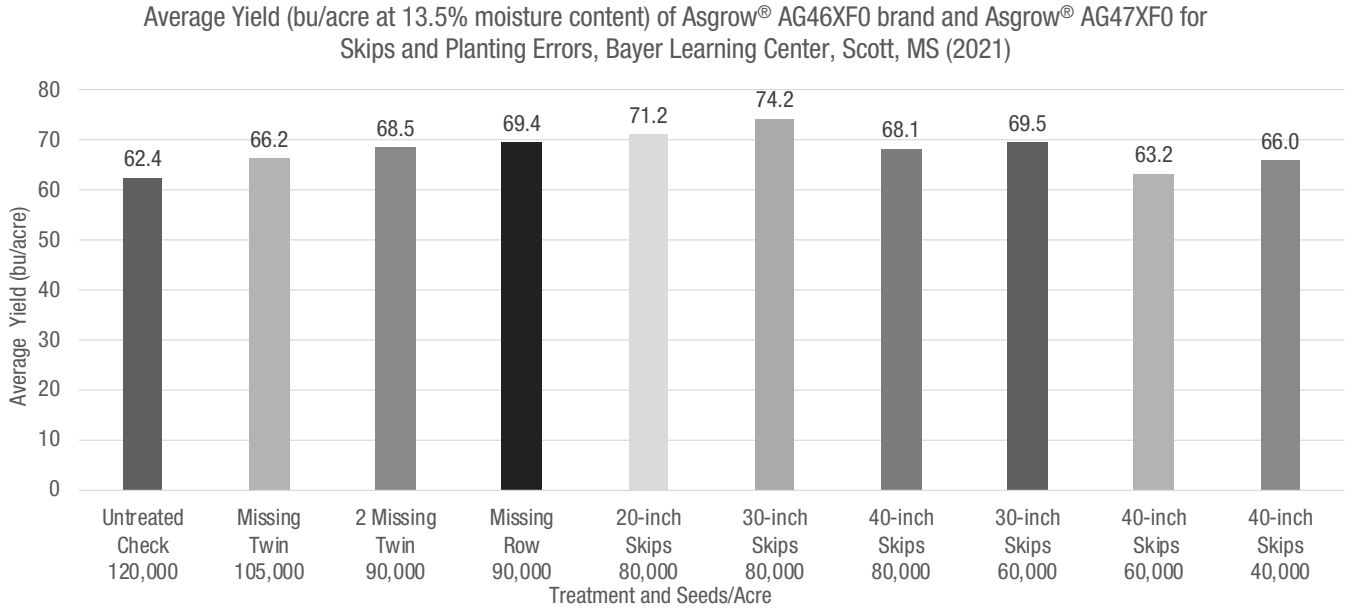

Figure 7. Average yield of Asgrow® AG46FX0 brand and Asgrow® AG47FX0 brand for various skips and planting errors in seeding rates. Bayer Learning Center, Scott, MS (2021).

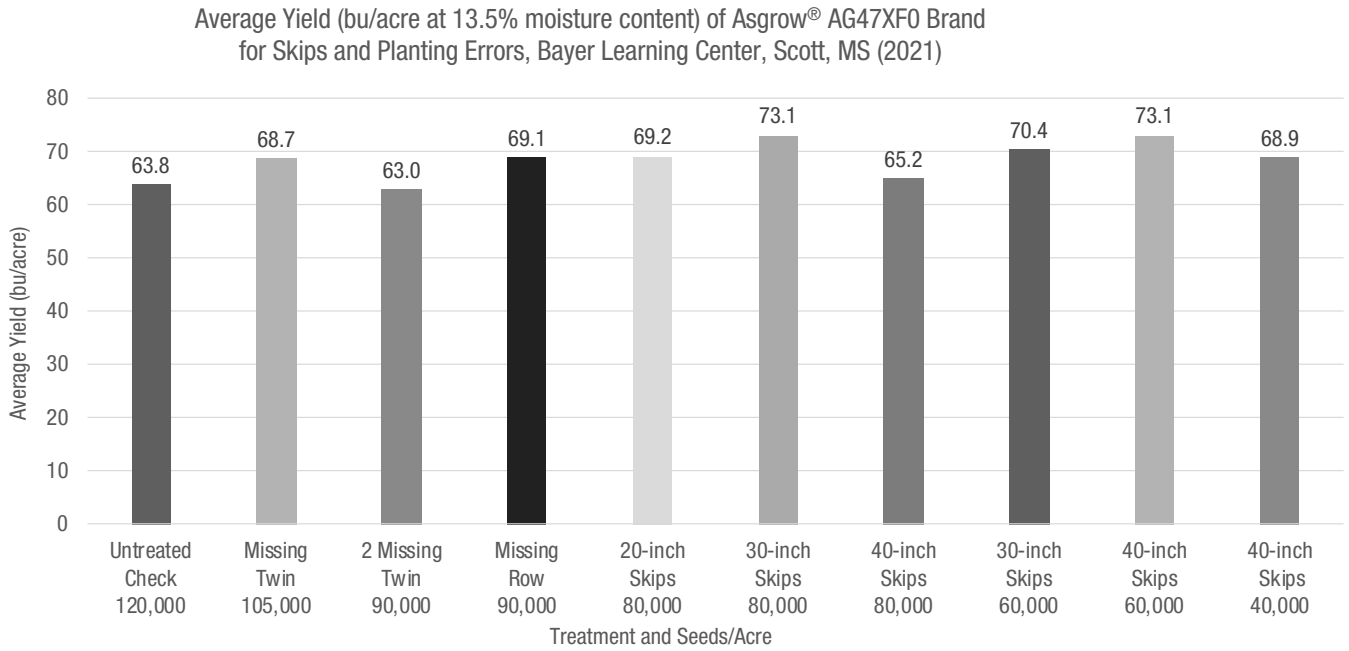

Figure 8. Average yield of Asgrow® AG47FX0 brand for various skips and planting errors in seeding rates. Bayer Learning Center, Scott, MS (2021).

Skips and Planting Errors in Soybean (2021) Bayer Learning Center at Scott, MS

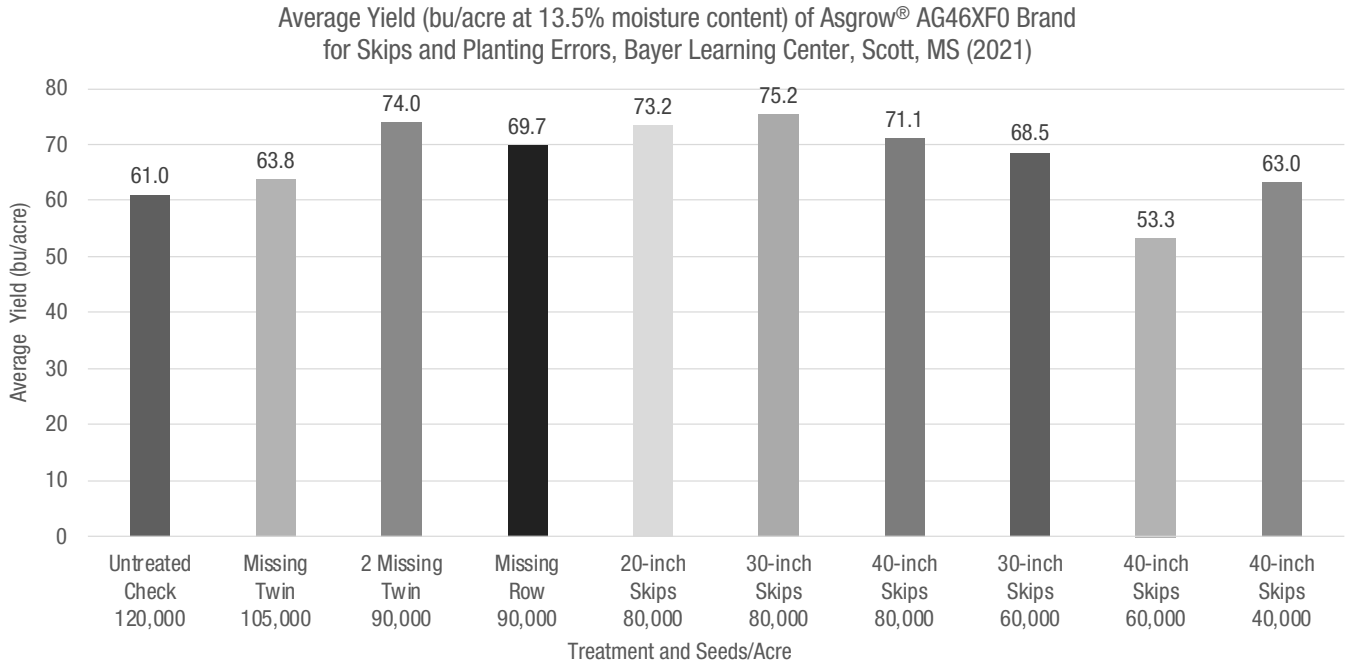

Figure 9. Average yield of Asgrow® AG46FX0 brand for various skips and planting errors in seeding rates. Bayer Learning Center, Scott, MS (2021).

Key Learnings

- Soybean plants continue to demonstrate a tremendous ability to compensate for planting errors and poor emergence when those events occur.
- Growers should carefully consider weed control implications when making soybean replanting decisions. Extra herbicide applications and in some cases, replanting could be recommended to maintain acceptable levels of weed control.
- Many factors should be carefully considered when deciding to replant a soybean field. It is likely that many fields can be managed to acceptable outcomes without replanting.
- Please consult your local Asgrow® brand representative or agronomist for further information.

Legal Statements

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ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.

Evaluation of Asgrow® Brand Soybean Products on Different Soil Types in the Delta

Trial Objective

- Each season the Bayer Learning Center at Scott, Mississippi evaluates a new class of soybean products for yield potential in the local production system.
- A -group of Asgrow® brand soybeans with XtendFlex® Technology were evaluated in this system in 2021 and compared to current local standard soybean products.
- Two very different soil types are represented in this work:
  - » light, hot sand (commerce silt loam)
  - » heavy, cracking clay (sharkey clay).
- The purpose of this work is to help identify strong performing soybean products for planting on these soils in 2022.

Research Site Details

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (bu/acre)	Seeding Rate (seeds/acre)
Scott, MS Highway Cut	Commerce Silt Loam, 15 Cation Exchange Capacity (CEC)	Cotton	Conventional	4/20/2021	As Ready -Dessicated	100	120,000
Scott, MS House Cut	Commerce Silt Loam, 15 CEC	Corn	Conventional	4/20/2021	As Ready – Dessicated	100	120,000
Scott, MS Buckshot	Sharkey Clay, 45 CEC	Corn	Conventional	4/20/2021	As Ready - Dessicated	100	120,000

- Field work, planting dates, pest and nutrient management followed local standards.
- Highway Cut Field Location: 11 soybean products were planted on twin rows 7.5-inches apart (seed beds 38-inches apart) on commerce silty loam soil.
  - » AG35XF1 Brand
  - » AG38XF1 Brand
  - » AG43X0 Brand
  - » AG44XF1 Brand
  - » AG45XF0 Brand
  - » AG46XF0 Brand
  - » AG46X6 Brand
  - » AG47XF0 Brand
  - » AG48X9 Brand
  - » AG48XF0 Brand
  - » AG53X0 Brand

Evaluation of Asgrow® Brand Soybean Products on Different Soil Types in the Delta

- House Cut Field Location: 18 soybean products were planted on twin rows 7.5-inch apart (seed beds 38 inches apart) on commerce silty loam soil.
  - » AG35XF1 Brand
  - » AG38XF1 Brand
  - » AG41XF2 Brand
  - » AG42XF1 Brand
  - » AG43X0 Brand
  - » AG43XF2 Brand
  - » AG44XF2 Brand
  - » AG45XF0 Brand
  - » AG46XF0 Brand
  - » AG46X6 Brand
  - » AG47XF0 Brand
  - » AG47XF2 Brand
  - » AG48X9 Brand
  - » AG48XF0 Brand
  - » AG48XF2 Brand
  - » AG53X0 Brand
  - » AG53XF2 Brand
  - » AG56XF2 Brand
- Buckshot Field Location: 18 soybean products were planted on twin rows 7.5-inch apart (seed beds 38 inches apart) on commerce silty loam soil.
  - » AG35XF1 Brand
  - » AG38XF1 Brand
  - » AG41XF2 Brand
  - » AG42XF1 Brand
  - » AG43X0 Brand
  - » AG43XF2 Brand
  - » AG44XF2 Brand
  - » AG45XF0 Brand
  - » AG46XF0 Brand
  - » AG46X6 Brand
  - » AG47XF0 Brand
  - » AG47XF2 Brand
  - » AG48X9 Brand
  - » AG48XF0 Brand
  - » AG48XF2 Brand
  - » AG53X0 Brand
  - » AG53XF2 Brand
  - » AG56XF2 Brand
- Statistical design was a single replication, strip plot design with plot size between 0.25 to 0.6 acre.
- Soybeans were desiccated prior to harvest using Mississippi State Extension recommendations for products, rates, and timings.
- Fields were harvested with a commercial combine and grain moisture was corrected to 13.5% for presentation.

Evaluation of Asgrow® Brand Soybean Products on Different Soil Types in the Delta

Understanding the Results

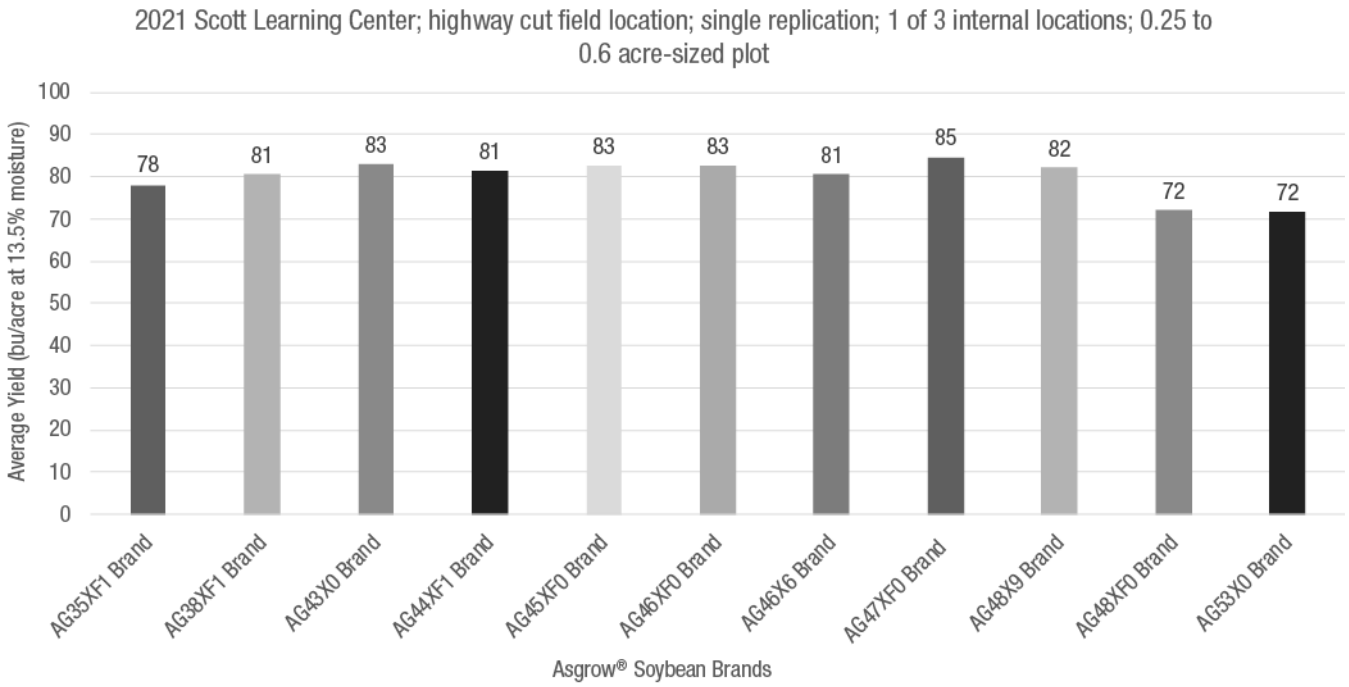

Figure 1. Yield evaluations of 11 Asgrow® soybean brands in 2021 at the highway cut field location at Scott, Mississippi. Grown on commerce silt loam soil with 15 cation exchange capacity.

- Overall, at this location, the soybean products had an average yield of 79.88 bu/acre.

Evaluation of Asgrow® Brand Soybean Products on Different Soil Types in the Delta

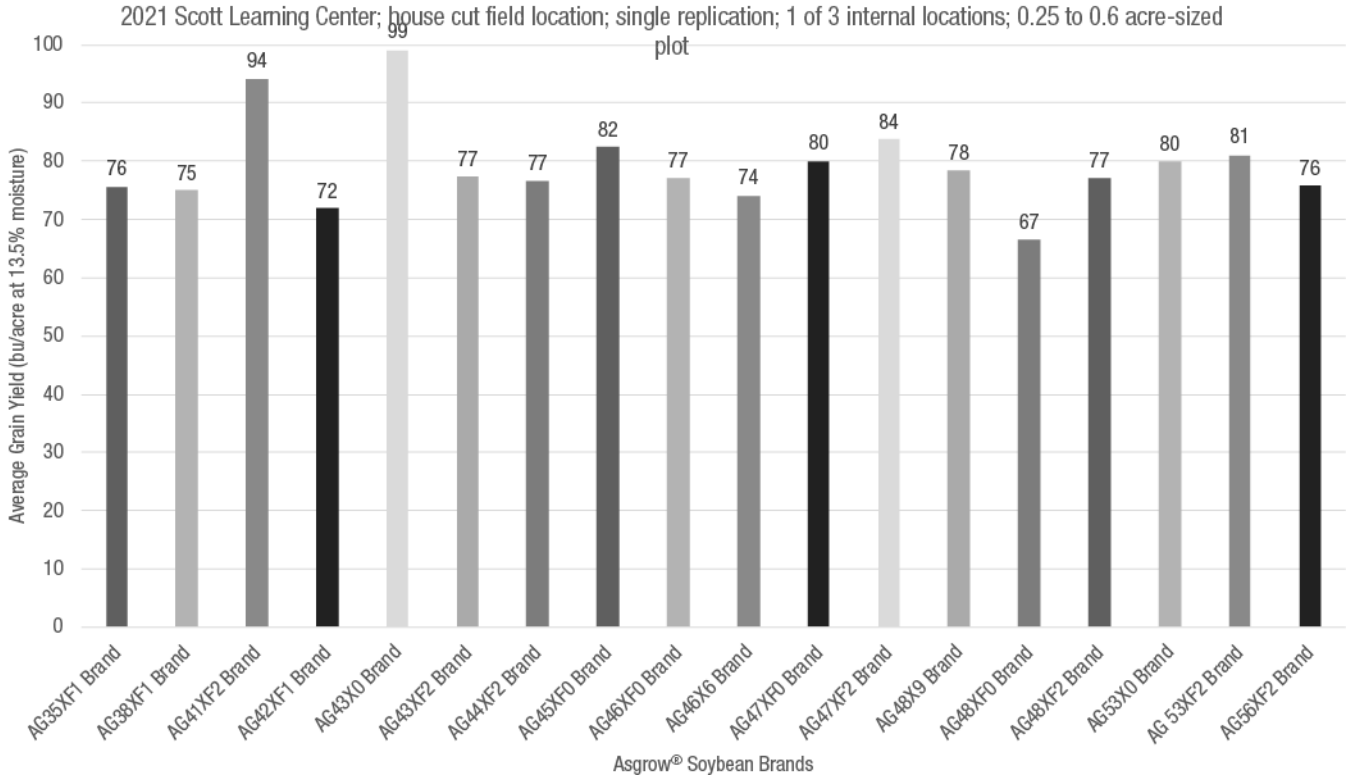

Figure 1. Yield evaluations of 11 Asgrow® soybean brands in 2021 at the highway cut field location at Scott, Mississippi. Grown on commerce silt loam soil with 15 cation exchange capacity.

