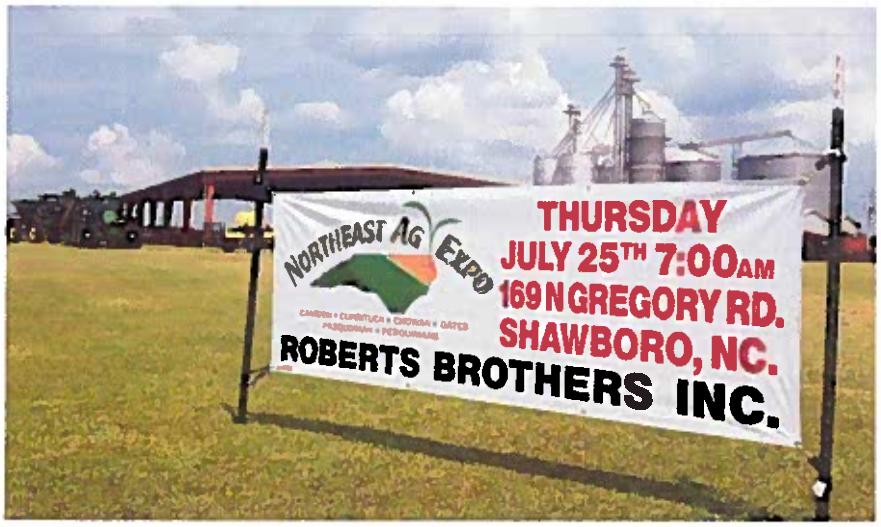
Northeast Ag Expo
2013 Soybean On-Farm-Test Report
Roberts Brothers, Incorporated – Currituck County



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Acknowledgements

Any effective on-farm-test requires a great deal of assistance from a number of different individuals. The Expo agents would like to recognize these people for their contribution to the 2013 Northeast Ag Expo Soybean Field Day and the data contained in this publication. Collaboration with a willing and effective landowner/cooperator is a key component to all successful field research. The cooperator for these tests was Roberts Brothers, Incorporated of Shawboro which includes Wade Morgan and Mel Morgan. We would like to thank them for allowing this work to be conducted on their farm and for conducting many of the field operations during the growing season. Several North Carolina State University Extension specialists were vital to this process. Dr. Ron Heiniger (Leah Boerema, Research Specialist), Dr. Jim Dunphy (Michael Buffaloe, Research Specialist), Dr. Wes Everman, and Dr. Steve Koenning were involved in various aspects of the research plots maintenance, harvest, and data collection as well as conducting presentations at the field day. In addition, a special thanks to Dr. Carl Crozier, Dr. Dominic Reisig, and Dr. David Holshouser (Virginia Tech) for the assistance with field day presentations. Support from all these specialists made the field day and this publication possible. Financial support from the North Carolina Soybean Producers Association and many others sponsors has been instrumental. The various seed and agribusiness companies represented in our data donated money, seed and/or other materials used in the various tests at this site. Also, we express our sincere appreciation to the Extension staff from each of these counties for assistance with various aspects of the field day and production of this publication. Thanks to everyone who contributed in the generation of these data. This information can also be found online at http://www.ncneagexpo.com.

Impact of Intensive Management on Maximizing Soybean Yields

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Soybean growers have been searching for the right combination of management practices and/or inputs to produce high yielding soybeans. Innovative management leading to recent record soybean yields combined with historically high prices, have sustained this pursuit. This test was conducted to determine the set of management practices and/or set of inputs that would lead to maximum soybean yields.

Methods

This test was conducted at the Northeast Ag Expo site on the farm of Roberts Brothers, Inc. in Shawboro, NC. Planting date was May 28, 2013. A John Deere MaxEmerge II four-row vacuum planter with 15 inch rows was used to plant 12 row plots 50 feet in length at a seeding rate of 160,000 seeds per acre. The entire test received 200 pounds per acre of 9-23-30 fertilizer prior to planting. Weed control consisted of a postemergence application of Roundup Ultra at 24 ounces per acre and FirstRate at 0.2 ounce per acre. A randomized complete block design was used with three replications. Treatments were applied to the middle four rows of each plot. The seven treatments consisted of the following:

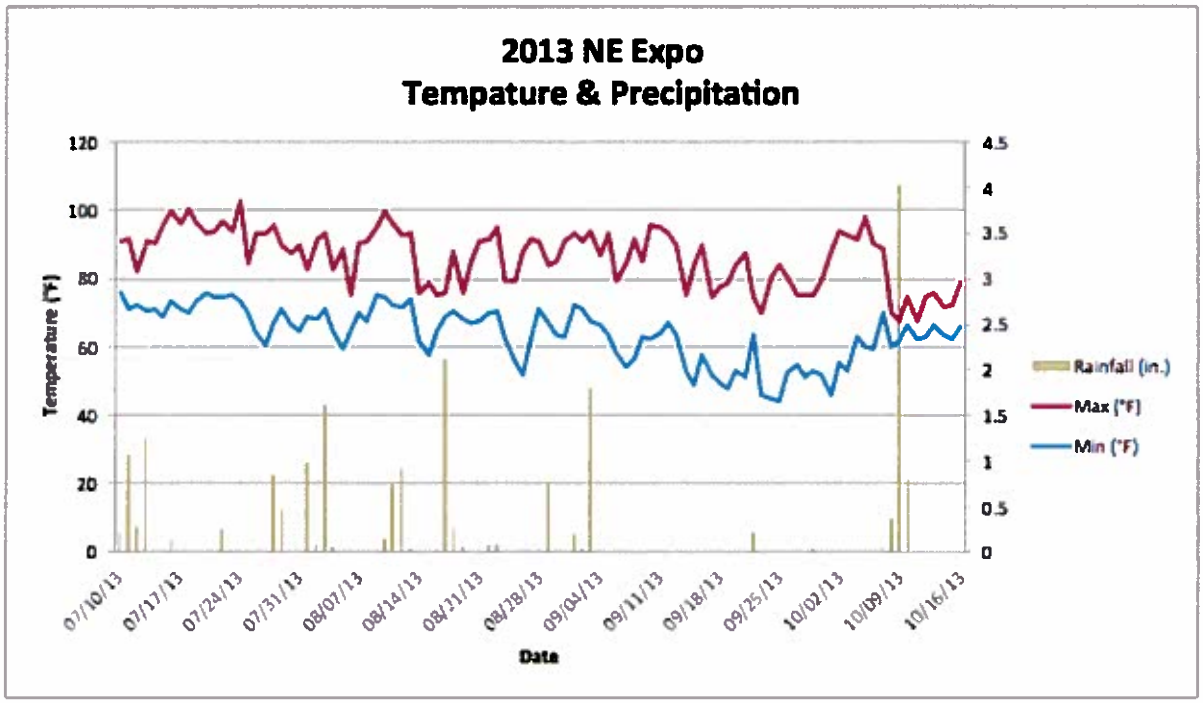
1. Check: USG 74F96 with no additional management practices and/or inputs
2