- Overall, at this location, the soybean products had an average yield of 79.22 bu/acre.

Evaluation of Asgrow® Brand Soybean Products on Different Soil Types in the Delta

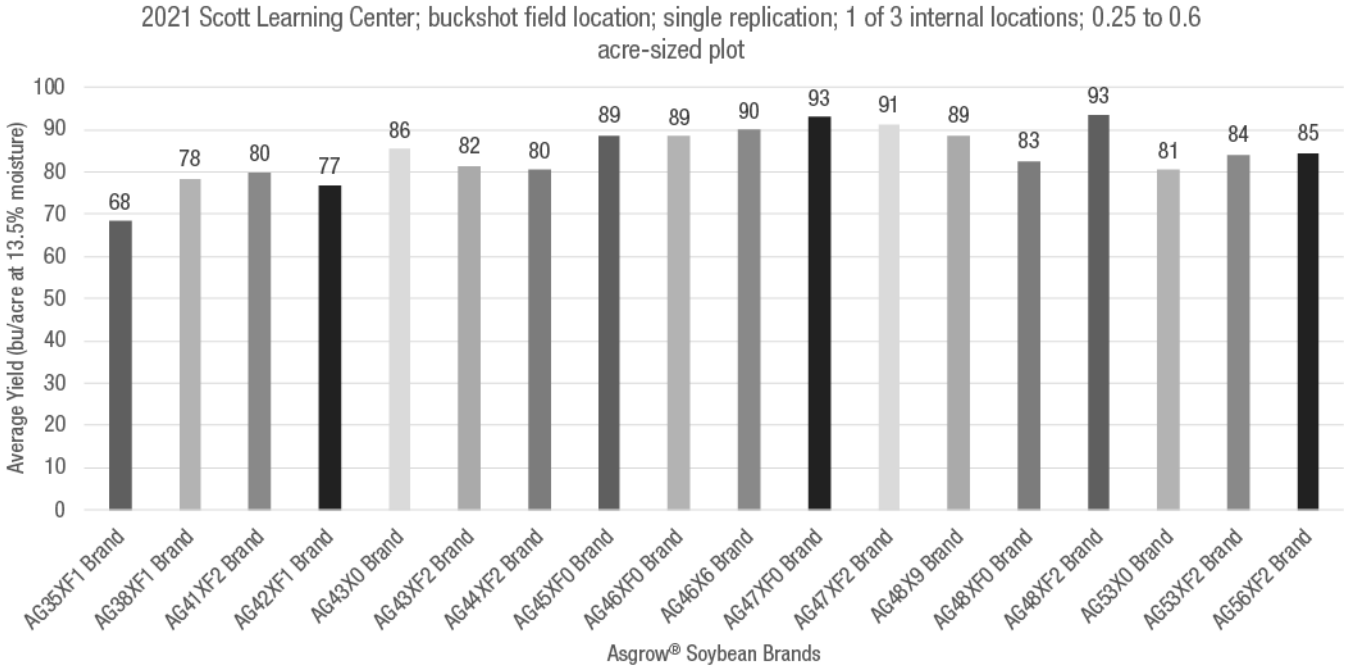

Figure 3. Yield evaluations of 18 Asgrow® soybean brands at the buckshot field location at Scott, Mississippi. Grown on sharkey clay soil with 45 cation exchange capacity.

- Overall, at this location, the soybean products had an average yield of 84.25 bu/acre.

Key Learnings

- From this work it appears that Asgrow® brand has developed a strong set of offerings for the 2022 growing season that fit many of the soil types and production systems of the Mid-South region.
- Please see your local Asgrow® brand seed representative for more information.

Evaluation of Asgrow® Brand Soybean Products on Different Soil Types in the Delta

Legal Statements

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ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. It is a violation of federal and state law to use any pesticide product other than in accordance with its labeling. NOT ALL formulations of dicamba, glyphosate or glufosinate are approved for in-crop use with products with XtendFlex® Technology. ONLY USE FORMULATIONS THAT ARE SPECIFICALLY LABELED FOR SUCH USES AND APPROVED FOR SUCH USE IN THE STATE OF APPLICATION. Contact the U.S. EPA and your state pesticide regulatory agency with any questions about the approval status of dicamba herbicide products for in-crop use with Roundup Ready 2 Xtend® soybeans or products with XtendFlex® Technology.

Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.

Products with XtendFlex® Technology contains genes that confer tolerance to glyphosate, glufosinate and dicamba. Glyphosate will kill crops that are not tolerant to glyphosate. Dicamba will kill crops that are not tolerant to dicamba. Glufosinate will kill crops that are not tolerant to glufosinate. Contact your seed brand dealer or refer to the Bayer Technology Use Guide for recommended weed control programs.

Insect Resistance Management
Planting Refuges, Preserving Technology

Before opening a bag of seed, be sure to read, understand and accept the stewardship requirements, **including applicable refuge requirements for insect resistance management,** for the biotechnology traits expressed in the seed as set forth in the Monsanto Technology/Stewardship Agreement that you sign. By opening and using a bag of seed, you are reaffirming your obligation to comply with the most recent stewardship requirements.

Roundup Ready 2 TECHNOLOGY

Planting Date in Southern Soybeans
Scott Learning Center - 2021

Trial Objective

- During the early 1990's, soybean producers in the Mid-south began selecting soybeans from the maturity groups 4 and 5 and started planting in mid-April. This was opposed to the historical pattern of planting soybeans from the maturity groups 5.5 to 7 during the late May to June period.
- Adoption of earlier planting dates with earlier maturity groups has led to the highest recorded yield potential due to reduced stresses during pod fill and the utilization of early season rainfall which was missed with later planting systems.
- Soybeans develop during relatively mild conditions and receive May to June rainfall which is typically missed with later planting dates.
- This trial was planted to evaluate the average soybean yield response to early and late planting dates across a broad range of maturity groups.

Research Site Details

- All agronomic, weed, and insect control practices were per local standards.
- Planted on raised beds 38-inch single rows apart.
- Asgrow® brand products planted
  - AG18XF1 Brand
  - AG20XF1 Brand
  - AG25XF1 Brand
  - AG30XF0 Brand
  - AG35XF1 Brand
  - AG36XF0 Brand
  - AG36XF1 Brand
  - AG38XF0 Brand
  - AG38XF1 Brand
  - AG40XF0 Brand
  - AG40XF1 Brand
  - AG41XF1 Brand
  - AG41XF2 Brand
  - AG42XF0 Brand
  - AG42XF1 Brand
  - AG43X0 Brand
  - AG45XF0 Brand
  - AG46XF0 Brand
  - AG46X6 Brand
  - AG48X9 Brand
  - AG48XF0 Brand
  - AG52XF0 Brand
- Trial was setup as strip plot design with one replication.
- Conditions at planting:
  - April Planting – Normal but relatively cooler at emergence compared to the May planting date. Development and bloom occurred during earlier, milder conditions.
  - May Planting – Warm conditions during emergence but relatively harsh conditions during growth and development.

Planting Date in Southern Soybeans
Scott Learning Center - 2021

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (bu/acre)	Seeding Rate (seeds/acre)
Scott, MS	Silty Clay Loam	Corn	Conventional	4/21/2021 5/24/2021	As Ready – desiccated per University Extension recommendations	80	120,000

Understanding the Results

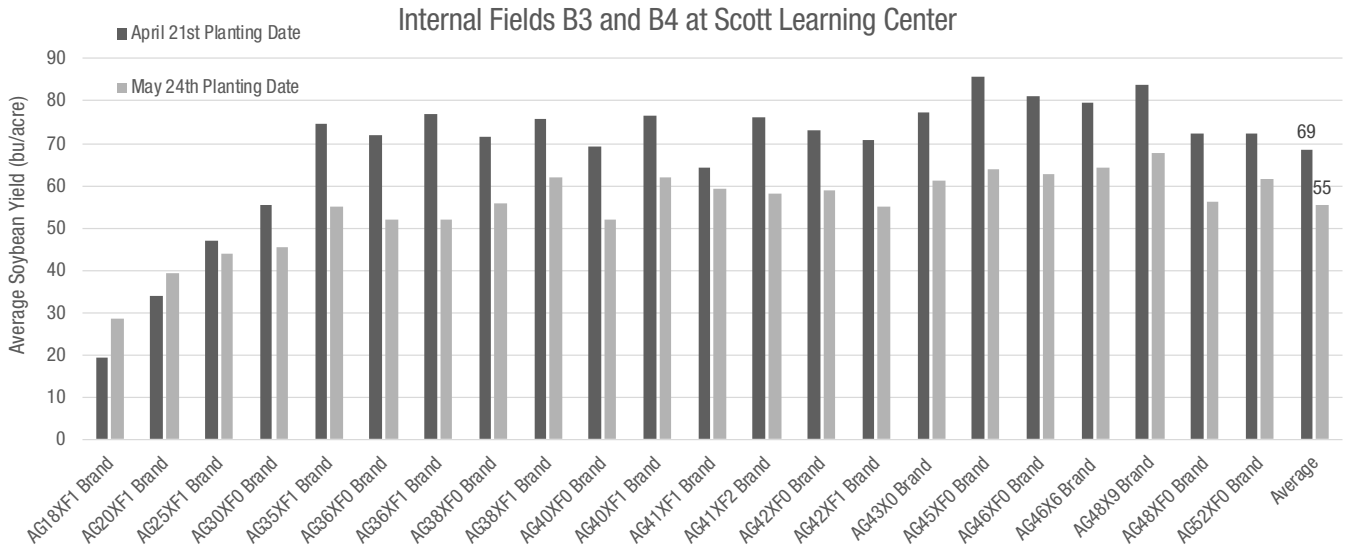

Figure 1. Soybean yield of 22 Asgrow® brand soybean products with early (April 21st) and late (May 24th) planting dates. Yield adjusted to 13.5% moisture. Bayer Learning Center, Scott, MS (2021).

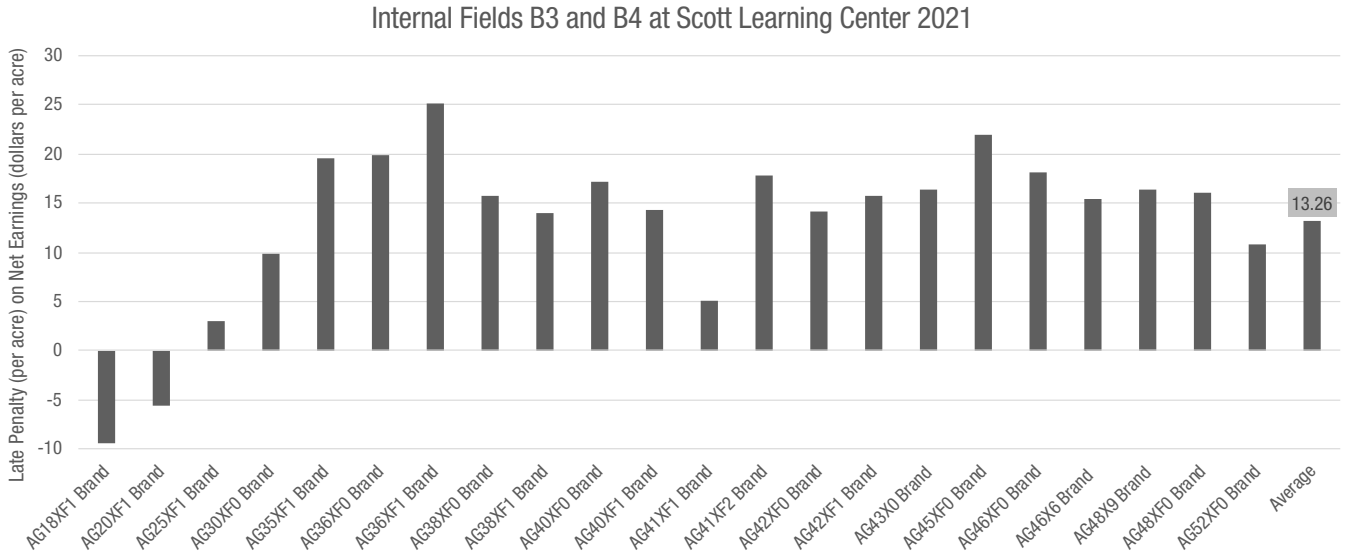

Figure 2. Net earnings penalty for early planting date (April 21st) compared to late planting (May 24th). Bayer Learning Center, Scott, MS (2021).

Planting Date in Southern Soybeans
Scott Learning Center - 2021

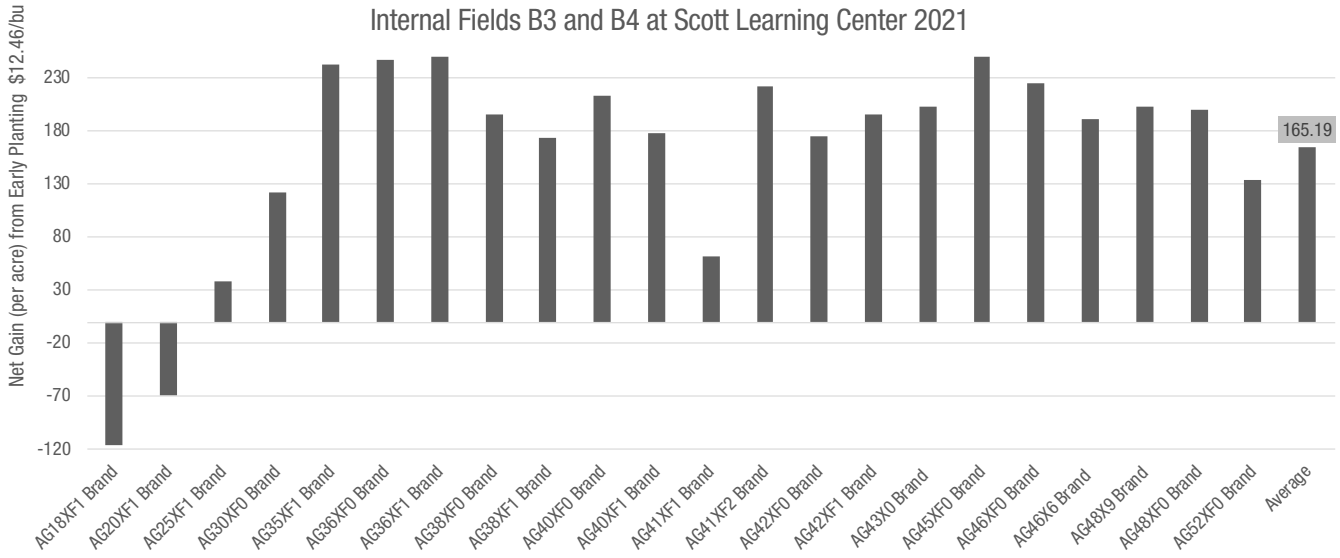

Figure 3. Net earnings gain for early planting date (April 21st) compared to late planting date (May 24th). Bayer Learning Center, Scott, MS (2021).

- Planting Date – The average yields were 69 bu/acre when planting on 4/21/2021 and 55 bu/acre planting on 5/24/2021.
  - » This provided a net yield gain of 13 bu/acre in favor of the April planting date.
  - » At $12.46/bu the net dollar gain for early planting was an average of $165.19/acre across the tested products for early planting.
- Variety Influences
  - » Planting date – Across both dates, the regionally predominate maturity groups (4.3 to 4.8) were the highest yielding.
  - » Some of the earlier MG products (earlier than MG 2.5) responded negatively to early planting. Regardless, these products are not well adapted to the south.
- Variety Selection – Varieties from the 3.5 to 3.8 MG are grown in the south to spread harvest timing without significant loss of yield potential. Harvest efficiency is increased while reducing input costs and weather risk. In this trial, earlier soybean products demonstrated relatively good yield potential on both planting dates.

Planting Date in Southern Soybeans
Scott Learning Center - 2021

Key Learnings

- Early- to mid-planting dates appear to be optimal for southern soybean varieties.
- Soybean varieties from the maturity groups 4.3 to 4.8 were the highest yielding products planted on both dates.
- Growers should carefully evaluate varieties in earlier maturity groups for regional adaptation.
- Please see your local Asgrow® brand representative for more information.

Legal Statements

Cotton Trials to Evaluate Row Configurations, Cotton Boll Locule Development, and Agronomic Interactions Involving Variety, Seeding Rate, and Row Configuration in Relation to Boll Locule Development

Trial Objective

Part I – Cotton Row Configuration

- Cotton planted on wider rows (up to 80-inches apart) has been a major point of discussion around the cotton industry for several years.
- Wide row and skip row plantings have several potential advantages over solid planting like equipment standardization across crops, reduced potential for excess vegetative growth via reduced plant to plant competition, and reductions in input costs from lower seeding cost and or banding of inputs.
- Questions remain regarding variety selection, appropriate management, and yield potential in wider row cotton plantings.
- This study was initiated at the Bayer Learning Center at Scott, MS to evaluate the potential of wide row cotton plantings in the production system.

Part II – Investigations into the Five Locule Boll

- A long-standing cotton mystery has been the five locule boll, which occurs at some level in most cotton fields.
- Questions regarding five locule bolls versus four locule bolls include:
  - » Do five locule bolls weigh more than four locule bolls?
  - » Do five locule bolls produce more seed and/or lint per boll than four locule bolls?
  - » What is the relative fiber quality of five versus four locule bolls?
  - » What contribution do five locule bolls make to lint yield?
  - » What factors can potentially influence the development of five locule bolls?

Figure 1. Four and five locule bolls. Scott, MS (2021)

- This study was an offshoot of the row configuration work in this document.
- This work helps to explain the agronomic impacts on boll locule number and some of the compensatory mechanisms that cotton shows at reduced populations.
- Some variety effects were also evaluated and are included in this analysis.

Part II B – Agronomic Interactions

- Inherent to this work, several agronomic factors including seeding rates, planting density down the row, variety, and row configuration had an influence on five locule development.

Cotton Trials to Evaluate Row Configurations, Cotton Boll Locule Development, and Agronomic Interactions Involving Variety, Seeding Rate, and Row Configuration in Relation to Boll Locule Development

Research Site Details

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (lb/acre)	Seeding Rate (seeds/acre)
Scott, MS	Silty/Sandy, Clay Loam	Corn	Conventional	5/15/2021	10/15/2021	1750	See Below

- Plots were approximately one acre each.
- Weed and insect controls were applied at local standard rates and timings.
- Nitrogen at a rate of 85 lb/acre was applied as 28-0-0-5 (N-P-K-S).
- Row configurations planted:
  - 38-inch Solid
  - 38-inch Skip Row (2:1) – 2 rows planted, 1 row skipped
  - 76-inch Wide Row (1:1) – Effectively 1:1 skip row 38-inch
    (This is planted as a proxy for 60-inch rows which is how wide row cotton is being planted. The Learning Center does not have 30-inch equipment and cannot effectively plant 60-inch rows due to drainage issues on 30-inch beds; therefore, 76-inch rows are used.)
- Deltapine® brand cotton varieties planted:
  - DP 2020 B3XF (early to mid-maturity)
  - DP 2127 B3XF (early to mid-maturity)
  - DP 2038 B3XF (mid-maturity)
  - DP 1646 B2XF (mid-maturity to full season)
  - DP 2055 B3XF (full season)
- Seeding rates per land acre:
  - 20,000
  - 30,000
  - 40,000
  - 50,000
- Mepiquat chloride 4.2% plant growth regulator (PGR) was applied at labeled rates to the row configuration treatments on dates relative to growth stage (9, 14, and 17 nodes):
  - 38-inch Solid
    - 6/22/2021 – 9 nodes - 12 fl oz/acre
    - 7/6/2021 – 14 Nodes - 12 fl oz/acre
    - 7/19/2021 – 17 nodes - 16 fl oz/acre
  - 76-inch Wide Row (1:1)
    - 6/22/2021 – 9 nodes - 10 fl oz/acre
    - 7/6/2021 – 14 Nodes - 10 fl oz/acre
    - 7/19/2021 – 17 nodes - 16 fl oz/acre

  - 38-inch Skip Row (2:1)
    - 6/22/2021 – 9 nodes - 10 fl oz/acre
    - 7/6/2021 – 14 Nodes - 10 fl oz/acre
    - 7/19/2021 – 17 nodes - 16 fl oz/acre
- The plots were intensively managed by row configuration. Each system was given the best chance for high lint yield potential in the Delta environment as water, mepiquat chloride, and defoliation were all independently managed for each production system.
- The 2021 early growing season at Scott, MS was harsh with large rainfall events and cloudy weather. This should have been an advantage for the alternative row configurations; however, the data collected did not support any advantage.
- Plots were machine harvested for lint yield after defoliation.

Data collected

- All plots were monitored for growth and development throughout the season.
- Box Mapping – All plots were positionally mapped to evaluate fruiting profile and boll parameters such as seed weight, seed number, and fiber quality:
  - Fruiting profile of the variety x seeding rate x row configuration combinations.
  - Sample ginning – All box mapping samples were bulked, ginned, and sent through High Volume Instrument (HVI) testing for both turnout and fiber quality evaluations.
  - Delinting – Mapping samples were segregated by treatment combination, locule number, and bulked together by locule cohort before ginning. After ginning, seeds were weighed fuzzy (in bulk), delinted, counted, and weighed post delinting (black) for reporting. This was done primarily to evaluate the influence of locule number on seed and lint weight and corresponding influences on lint yield and fiber quality.

Figure 2. Boll segregation process (left) and buckets (right) showing number of four locule bolls (red bucket) and five locule bolls (white bucket). Scott, MS (2021)

Understanding the Results

- **Part I-Row Configuration Evaluations and Observations**
  - » Row configuration
    - » The 38-inch solid configuration produced an average yield of 1564 lb lint/acre (Figure 3).
    - » The 76-inch (1:1) wide row (Figure 4) and 38-inch (2:1) skip row (Figure 5) treatments showed somewhat reduced average lint yields of 1151 to 1193 lb lint/acre, respectively.

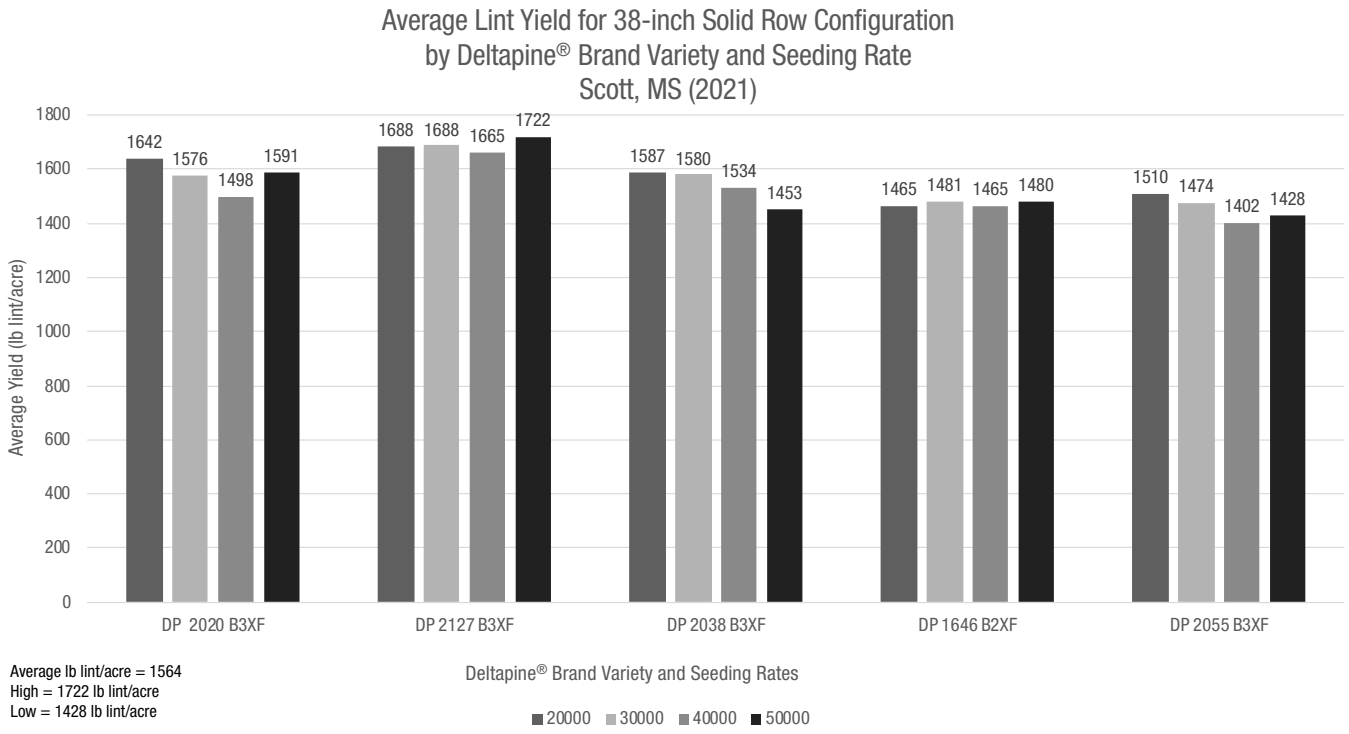

Figure 3. Average lint yield for 38-inch solid row configuration by Deltapine® brand variety and seeding rate. Scott, MS (2021)

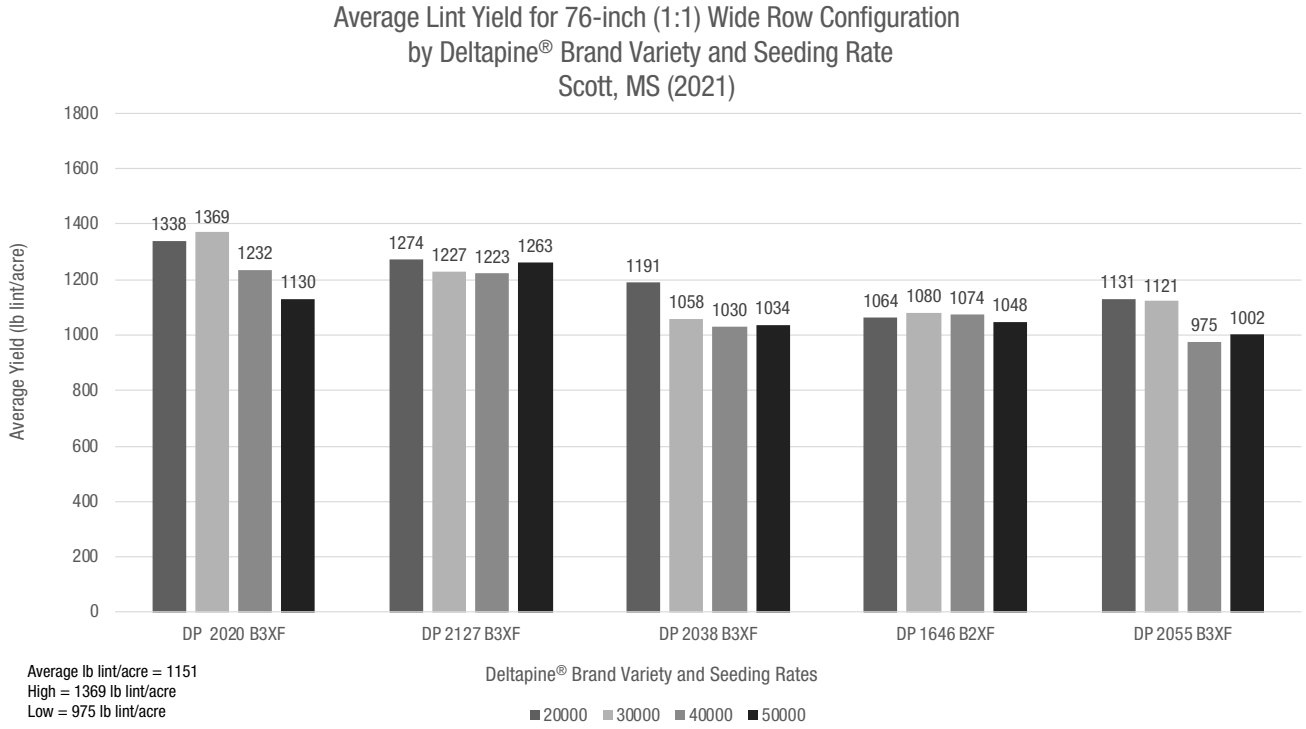

Figure 4. Average lint yield of 76-inch (1:1) wide row configuration by Deltapine® brand variety and seeding rate. Scott, MS (2021)

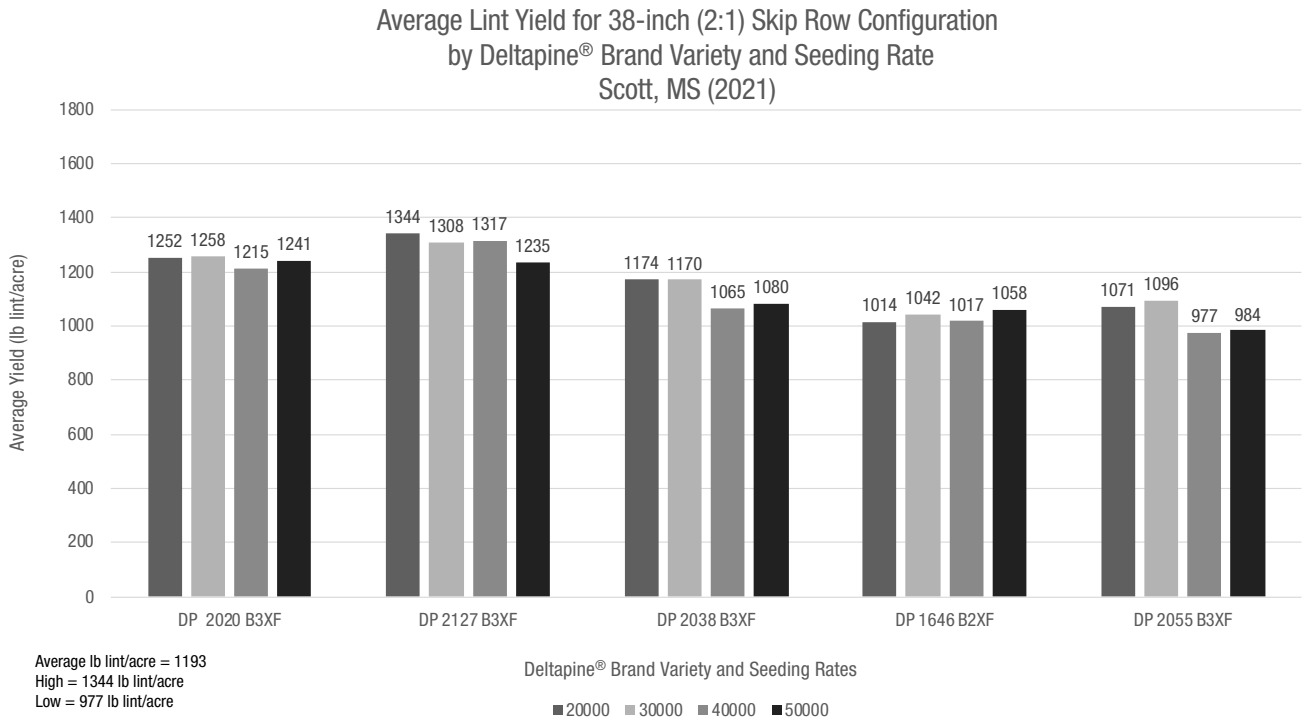

Figure 5. Average lint yield of 38-inch (2:1) skip row configuration by Deltapine® brand variety and seeding rate. Scott, MS (2021)

- » Comments about results:
  - » While the solid plantings were higher yielding, several of the wider/skip row treatment combinations showed average yields of 1300+ lb lint/acre. Growers should acknowledge this limitation before pursuing either alternative row spacing as a production practice.
  - » Variety selection should be carefully evaluated before selecting a variety for wide row production.
  - » An important note – these differences are likely to narrow as row configuration moves closer to 60-inches but may also remain. Further investigation is warranted.
- » Seeding Rates:
  - » Seeding rate is a factor many growers use to moderate vegetative development and supplement or improve the effectiveness of PGR applications.
  - » Seeding rate appears to be optimized in this study between 30,000 to 40,000 seeds/acre. This agrees with commercial practice.
  - » It appears that reducing the seeding rate in solid row plantings does not greatly decrease yield potential.
  - » Yields appeared to be slightly higher in the 76-inch wide rows (1:1) at the lowest seeding rates but at levels of 300 to 400 lb lint/acre lower than in the solid plantings (Figure 4). This points out one fundamental limitation of the wide row planting.
  - » Growers should carefully evaluate seeding rate decisions and variety response when a change is being considered. However, cotton yield potential appears to be very high even at relatively low seeding rates.

- **Part II - Investigations into the Five Locule Boll**
  - » In the previously discussed row configuration study, the plots were positionally mapped and the bolls were grouped into cohorts of either four or five locule containing bolls.
  - » Six-row feet from each plot, which contained a varying number of plants depending on seeding rate and emergence, were mapped. Data not shown.
  - » 11,633 bolls were mapped, categorized, delinted, and counted from the plots.
    - » 10,105 bolls were categorized as four locule (86.4%).
    - » 1,528 bolls were categorized as five locule (13.4%).
  - » Bolls were weighed, ginned, High Volume Instrument (HVI) testing completed on the fiber, seed delinted, and seeds were counted.
    - » Boll size evaluations and data from this step included:
      - Seed cotton/boll in grams (significantly more for five locule bolls) (Figure 6).
      - Lint/boll in grams (significantly more for five locule bolls) (Figure 7).
      - Number of seed/boll (significantly more for five locule bolls) (Figure 8).
      - Number seed/locule (similar for four and five locule bolls) (Figure 9).
      - Turnout - % Lint versus seed cotton (similar for four and five locule bolls) (Figure 10).
      - Fiber quality - Length, strength, micronaire, and uniformity (all similar for four and five locule bolls) (Figures 11 and 12).

- Gross conclusions:
  - **Five locule bolls are roughly 20% larger versus four locule bolls including seed cotton weight, lint weight, and seed weight.**
  - **The fiber quality of five and four locule bolls is similar.**

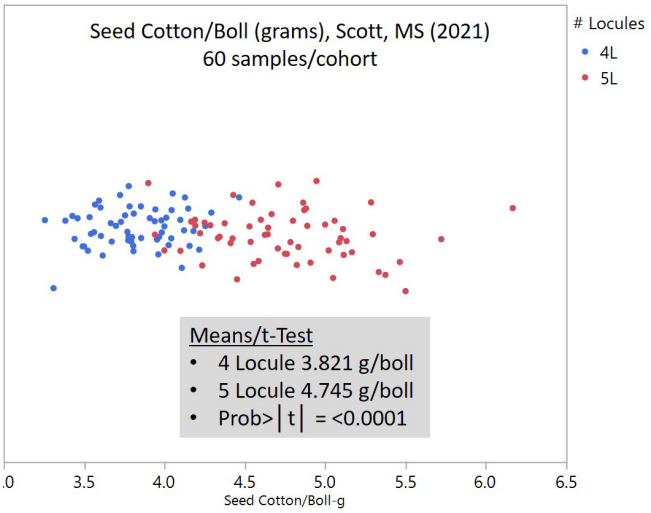

Figure 6. Weight (grams) of seed cotton four and five locule bolls at Scott, MS (2021).

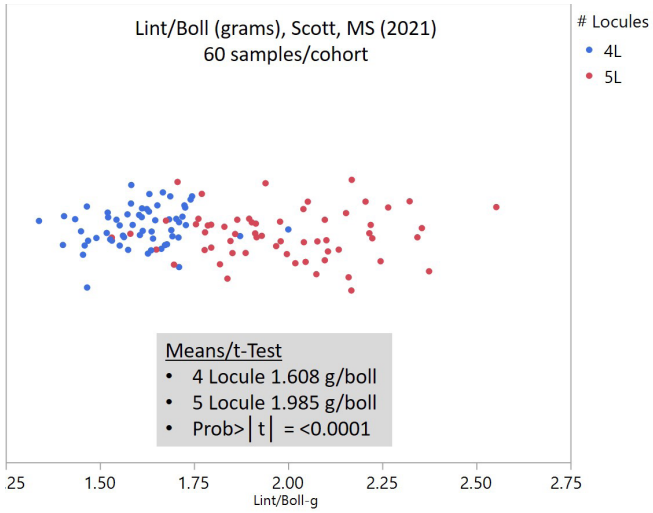

Figure 7. Lint weight (grams) for four and five locule bolls at Scott, MS (2021).

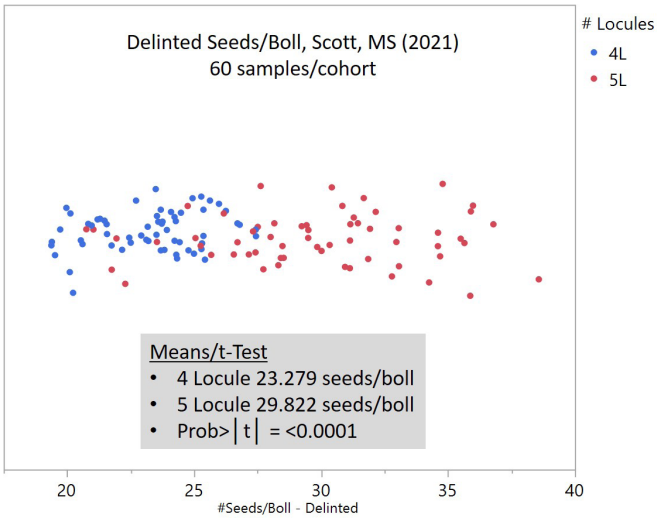

Figure 8. Delinted seeds per four and five locule bolls, Scott, MS (2021).

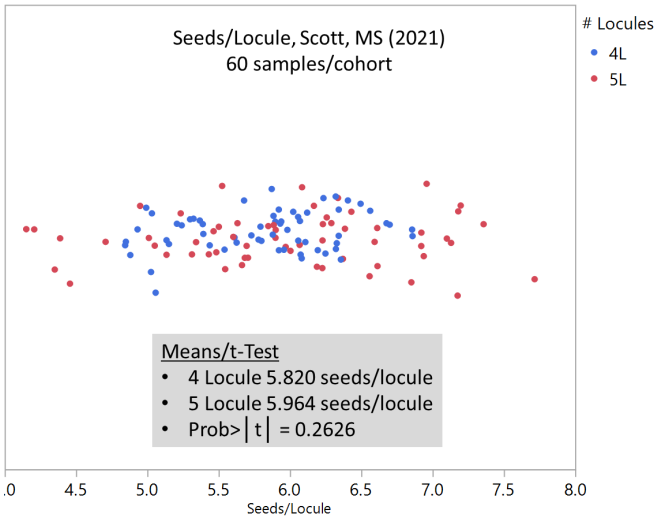

Figure 9. Counted seeds per locule in four and five locule bolls, Scott, MS (2021).

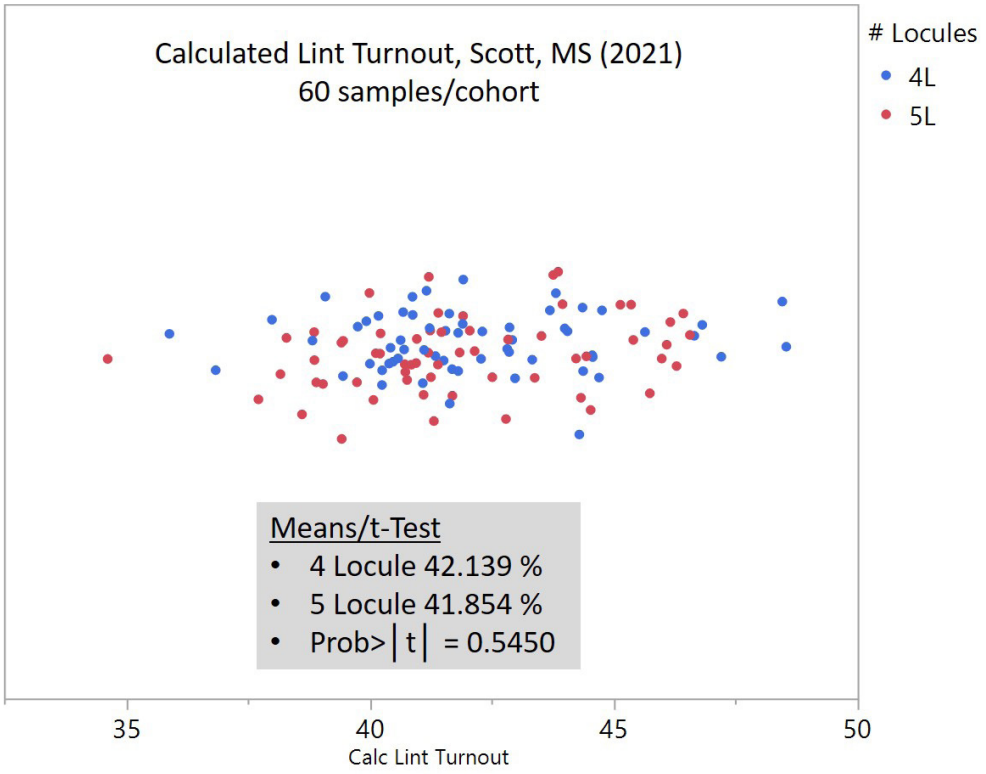

Figure 10. Calculated lint turnout for four and five locule bolls, Scott, MS (2021)

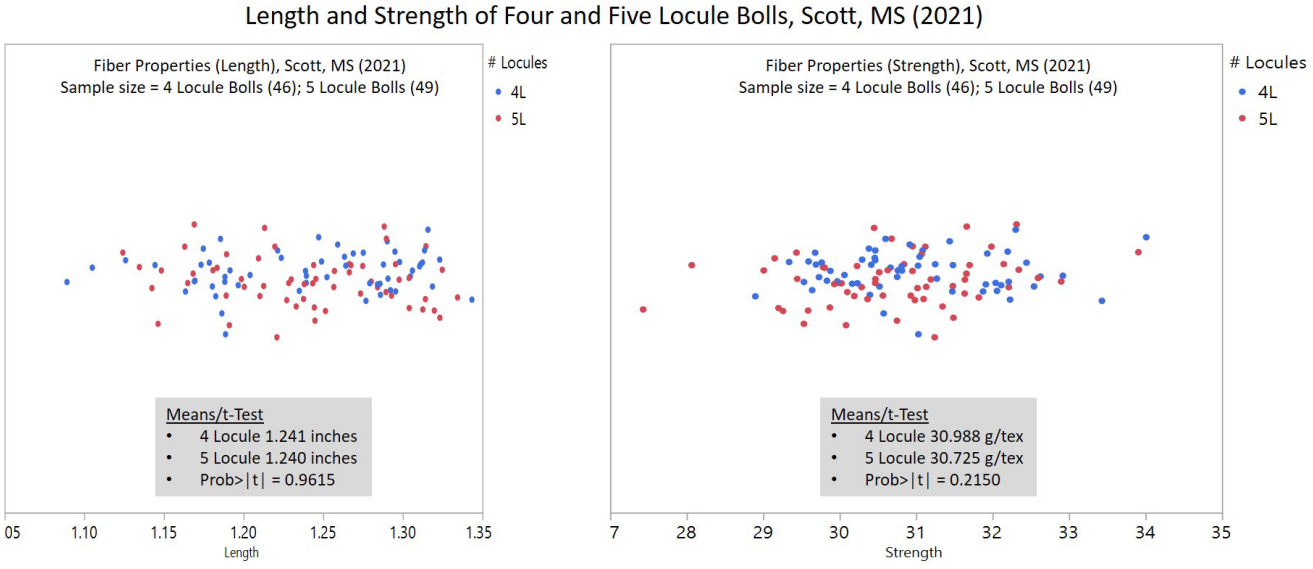

Figure 11. Length and strength of four and five locule bolls, Scott, MS (2021).

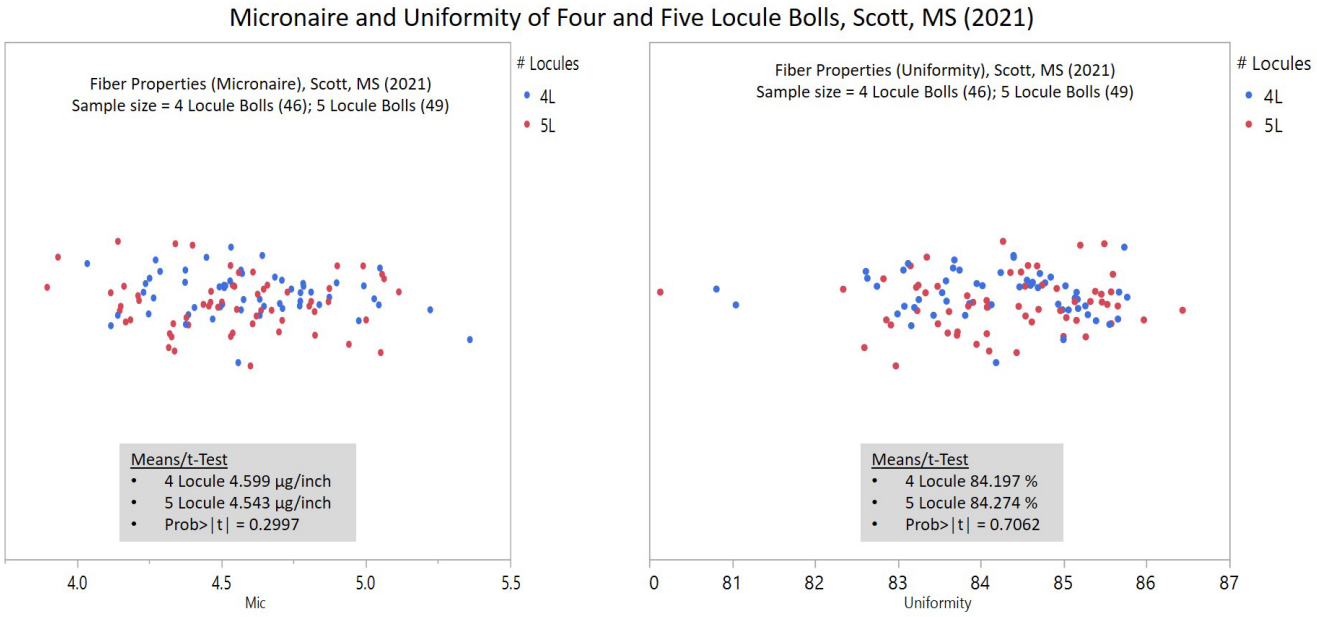

Figure 12. Micronaire and uniformity of four and five locule bolls, Scott, MS (2021).

- **Part II B – Agronomic influences on locule development in cotton.**
  - » Background – Historical (1920's) and recent literature indicates that locule (4 or 5) determination occurs about 24-28 days prior to bloom.[1,2] Most cotton bolls in *Gossypium hirsutum* start with 5 locules and drop to 4 based on carbohydrate status. Typically less available energy leads to reductions in locule number from 5 to 4. The determination is based mainly on the status of carbohydrate production; higher carbohydrate amounts preserve more five locule bolls (Figure 1).
  - » Factors to consider in carbohydrate availability – All field effects that influence the production and availability of carbohydrates should be considered including:
    - » Reduced production – Due to cloudy weather, fertility availability, water logging, drought and other factors.
    - » Plant to plant competition – This leads to increased vegetative development and can decrease carbohydrates availability, particularly when not managed properly. It is also a primary driver of why differences among populations were observed.
    - » Vegetative growth – Any factor that leads to excess vegetative development can reduce carbohydrate availability to the rest of the plant. This can be managed using PGRs and for that reason PGR use is a factor to consider here since it is primarily used to balance vegetative and reproductive growth.

Cotton Trials to Evaluate Row Configurations, Cotton Boll Locule Development, and Agronomic Interactions Involving Variety, Seeding Rate, and Row Configuration in Relation to Boll Locule Development

- Agronomic influences on locule development in cotton:
  - Variety
    - Variety is a huge component for locule number determination.
    - Some varieties (particularly DP 2038 B3XF in this study) produce more (as much as 3X) five locule bolls through various seeding rates (Table 1). This may explain the impact on yield potential and the increase (mysterious) in turnout in some fields.
    - The percentage of five locule bolls appears to range from very few (4%) to around 35% depending on the variety x row configuration x seeding rate combination.
    - Table 1 data is averaged **across the 38-inch Skip Row (2:1) and 38-inch solid plantings** since they were numerically similar.

Table 1. Average percent of five locule bolls by variety and seeding rates averaged across the 38-inch skip row (2:1) and 38-inch solid row configurations at Scott, MS (2021).

Seeds/acre and Percent of Five Locule Bolls				
Variety	20,000	30,000	40,000	50,000
DP 2020 B3XF	15.39	13.92	15.39	9.37
DP 2127 B3XF	25.21	16.66	14.07	13.82
DP 2038 B3XF	35.72	19.66	23.97	20.61
DP 1646 B2XF	20.99	13.51	13.44	8.23
DP 2055 B3XF	14.06	10.81	4.28	7.63
Grand Total	22.27	14.91	14.23	11.93

  - Averaged across the three row configurations, varieties, and seeding rates in the trial, five locule bolls accounted for 13.43% of the bolls which contributed 16.03% of the harvested dry weight for a yield gain associated to five locule bolls of 2.62% (Table 2).
    - This gain can be scaled to the number of five locule bolls contained in each treatment combination to roughly estimate the contribution made to yield.

Table 2. Average percent of five locules for each seeding rate and average percent harvested weight attributed to five locule bolls at Scott, MS (2021).*

Seeding Rate Seeds/acre	Average Percent of Five Locule Bolls for Each Seeding Rate	Average Percent of Harvested Weight Attributed to Five Locule Bolls
20,000	18.62	21.99
30,000	12.80	15.42
40,000	11.94	14.30
50,000	10.34	12.40
Grand Total	13.43	16.03

*Averaged across the three row configurations.

- Seeding Rate
  - Seeding rate effects on locule development appeared similar in all three row configurations but at different magnitudes. The 76-inch wide row (1:1) cotton had a lower percentage of five locule bolls in almost all cases but with similar trends to the 38-inch skip row (2:1) and 38-inch solid (Table 3). This is likely a result of increases in down-the-row density (plant-to-plant competition) versus the other row spacings. The data below is averaged across varieties and the three row configurations.
  - Less plant to plant competition (lower population) can be the trigger for improving carbohydrate availability. There seems to be a plant density (down the row not the land acre) effect, which is why the 76-inch wide row (1:1) spacing responded differently. We must remember that even though the row configurations contain similar numbers of plants on the land acre they are as much as half the distance apart down the row. This apparently introduces plant to plant competition that can cause a long-lasting impact throughout the growing season.
- Row Configuration
  - The data below is averaged across variety and seeding rate within the row configurations.
  - 38-inch solid row and 38-inch skip row (2:1) plantings were similar in the percentage of five locule bolls (Table 3).
  - The 76-inch (1:1) row plantings developed about 50% less (8.60%) five locule bolls versus the 38-inch solid and 38-inch (2:1) skip row plantings which were 16.87% and 14.80%, respectively (Table 3).
    - This is likely the result of increased plant to plant competition down the row in the 76-inch (1:1) plantings and will be focus of further research.
  - Similar percentage increases of relative dry weight can be attributed to five locule bolls in the three row configurations (Table 3).
    - **An explanation may be that the average percentage of five locule bolls equals the percentage of the bolls in the treatment combination with five locules. The average percentage of five locule boll weight is the percentage of the dry weight that they contributed to yield.**

Table 3. Average percentage of five locule bolls and average percentage of dry weight attributed to five locule bolls within three row configurations at Scott, MS (2021).

Row Configurations	Average Percentage of Five Locule Bolls	Average Percentage of Dry Weight Attributed to Five Locule Bolls
76-inch wide row (1:1)	8.60	10.70
38-inch skip row (2:1)	14.80	17.40
38-inch solid	16.87	19.98

Cotton Trials to Evaluate Row Configurations, Cotton Boll Locule Development, and Agronomic Interactions Involving Variety, Seeding Rate, and Row Configuration in Relation to Boll Locule Development

Key Learnings

- Wider row spacings can produce acceptable yields; however, potential yield may be limited versus solid plantings.
- Growers should carefully consider variety selection and placement when choosing a wide row or skip row configuration.
- Seeding rate management appears to be a useful tool for managing vegetative development in cotton without greatly sacrificing yield potential.
- **Five locule bolls, when present, are roughly 20% bigger, have similar fiber qualities, and offer greater contributions to yield potential than four locule bolls when considered on an individual basis; however, all bolls are important and four locule bolls remain the primary contributors to yield potential.**
- Agronomic factors that include variety selection, seeding rates, row configuration, drought, irrigation, and other factors influence the development and number of five locule bolls.
- Please see your local Deltapine® brand representative for more information.

Sources:

[1] Robertson, B., Bednarz, C., and Burmester, C. 2007. Growth and development – first 60 days. Cotton Physiology Today. Vol. 13, No. 2. National Cotton Council. https://www.cotton.org/tech/physiology/cpt/plantphysiology/upload/Growth-and-Development-First-60-Days-NOSUBSCRIBE.pdf.

[2] Oosterhuis, D., Stewart, M., and Guthrie, D. 1994. Cotton fruit development: The boll. Cotton Physiology Today. Vol. 5. No. 7. National Cotton Council. https://www.cotton.org/tech/physiology/cpt/plantphysiology/upload/CPT-Aug94-REPOP.pdf.

Legal Statements

Evaluation of Deltapine® Brand Commercial and Non-Commercial Cotton Products at Scott, MS

Trial Objective

- The objective of this study was to evaluate current Deltapine® brand commercial and non-commercial cotton products for adaptation to the Mid-Southern production system.

Research Site Details

- The cotton products were evaluated across the normal range of maturities and determinacy typical of the Deltapine® lineup. Included in the testing were two cotton products from the Class of 2021 New Product Evaluator (NPE) group. This type of testing helps to identify which non-commercial candidates perform the best across the different soil types.
- This trial was a single replicate study (0.2 acre/plot) conducted at Scott, MS on two radically different Delta soil types:
  - The Highway Cut site is a silty sand soil.
  - The Buckshot Field is a heavy clay soil.
- Deltapine® Brand Products and NPE Products Planted:
  - DP 1908 B3XF
  - DP 2012 B3XF
  - DP 2115 B3XF
  - DP 1518 B2XF
  - DP 1820 B3XF
  - DP 2020 B3XF
  - DP 1725 B2XF
  - DP 2127 B3XF
  - 20R734 B3XF (NPE candidate)
  - DP 2038 B3XF
  - DP 1840 B3XF
  - DP 2141NR B3XF
  - DP 2239 B3XF
  - 20R745NR B3XF (NPE candidate)
  - DP 1646 B2XF
  - DP 2055 B3XF
- All weed, insect and agronomic inputs were per local standards.
- Machine harvested.
- Fiber samples submitted to High Volume Instrument (HVI) Lab for turnouts and fiber quality evaluations.

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (lb/acre)	Seeding Rate (seeds/acre)
Scott, MS Highway Cut	Commerce/Forestdale Silt Loam, 15 CEC	Corn	Conventional	5/14/2021	10/9/2021	1600	35,000
Scott, MS Buckshot Field	Sharkey Clay, 45 CEC	Corn	Conventional	5/17/2021	10/11/2021	1200	40,000

Evaluation of Deltapine® Brand Commercial and Non-Commercial Cotton Products at Scott, MS

- Agronomic Notes about each site.
  - » Highway Cut – This is a very deep silty sand that represents the traditional "cotton soils" of the Delta. It is characterized by very aggressive growth conditions, particularly when planted in cotton following corn. For this reason, plant growth regulator (PGR) use and population are particularly useful for managing vegetative development.
  - » 4.2% mepiquat chloride (PGR) application dates and rates:
    - 6/25/2021 - 16 fl oz/acre.
    - 7/12/2021 - 16 fl oz/acre.
    - 7/24/2021 - 16 fl oz/acre.
  - » 80 lb/acre of 28-0-0-4 (N-P-K-S) applied.
  - » Buckshot Field – This is an abusive environment for cotton production. The soils are typically too wet or too dry. For this study, one stress followed the other with waterlogging conditions, soon followed by a threat of premature cutout due to drought and finishing with good production conditions.
  - » 4.2% mepiquate chloride (PGR) application dates and rates:
    - 7/20/2021 - 8 fl oz/acre.
    - 8/15/2021 - 12 fl oz/acre.
  - » 130 lb/acre of 28-0-0-4 applied in two applications: 100 lb/acre of N applied at planting and in response to flooding and associated fertilizer loss, 35 lb/acre was applied at layby as a supplement.

Understanding the Results

- The two sites and the 2021 production season were characterized with poor fruiting low in the plants (although they were two very different agronomic cases) followed by a period of excellent fruit accumulation through mid- and late season. For this reason, early and mid-maturity products seemed to perform well, particularly in the Highway Cut site.
- In the Buckshot Field, fruiting profiles were radically different than the Highway Cut site and as a result the differences in yield were narrowed with a broader group of products appearing to tolerate and recover from the stresses.
- Fruit retention in lower nodes (nodes 6 to 10) was very low to zero at both sites. The Buckshot Field is a particularly odd case where retention was low, then too high causing the potential for premature cutout.
- Highway Cut
  - » Due to agronomic complications from 2021, the early- to mid-season products seemed to perform better at the Highway Cut site. This is a typical result in very growthy, difficult to manage production systems. Yield at this site averaged 1210 lb lint/acre with a high of 1543 lb lint/acre and a low of 706 lb lint/acre (Figure 1).
  - » Gross revenue ($/acre) tracked closely to lint yield/acre (Figure 2).

Evaluation of Deltapine® Brand Commercial and Non-Commercial Cotton Products at Scott, MS

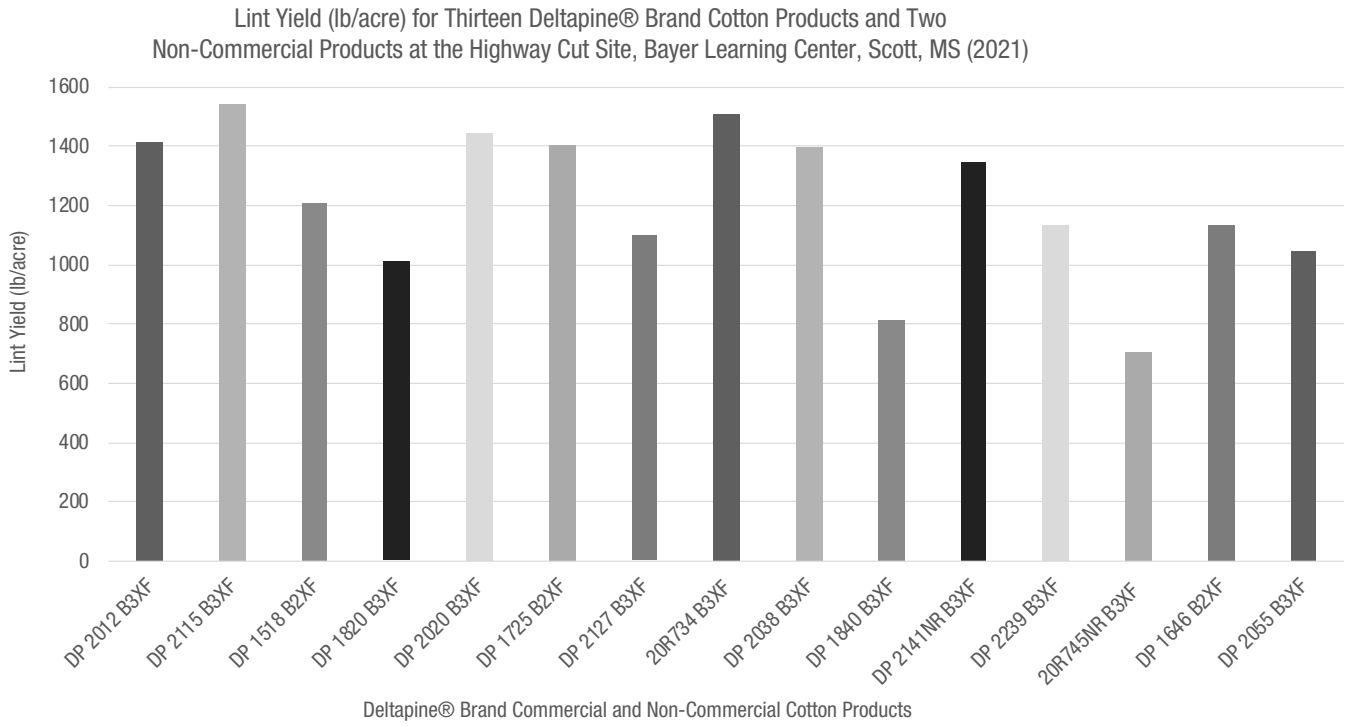

Figure 1. Lint Yield at the Highway Cut site, Bayer Learning Center, Scott, MS (2021).

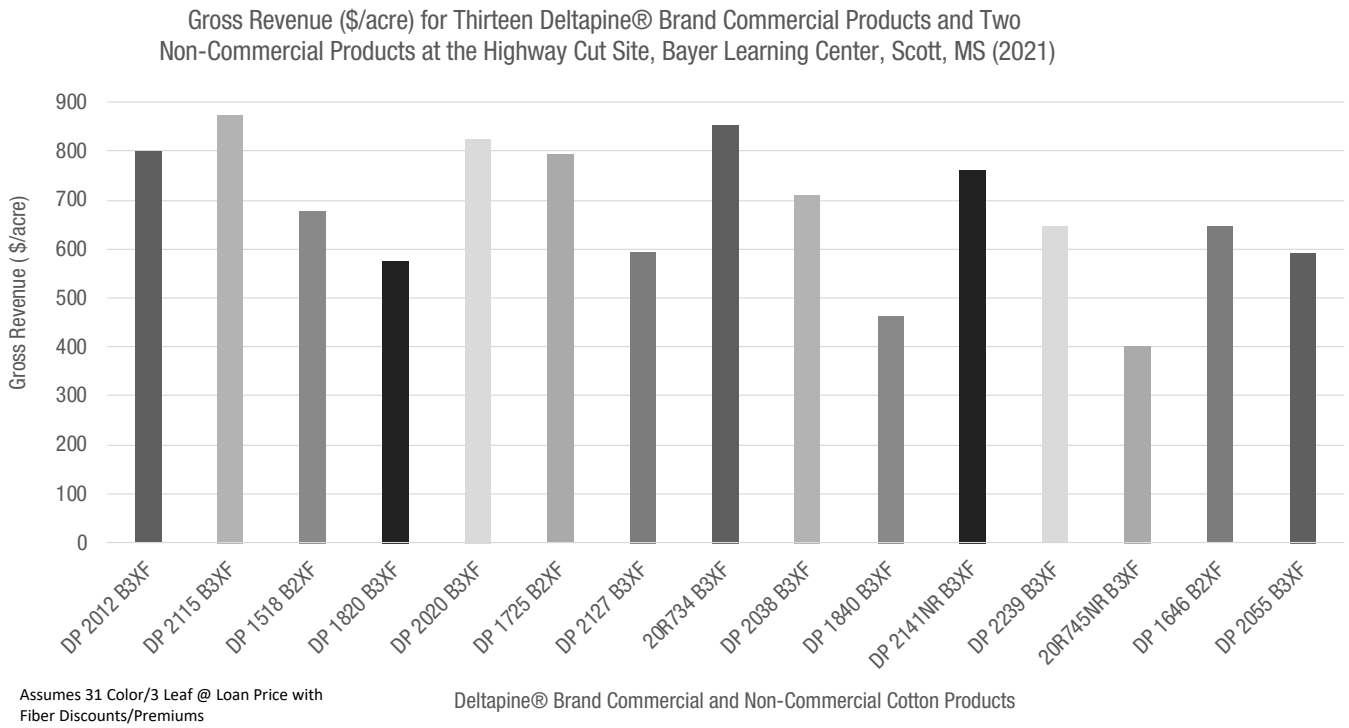

Figure 2. Gross revenue ($/acre) at the Highway Cut site, Bayer Learning Center, Scott, MS (2021).

Evaluation of Deltapine® Brand Commercial and Non-Commercial Cotton Products at Scott, MS

- Buckshot Field
  - » The agronomic situation in this field was entirely different and required differential management; however, it still recovered and established an average yield of 899 lb lint/acre with a high of 1117 lb lint/acre and a low of 712 lb lint/acre (Figure 3).
    - Prebloom – Extreme rainfall events waterlogged this location for much of the prebloom period resulting in restricted growth.
    - Bloom – At and just after bloom, this location dried out and began to recover from the excess water stress, then became too dry which led to a potential for premature cutout. Additionally, a high lygus infestation removed much of the existing fruit causing the following intense management steps to be initiated:
- At minimum fruiting (under 10% square retention), insect control was initiated along with relatively low rates of PGR and a minimally wetting irrigation was applied.
- After treatment, the cotton plants began to recover from both excess water stress, drought stress, and insect damage.
  - » Mid-Late Season – The Buckshot Field fruited as expected and established an acceptable yield potential (1100 lb/acre) because of the dynamic in-season management.
    - Gross revenue ($/acre) tracked closely to lint yield/acre (Figure 4).

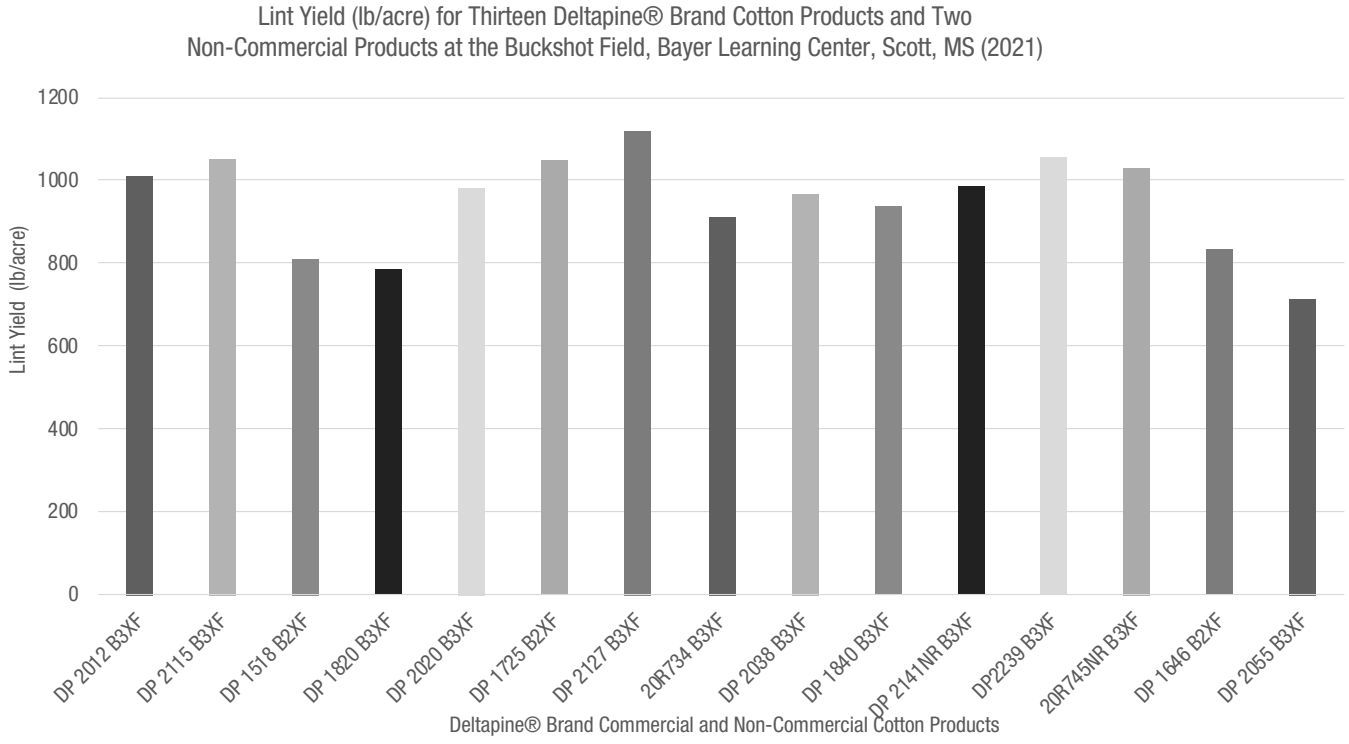

Figure 3. Lint yield at the Buckshot Field, Bayer Learning Center, Scott, MS (2021).

Evaluation of Deltapine® Brand Commercial and Non-Commercial Cotton Products at Scott, MS

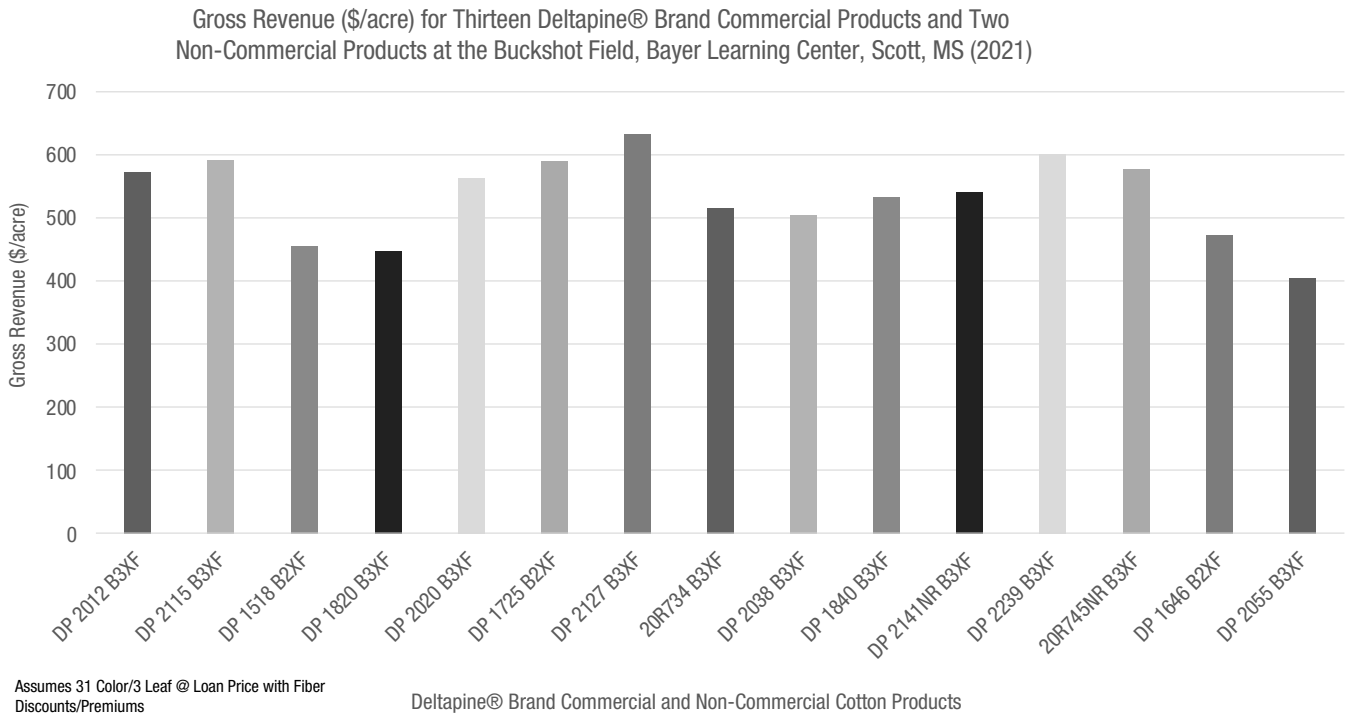

Figure 4. Gross revenue ($/acre) at the Buckshot Field, Bayer Learning Center, Scott, MS (2021).

Key Learnings

- Current Deltapine® brand products and some of the new NPE class products appear to offer growers excellent candidates for either tested production system even though very specific considerations should be given when choosing a cotton product to plant.
- When choosing a cotton product(s) to plant, growers should carefully consider the entire package including PGR management required, yield, agronomic traits, and inherent fiber quality potential. As shown in the gross revenue slides, it appears new and emerging Deltapine® brand products offer excellent potential in southern production systems.
- Please contact your local Bayer representative for more information.

Legal Statements

Evaluation of Deltapine® Brand Commercial and Non-Commercial Cotton Products at Scott, MS

B.t. products may not yet be registered in all states. Check with your seed brand representative for the registration status in your state.

Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.

Products with XtendFlex® Technology contains genes that confer tolerance to glyphosate, glufosinate and dicamba. Glyphosate will kill crops that are not tolerant to glyphosate. Dicamba will kill crops that are not tolerant to dicamba. Glufosinate will kill crops that are not tolerant to glufosinate. Contact your seed brand dealer or refer to the Bayer Technology Use Guide for recommended weed control programs.

Insect Resistance Management
Planting Refuges, Preserving Technology

Before opening a bag of seed, be sure to read, understand and accept the stewardship requirements, **including applicable refuge requirements for insect resistance management,** for the biotechnology traits expressed in the seed as set forth in the Monsanto Technology/Stewardship Agreement that you sign. By opening and using a bag of seed, you are reaffirming your obligation to comply with the most recent stewardship requirements.

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RESPECT THE REFUGE

Roundup Ready 2 TECHNOLOGY

ENVIRONMENT

Response of Deltapine® Brand Cotton Products to Different Plant Growth Regulator (PGR) Regimens

Trial Objective

- The objective of this study at the Bayer Learning Center at Scott, MS was to evaluate the response of Deltapine® brand cotton products to different plant growth regulator (PGR) regimens.
- PGR response is a very important characteristic to consider when choosing a cotton product to plant.
- From this work, we hope to increase the amount of information for managing new and existing products.
- Proper PGR management helps optimize Deltapine® brand cotton product return on investment.

Research Site Details

- All weed, insect, and agronomic inputs were per local recommendations except PGR applications.
- 110 lb/acre of nitrogen (N) applied as 28-0-0-4 (N-P-K-S) before layby.
- PGR Regimens:
  - » Untreated Check (UTC) - no PGR applied.
  - » Passive Regimen - Represents the more passive PGR treatments typically applied two weeks later and at reduced application rates compared to aggressive treatments.
    - Application dates, timing, and rates for 4.2% mepiquat chloride:
    - 7/6/2021 - 14 nodes - 10 fl oz/acre.
    - 7/19/2021 - 17 nodes - 12 fl oz/acre.
    - 7/30/2021 - 20 nodes - 12 fl oz/acre.
  - » Aggressive Regimen – PGR applications that are the most biologically and legally aggressive which usually begin at 8 to 9 nodes and at relatively high application rates.
    - Application Dates, timing, and rates for 4.2% mepiquat chloride:
    - 6/22/2021 - 9 nodes - 16 fl oz/acre.
    - 7/6/2021 - 14 Nodes - 16 fl oz/acre.
    - 7/19/2021 - 17 nodes - 16 fl oz/acre.
- Deltapine® Brand Products:
  - » DP 1908 B3XF (very early to early maturity)
  - » DP 2012 B3XF (early maturity)
  - » DP 2115 B3XF (early maturity)
  - » DP 1820 B3XF (early to mid-maturity)
  - » DP 2020 B3XF (early to mid-maturity)
  - » DP 1725 B2XF (early to mid-maturity)
  - » DP 2127 B3XF (early to mid-maturity)
  - » DP 2038 B3XF (mid-maturity)
  - » DP 1840 B3XF (mid-maturity to full season)
  - » DP 2141NR B3XF (mid-maturity to full season)

Response of Deltapine® Brand Cotton Products to Different Plant Growth Regulator (PGR) Regimens

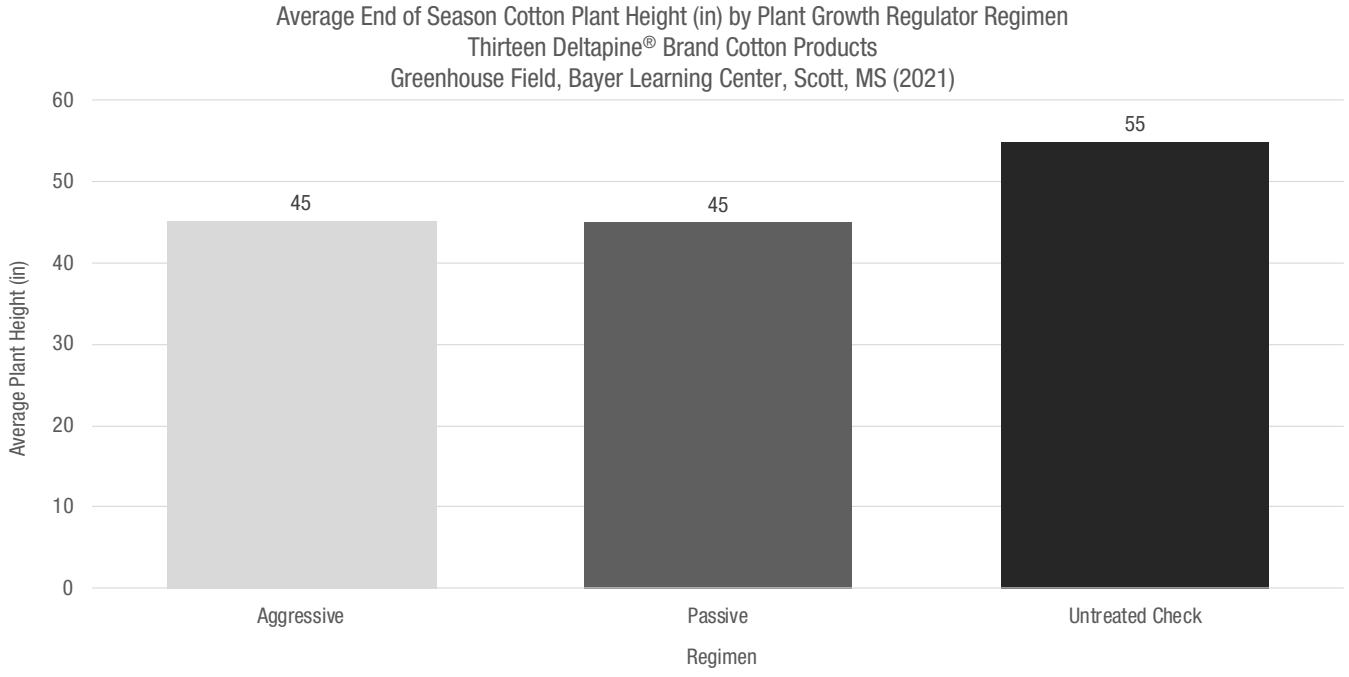
- » o DP 2239 B3XF (mid-maturity to full season)
- » o DP 1646 B2XF (mid-maturity to full season)
- » o DP 2055 B3XF (full season)

- Trial was a single replicate study (0.1 acre/plot), machine harvested, and site turnouts (from adjacent experiments) were used to estimate lint yields.

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (lb/acre)	Seeding Rate (seeds/acre)
Scott, MS	Commerce Sandy Loam	Corn	Conventional	5/14/2021	10/10/2021	1700	42000

Understanding the Results

- For 2021 cotton production, very harsh early season growing conditions were followed by good growing conditions. The characteristics of the season included:
  - » On time planting.
  - » A very wet early season leading to poor early fruit set in all tested products.
  - » After the early rains ended, cotton crops at the Learning Center began to fruit normally and ultimately showed very good yield potential.
  - » Data from 2021 shows a similar response to previous years but requires a somewhat different interpretation.
- Plant Heights: Across the products tested, the Aggressive and Passive Regimens showed similar reductions in growth of about 10-inches (18%) compared to the UTC plots (Figure 1). This is typical for previous years as well.*



Passive = 4.2% mepiquat chloride application dates, timing, and rates: 7/6/2021 - 14 nodes - 10 fl oz/acre; 7/19/2021 - 17 nodes - 12 fl oz/acre; 7/30/2021 - 20 nodes - 12 fl oz/acre
Aggressive = 4.2% mepiquat chloride application dates, timing, and rates: 6/22/2021 - 9 nodes - 16 fl oz/acre; 7/6/2021 - 14 nodes - 16 fl oz/acre; 7/19/2021 - 17 nodes - 16 fl oz/acre

Figure 1. Average end of season plant height (in) by Plant Growth Regulator Regimen for thirteen Deltapine® brand cotton products. Greenhouse Field, Bayer Learning Center, Scott, MS (2021).

Response of Deltapine® Brand Cotton Products to Different Plant Growth Regulator (PGR) Regimens

- Lint Yield: The UTC plots averaged 1139 lb lint/acre. This improved to 1274 lb lint/acre (135 lb/acre or 12% increase) in the Passively managed plots and 1366 lb lint/acre (227 lb/acre or 20% increase) in the aggressively managed plots across all products (Figure 2).

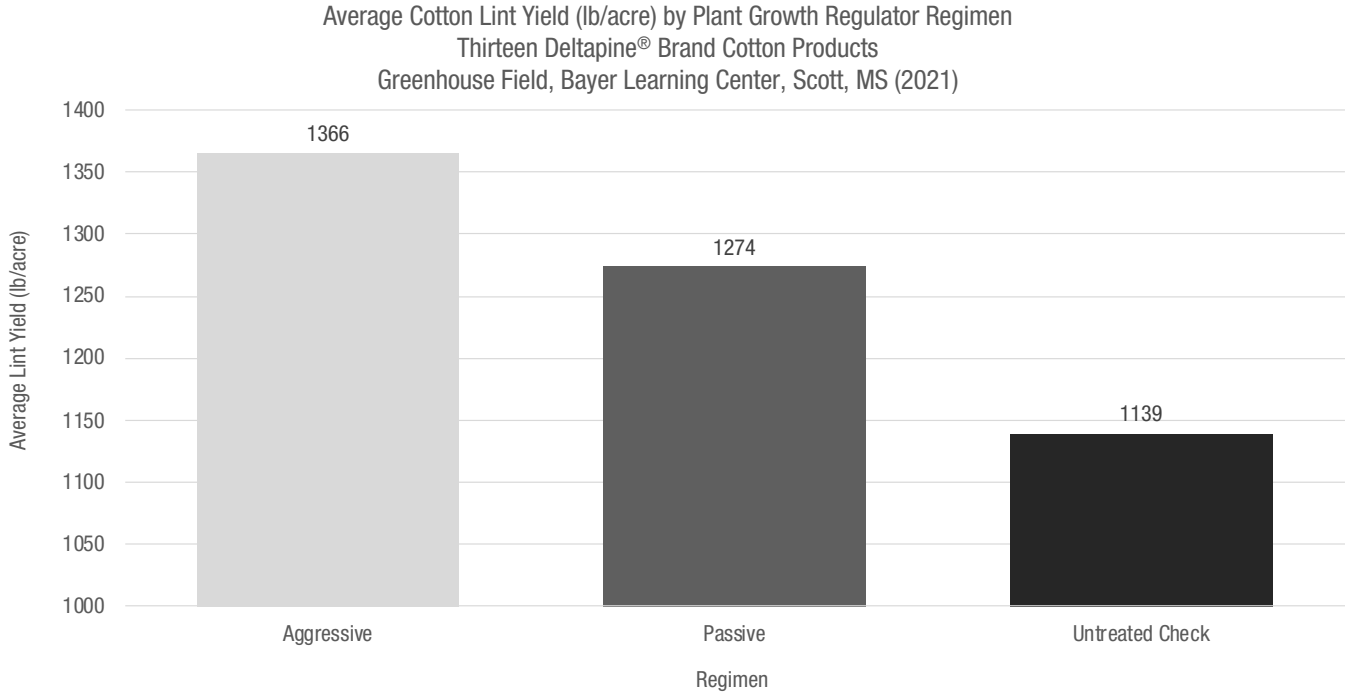
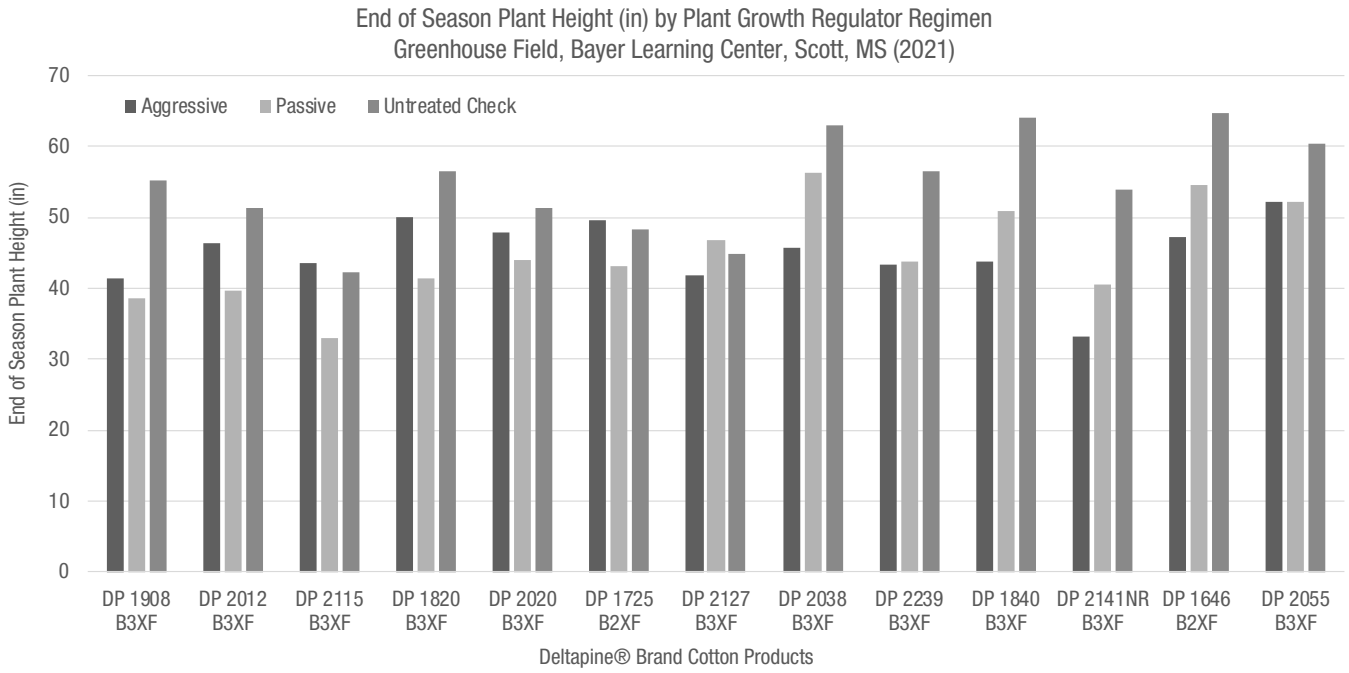


Figure 2. Average cotton lint yield (lb/acre) by Plant Growth Regulator Regimen for thirteen Deltapine® brand cotton products. Greenhouse Field, Bayer Learning Center, Scott, MS (2021).

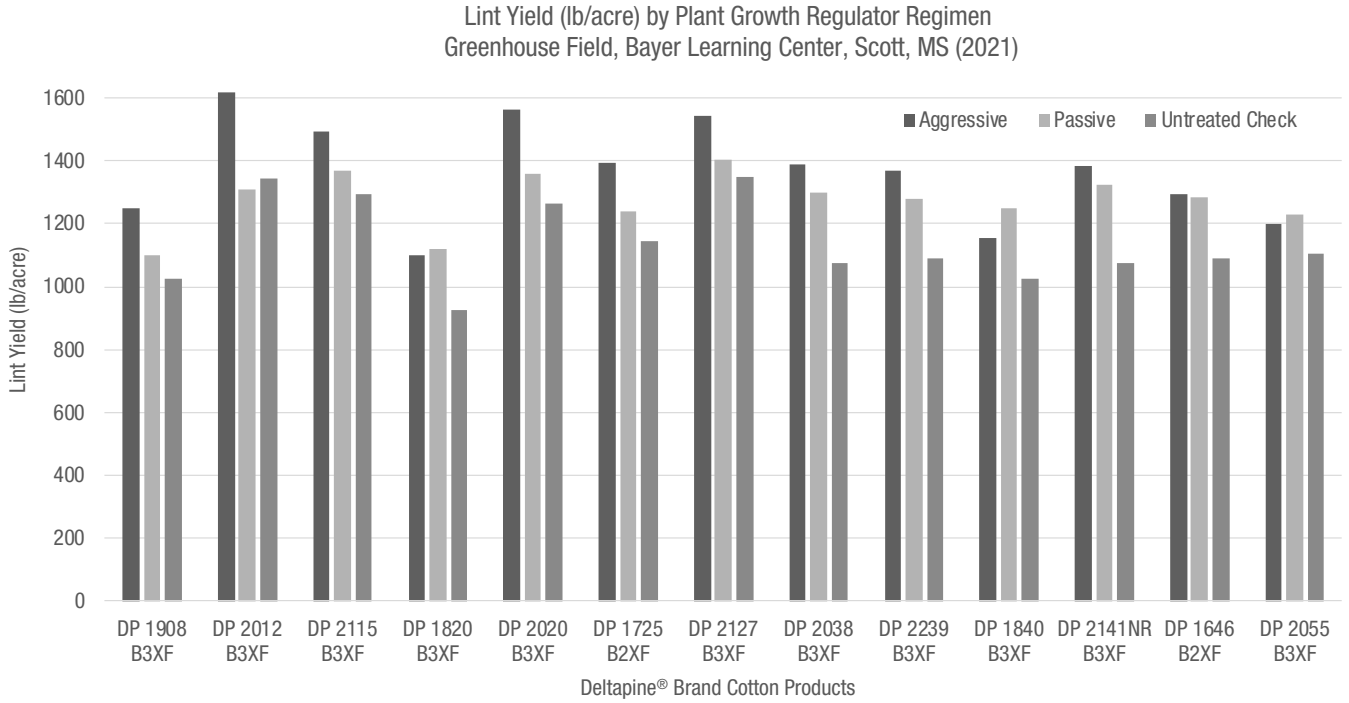
- Growing conditions, fruiting, and PGR effects on plant height:
  - » 2021 had unique growing conditions and discussions of interactions with those conditions are necessary for correct data interpretation.
    - Early, more determinate products:
- In many years, these will be some of the taller products in the UTC treatments. During 2021 they were not; the earlier products, while having a reduced fruit load very early, began to fruit and recover from early season stresses sooner than later products. Therefore, resumption of early season growth combined with good fruiting conditions afterwards and aggressive PGR use effectively limited mid-season vegetative development in the more determinate products, i.e. they are more responsive to the PGR applications (Figure 3). Interestingly, most of the tested products yielded more when managed aggressively even when considering these factors (Figure 4).
  - » Later, less determinate products:
- As in previous seasons, these products showed the potential to continue or resume growth when stresses were removed. Therefore, they were some of the taller products in the UTC plots during 2021. This points out the need for situational awareness of product background, in-season fruiting profile, weather, and PGR response when making management decisions (Figures 3 and 4).

Response of Deltapine® Brand Cotton Products to Different Plant Growth Regulator (PGR) Regimens



Passive = 4.2% mepiquat chloride application dates, timing, and rates: 7/6/2021 - 14 nodes - 10 fl oz/acre; 7/19/2021 - 17 nodes - 12 fl oz/acre; 7/30/2021 - 20 nodes - 12 fl oz/acre
Aggressive = 4.2% mepiquat chloride application dates, timing, and rates: 6/22/2021 - 9 nodes - 16 fl oz/acre; 7/6/2021 - 14 nodes - 16 fl oz/acre; 7/19/2021 - 17 nodes - 16 fl oz/acre

Figure 3. End of season plant height (in) for thirteen Deltapine® brand cotton products by Plant Growth Regulator Regimen. Greenhouse Field, Bayer Learning Center, Scott, MS (2021).

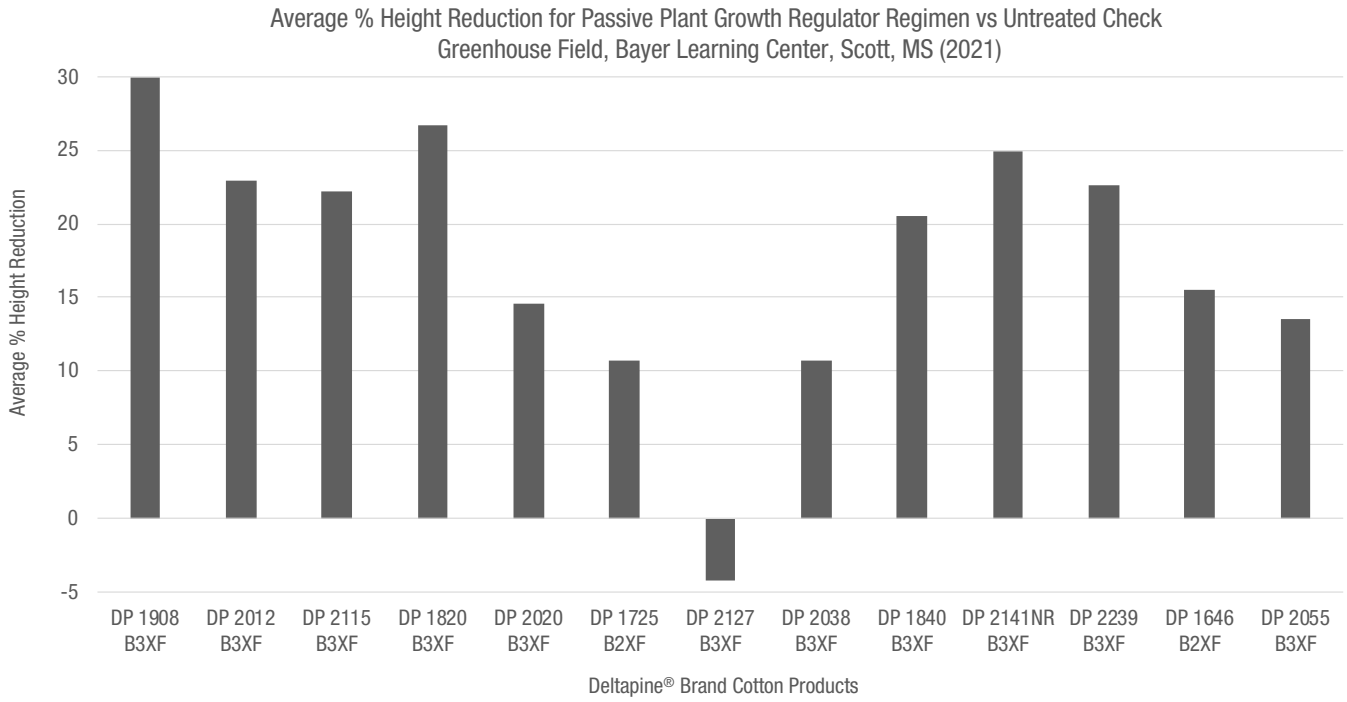


Passive = 4.2% mepiquat chloride application dates, timing, and rates: 7/6/2021 - 14 nodes - 10 fl oz/acre; 7/19/2021 - 17 nodes - 12 fl oz/acre; 7/30/2021 - 20 nodes - 12 fl oz/acre
Aggressive = 4.2% mepiquat chloride application dates, timing, and rates: 6/22/2021 - 9 nodes - 16 fl oz/acre; 7/6/2021 - 14 nodes - 16 fl oz/acre; 7/19/2021 - 17 nodes - 16 fl oz/acre

Figure 4. Lint yield for thirteen Deltapine® brand cotton products by Plant Growth Regulator Regimen. Greenhouse Field, Bayer Learning Center, Scott, MS (2021).

Response of Deltapine® Brand Cotton Products to Different Plant Growth Regulator (PGR) Regimens

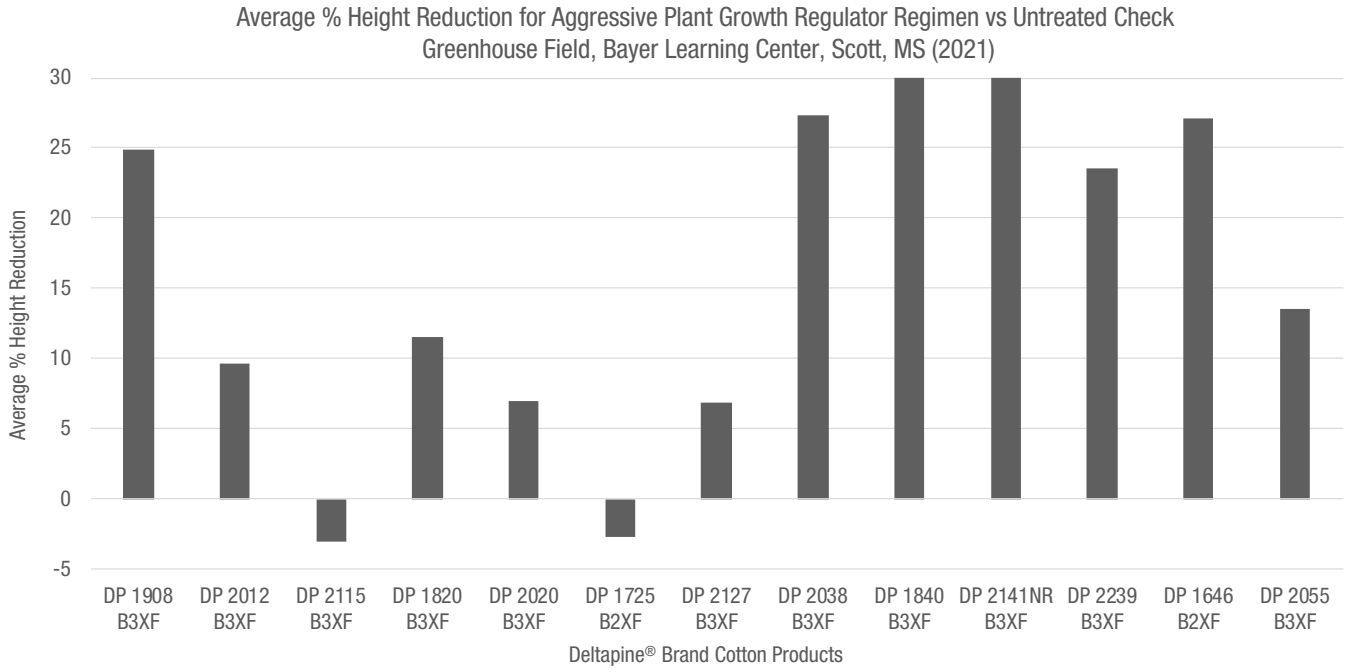
- Product PGR Sensitivity:
  - » Across the range of tested products, the earlier products showed reduced response (as measured by % height reduction at the season end) to the aggressive PGR applications (Figures 5 and 6). This appears to conflict with results from previous years; however, when the 2021 fruiting profile is considered it can be explained. The earlier products recovered from the early season stresses and began to fruit as the first dose of aggressive PGR was applied. These two factors combined to manage plant height in those products through the rest of the season. In other words, they weren't growing as aggressively, where the less determinate products kept growing and thereby demonstrated a somewhat increased height reduction response to the aggressive PGR treatments.



Passive 4.2% mepiquat chloride application dates, timing, and rates: 7/6/2021 - 14 nodes - 10 fl oz/acre; 7/19/2021 - 17 nodes - 12 fl oz/acre; 7/30/21 - 20 nodes - 12 fl oz/acre

Figure 5. Average % height reduction for aggressive plant growth regulator regimen for thirteen Deltapine® brand cotton products. Greenhouse Field, Bayer Learning Center, Scott, MS (2021).

Response of Deltapine® Brand Cotton Products to Different Plant Growth Regulator (PGR) Regimens



Aggressive 4.2% mepiquat chloride application dates, timing, and rates: 6/22/21 - 9 nodes – 16 fl oz/acre; 7/6/2021 - 14 nodes - 16 fl oz/acre; 7/19/2021 - 17 nodes - 16 fl oz/acre

Figure 6. Average % height reduction for passive plant growth regulator regimen for thirteen Deltapine® brand cotton products. Greenhouse Field, Bayer Learning Center, Scott, MS (2021).

- All of this points to the need for individual field management, products, and cases with a continued focus on the differential responses among products.

Key Learnings

- In response to the applied PGR regimens, the tested products responded as expected in height reduction and showed improvements in yield potential in the study.
- PGR responses and application remain very important factors when considering a cotton product to plant for 2022.
- Each product, field, farm, and agronomic case should be managed individually.
- Please contact your local Bayer representative for more details.

Legal Statements

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Response of Deltapine® Brand Cotton Products to Different Plant Growth Regulator (PGR) Regimens

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. It is a violation of federal and state law to use any pesticide product other than in accordance with its labeling. NOT ALL formulations of dicamba, glyphosate or glufosinate are approved for in-crop use with products with XtendFlex® Technology. ONLY USE FORMULATIONS THAT ARE SPECIFICALLY LABELED FOR SUCH USES AND APPROVED FOR SUCH USE IN THE STATE OF APPLICATION. Contact the U.S. EPA and your state pesticide regulatory agency with any questions about the approval status of dicamba herbicide products for in-crop use with Roundup Ready 2 Xtend® soybeans or products with XtendFlex® Technology.

B.t. products may not yet be registered in all states. Check with your seed brand representative for the registration status in your state.

Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.

Products with XtendFlex® Technology contains genes that confer tolerance to glyphosate, glufosinate and dicamba. Glyphosate will kill crops that are not tolerant to glyphosate. Dicamba will kill crops that are not tolerant to dicamba. Glufosinate will kill crops that are not tolerant to glufosinate. Contact your seed brand dealer or refer to the Bayer Technology Use Guide for recommended weed control programs.

A Meta-Analysis of Cotton Response to Plant Growth Regulators from the Scott Learning Center 2011-2021

Trial Objective

- Scott Learning Center (SLC) conducts studies each season to evaluate the response of new and existing cotton products to plant growth regulator (PGR) mepiquat chloride applications.
- A diverse set of varieties from across the cotton belt are tested each season representing the diversity in growth habit and determinacy present in current Deltapine® brand cotton products.
- Historically, differential responses have been observed among the group of varieties tested.
- This work is a summary of those responses from the long-term data from 2011 through 2021.

Research Site Details

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (lb/acre)	Seeding Rate (seeds/acre)
Scott, MS	Commerce/ Forestdale silt loam	Corn	Conventional	May 1 or later	Vary	1900	41,000 to 45,000

- A total of 10 to 18 Deltapine® brand cotton products were tested each season.
- These studies were set up to encourage excessive vegetative growth due to strong background fertility levels, the previous corn crop, irrigation, and relatively high rates of nitrogen fertility (100 to 120 lb/acre of actual nitrogen soil applied as 32% liquid N).
- All agronomic inputs (weed control, insect control and irrigation) were per local standards for each treatment.
- There was no PGR trial in 2014 and no passive regime in the 2012 trial.
- All PGR plots were treated with labeled but varying rates and application timings of currently available mepiquat chloride (standard 4.2% formulation). These application rates and timings were used to separate differences in Deltapine® brand cotton variety responses and not necessarily to provide specific guidance on PGR management for an individual field, farm, or variety.
- Application regimes (Table 1) included:
  - » Untreated with PGR
  - » Passive Treatments – represents relatively lower rate/later timing
  - » Aggressive Treatments – Applied at labeled timings and within the max product use per season 48 ounces /acre.
- The various treatments are used to separate possible differences in varietal response not necessarily to provide specific guidance specific.
- Growth characteristics of Deltapine® brand cotton products tested were evaluated by:
  - » Stand establishment: monitored for normal emergence (data not presented)
  - » Plant growth: monitored in season
  - » End-of-season plant height: 10 plants/plot measured at harvest

Table 1. Passive and aggressive PGR treatment rates and application timings.

Regime	Treatment	Number of Cotton Nodes at PGR application	PGR Rate (ounces/acre)
Passive	1	10-12	8-10
	2	15-17	10-12
	3	20-21	16
Aggressive	4	8-9	16
	5	12-13	16
	6	15-16	16

- » Height reduction from either the passively or aggressively managed treatments versus the untreated check.
- » Representative turnouts from trials at the SLC were used to estimate lint yield/acre to evaluate yield effects of PGR treatments.

Analysis conducted in two parts for 2021

Part 1

Deltapine cotton variety sensitivity to PGRs – PGR application growth reduction was calculated as the percentage that plant height was reduced when compared to the untreated plot.

- Cotton varieties were then characterized by the percent growth reduction to indicate PGR sensitivity within each year as either:
  - » More Responsive – Cotton varieties considered more responsive were the top 50% in plant height of the Deltapine cotton varieties within the year tested.
  - » Less Responsive– Cotton varieties considered less responsive were the bottom 50% in plant height of the Deltapine cotton varieties within the year tested.

Part 2 Regression Analysis

- Varietal Characterization – for the purposes of this analysis Growth Reduction was calculated as the percentage that plant height was reduced in the Aggressively managed plots vs the untreated.
- Used as an indication of sensitivity to PGR and each variety in the testing series - data not shown.
- Varieties were then segmented by percent growth reduction as an indication of PGR sensitivity within each season as either:
- More Responsive – Cotton varieties considered more responsive were the top 50% of the Deltapine cotton varieties within the year tested. Less Responsive – Cotton varieties considered less responsive were the bottom 50% of the Deltapine cotton varieties within the year tested.
- Cotton products were further segmented into cohorts based upon untreated plant heights.
  - » TALL in the untreated plots – those varieties with plant heights in the upper 50% of the population.
  - » SHORT in the Untreated plots – those varieties with plant heights in the lower 50% of the population.

Understanding the Results

All conclusions from this data are highly interactive with the production system and environmental conditions during each growing season and should be viewed as such.

A Meta-Analysis of Cotton Response to Plant Growth Regulators from the Scott Learning Center 2011-2021

Part 1 Results

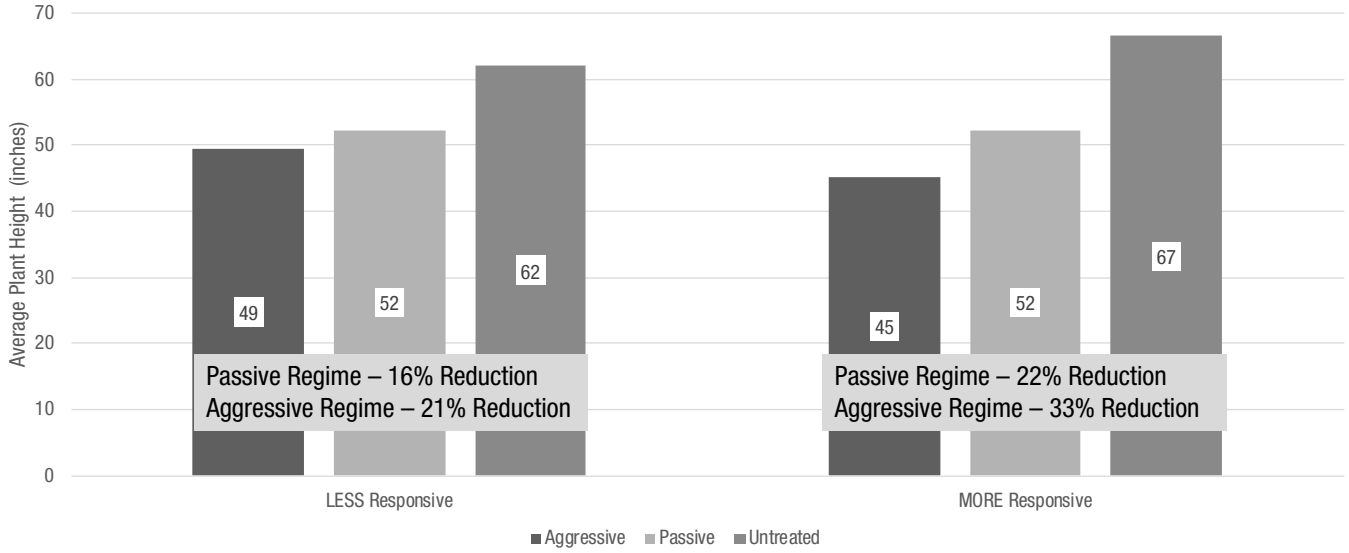

Figure 1A. Average cotton plant height by PGR regime from 2011 through 2021.

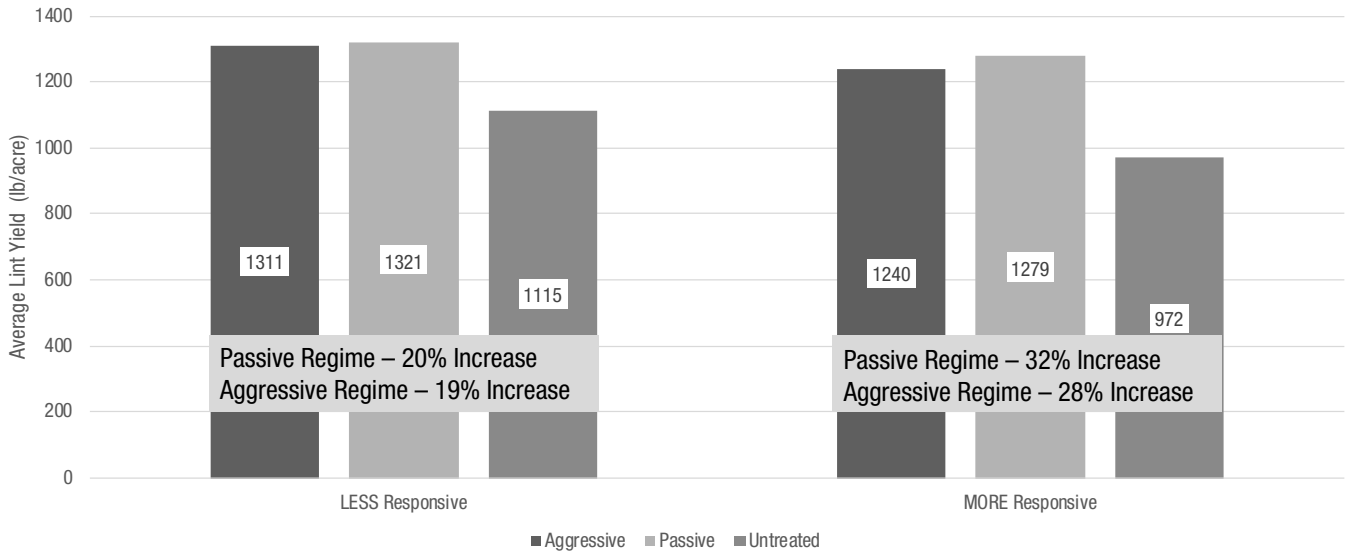

Figure 1B. Average cotton yield by PGR regime from 2011 through 2021.

A Meta-Analysis of Cotton Response to Plant Growth Regulators from the Scott Learning Center 2011-2021

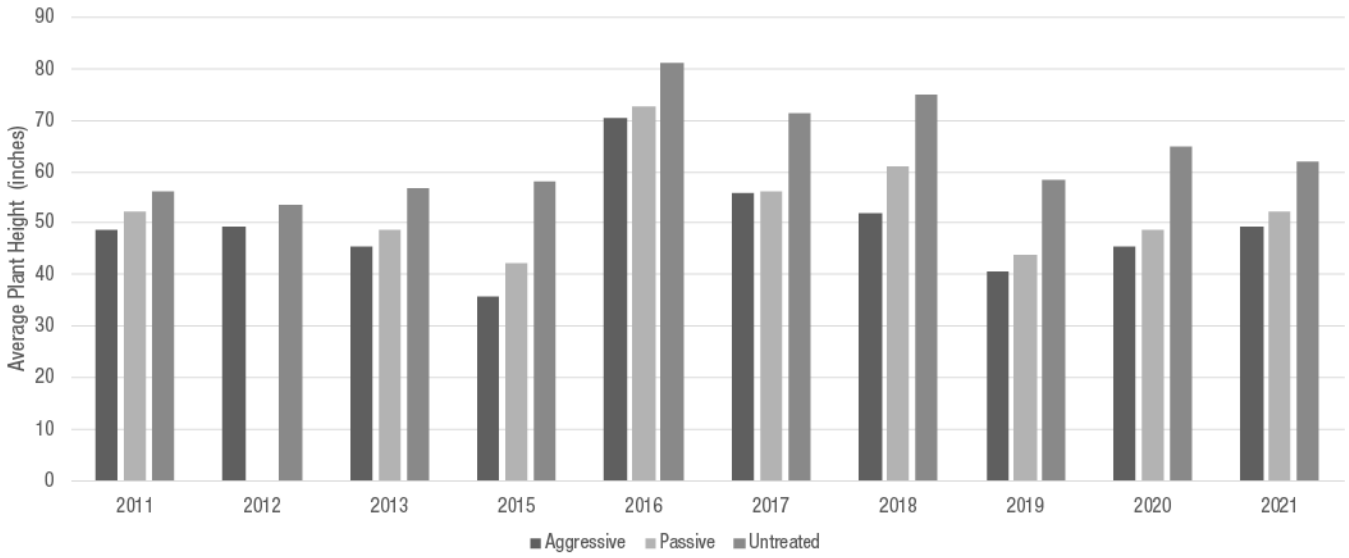

Figure 2A. Average Plant Height of Less Responsive Deltapine® brand cotton varieties by PGR regime from 2011 through 2021.

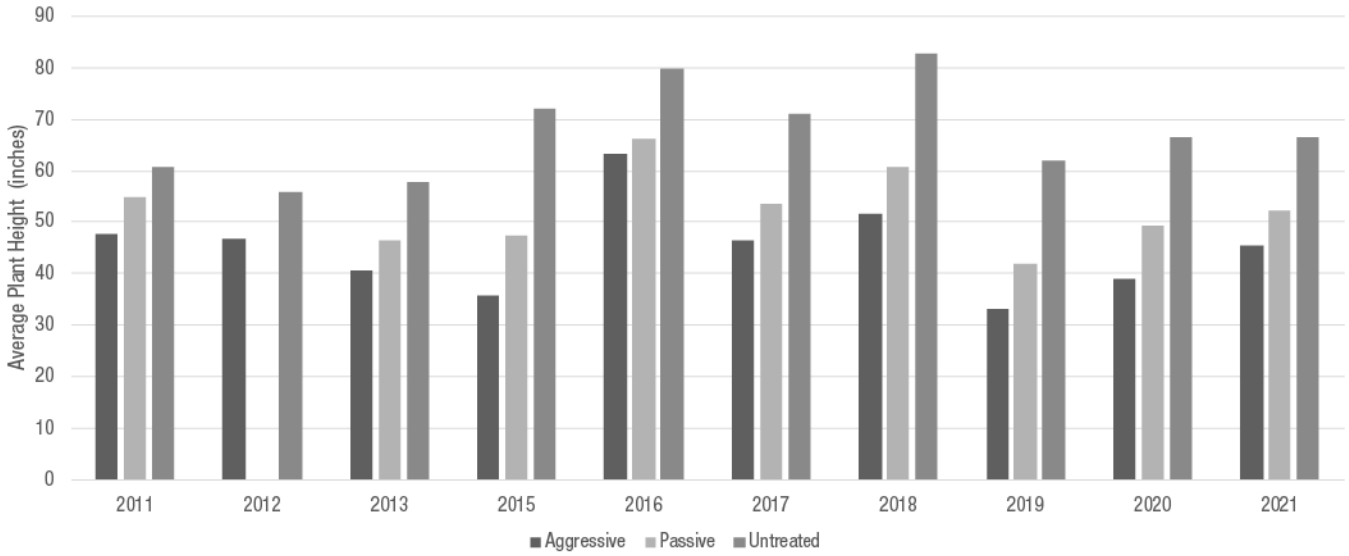

Figure 2B. Average plant height of More Responsive Deltapine® brand cotton varieties by PGR regime from 2011 through 2020.

A Meta-Analysis of Cotton Response to Plant Growth Regulators from the Scott Learning Center 2011-2021

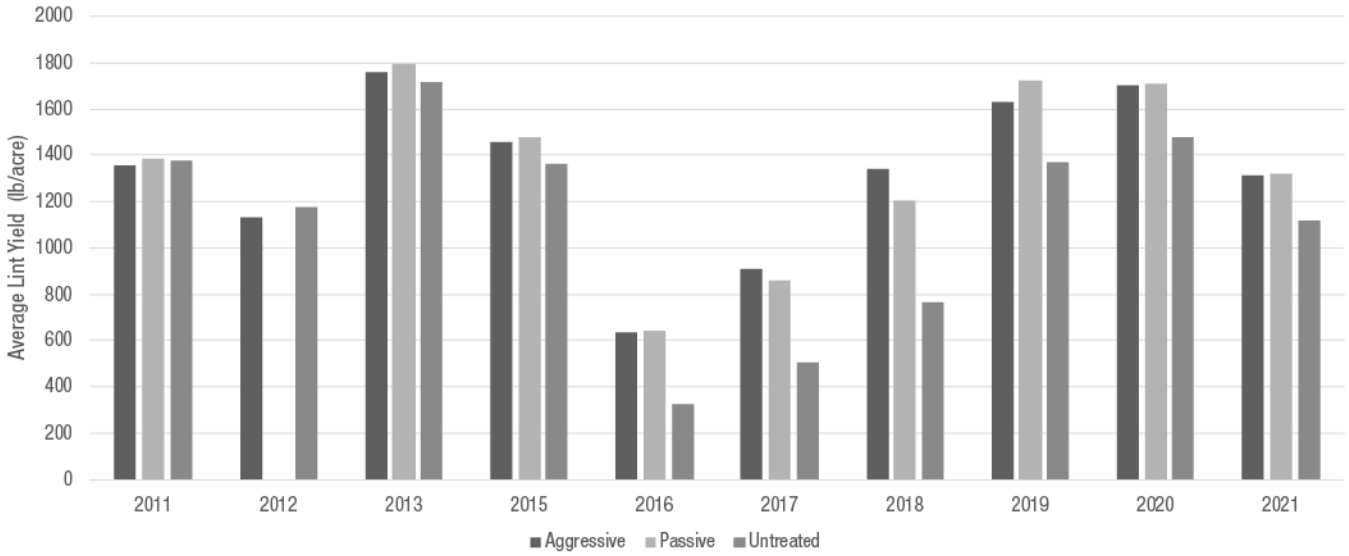

Figure 3A. Average Lint Yield of Less Responsive Deltapine® brand cotton varieties by PGR regime from 2011 through 2021.

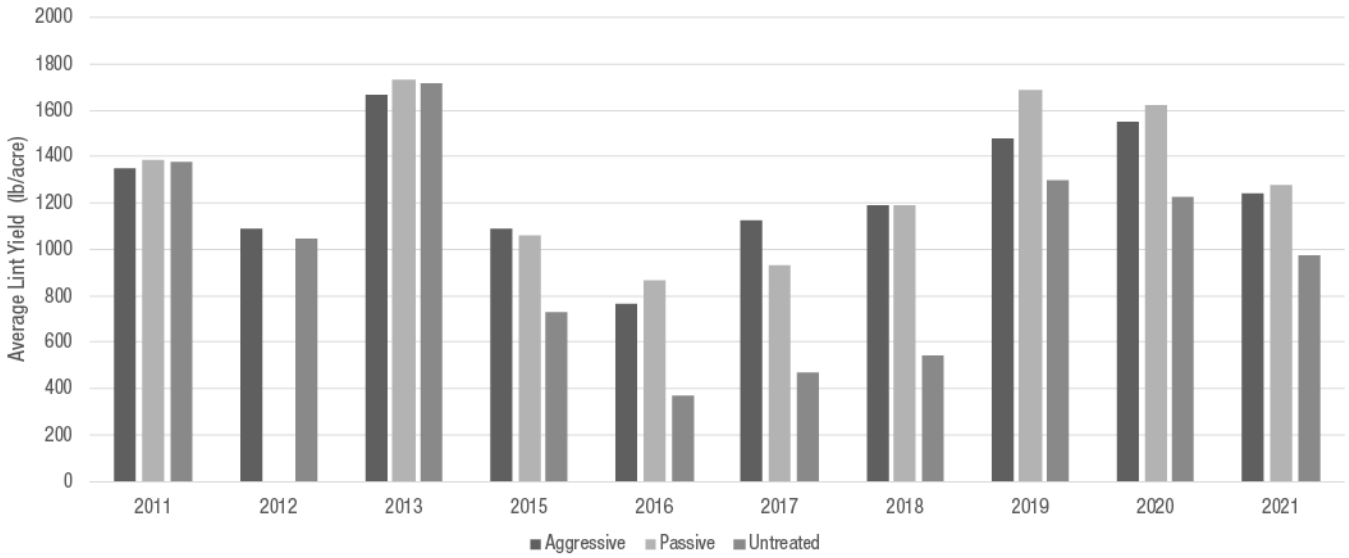

Figure 3B. Average Lint Yield of More Responsive Deltapine® brand cotton varieties by PGR regime from 2011 through 2021.

Plant height observations

- Over the testing series, in response to the aggressive regime PGR applications Less Responsive varieties showed an average reduction in height of 21% where More Responsive products showed a reduction in 33% indicting a difference in responsiveness between categories (Figure 1A).
- The Passive PGR regime treatment response was intermediate in both More and Less Responsive categories
- Yearly summaries of PGR application regime impact on plant height are shown in Figures 2A and 2B.

A Meta-Analysis of Cotton Response to Plant Growth Regulators from the Scott Learning Center 2011-2021

Lint yield observations

- The Less Responsive cotton varieties demonstrated slightly higher yield potential than the More Responsive cotton varieties in all PGR regimes (Figure 1B).
- Over the testing series, in response to either PGR application compared within response category, both Less and More Responsive varieties showed a numerically similar yield increase (Figure 1B)
- However More Responsive products showed a numerically larger increase in yield vs Less Responsive products – 28% vs 19%.(Figure IB)
- Across the range of testing, the Less Responsive products, which are generally more difficult to manage, demonstrated higher yield potential than More Responsive varieties.
- Local variety adaptation likely plays a role in the observed responses.

Part 2 Results

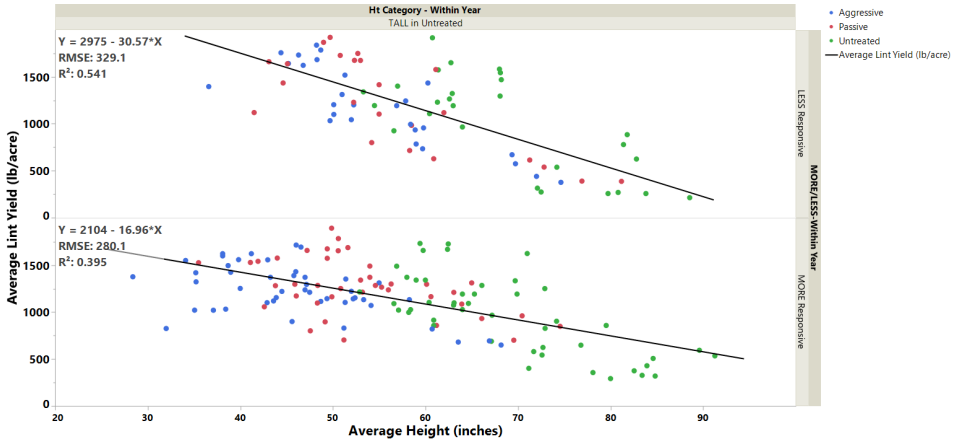

Figure 4A. Linear regression of average lint yield versus average height in Less Responsive and More Responsive Deltapine® brand cotton varieties from 2011 through 2021 at the Scott Learning Center. (Student t-test was significant at P=0.0003).

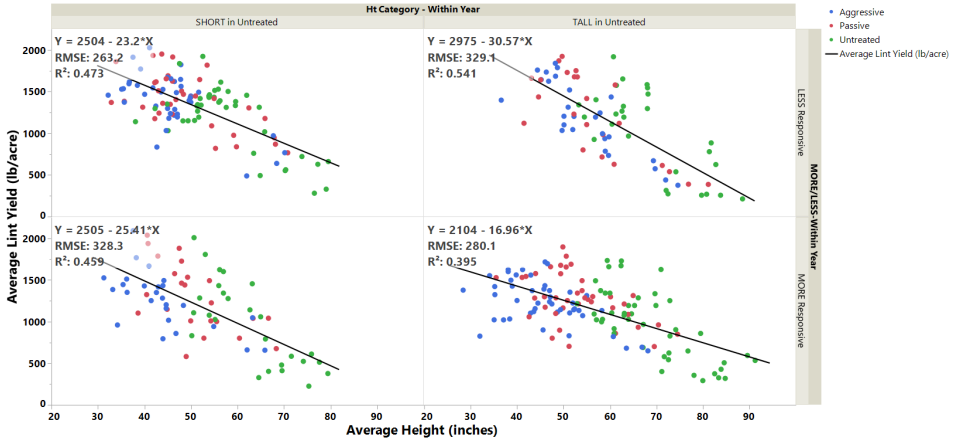

Figure 4B. Linear regression of average lint yield versus average height in Less Responsive and More Responsive Deltapine® cotton varieties from 2011 through 2021 at the Scott Learning Center. (Student t-test was significant at P=0.0003).

A Meta-Analysis of Cotton Response to Plant Growth Regulators from the Scott Learning Center 2011-2021

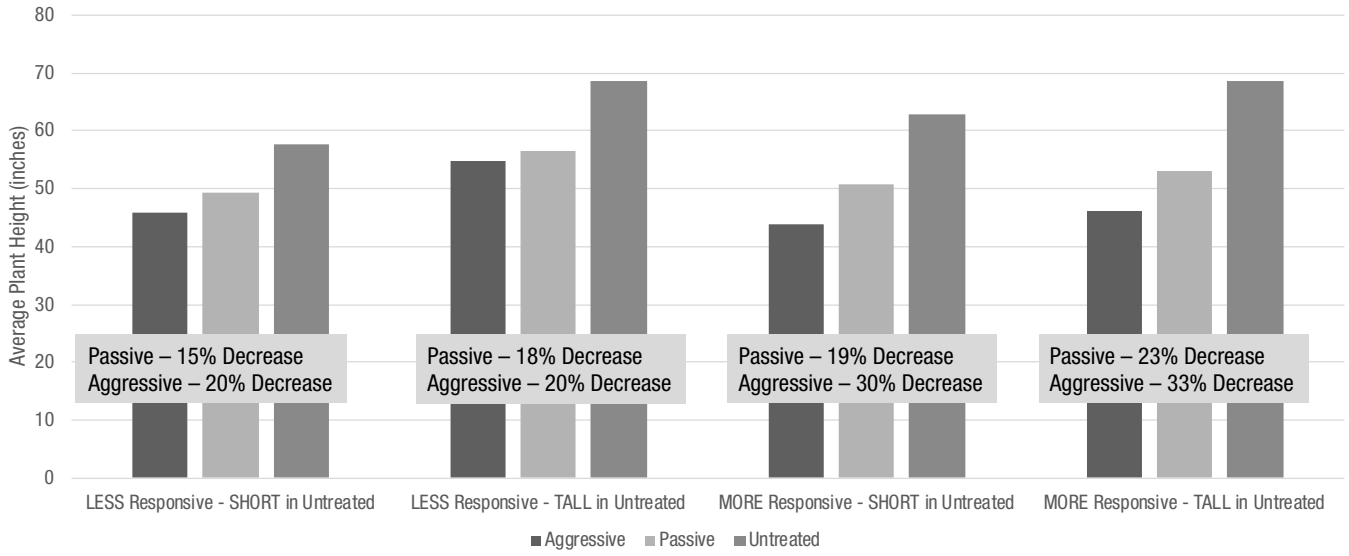

Figure 5A. Average cotton plant height by PGR regime from 2011 through 2021.

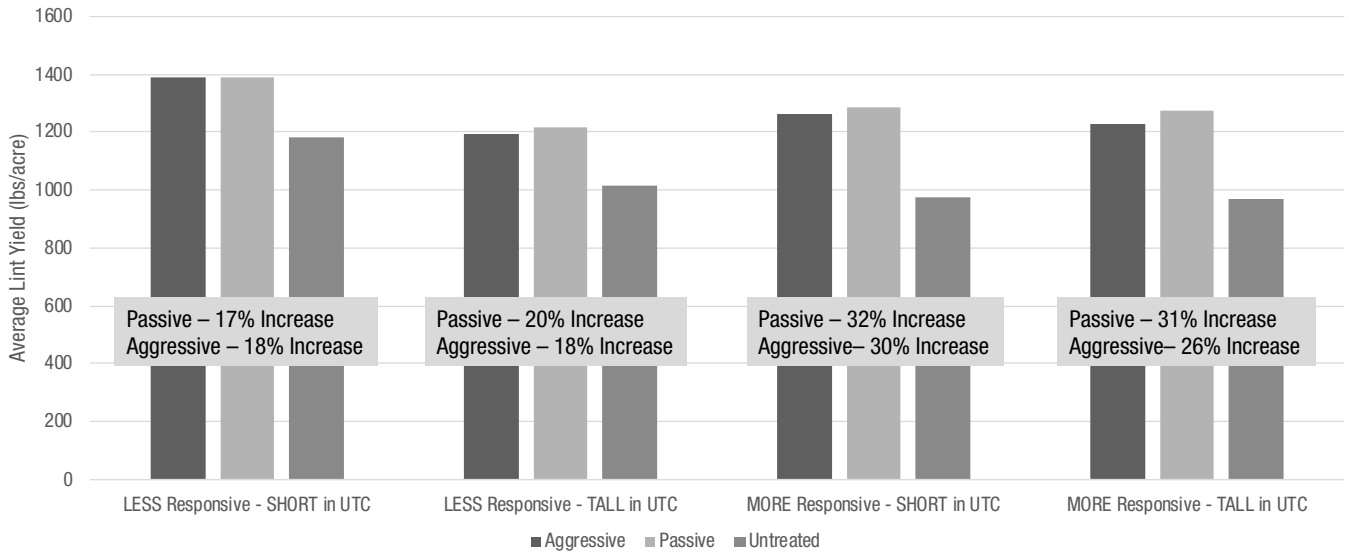

Figure 5B. Average cotton yield by PGR regime from 2011 through 2021.

- The Less Responsive cotton products showed a statistically significant greater decrease in average yield potential than the More Responsive cotton varieties in response to excessive height (Figure 4B).
- SHORT cohorts (regardless of PGR response) showed a decrease in average yield of 24 lb lint/ acre/inch to increasing height (Figure 4B).
  - » Approximately 15% more of the yield variability can be accounted for in height (as measured by R2) in the LESS responsive varieties when comparing the TALL vs SHORT varieties.
  - » A statistically significant difference in the yield response to final plant height was observed between response classes (student's t P=0.0003; 205 df)

  - » TALL cohorts demonstrated differential responses to increasing height
- Differences in slope between categories
  - » TALL-MORE Responsive = - 16.96 lb lint/acre/inch
  - » TALL-LESS Responsive= - 30.57 lb lint/acre/inch
- It's important to note that even TALL / Less Responsive varieties can be managed to the high yield potential ranges of the More Responsive or SHORT varieties within the maximum labeled rate of mepiquat chloride (Figure 4B).
- The yield response due to additional height is likely a function of the effect of the plant allocating energy to vegetative growth, the shading that occurs from neighboring plants, and associated fruit shed. Plants can also shade themselves as a result of excess height. An individual fruiting structure (squares particularly) is photosynthetically independent of the plant and if shaded, is more likely to shed just after bloom due to the lack of available sugar. Bolls are not independent, and the plant senses their need for sugar (to make carpals, seed and lint) hormonally. If it's not there for whatever reason, the boll will shed in the week or so after bloom. That's why this is all a big cascade of an effect. None of it occurs due to a single cause (Figure 6).
- When creating management plans for Less Responsive cotton varieties, early and timely applications of PGRs at appropriate rates are even more important.
- When the cotton variety sensitivity to PGR is known, a management system can be built factoring in their growth tendencies.
- To help obtain optimal value from the cotton varieties and the traits they contain, this information should be considered for every cotton variety, field, and farm.

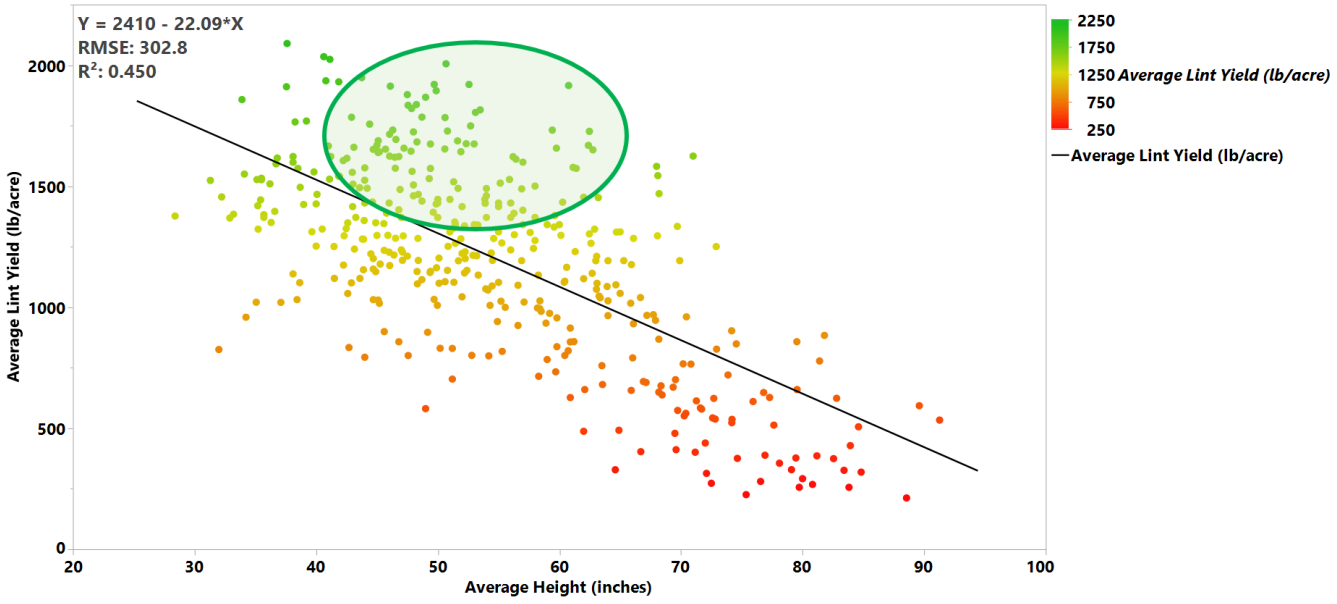

Figure 6. Linear regression of average lint yield versus average height of Deltapine® cotton varieties from 2011 through 2021 at the Scott Learning Center.

A Meta-Analysis of Cotton Response to Plant Growth Regulators from the Scott Learning Center 2011-2021

Key Learnings

- All conclusions from this data are highly interactive with production system and should be viewed as such.
- Across this range of testing, several conclusions can be drawn:
  - » The MORE Responsive cotton products demonstrated as much as 10% greater height reduction in the Aggressive regime vs untreated when compared to the LESS Responsive products. Figure 5A
  - » The LESS Responsive TALL products showed a significantly greater decrease in yield than the MORE Responsive TALL products in response to excessive height = -31 lb/inch vs -17 lb/inch. Figure 4A and4B
- PGR use in cotton crops is a tool that can be used to help manage excessive vegetative development and increase yield.
- Significant differences exist in the response of cotton variety classes to PGR application.
- For this reason, understanding the PGR sensitivity of cotton varieties is essential in developing a management plan for the product planted on a given farm or field.

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2021 FIELD RESEARCH BOOK

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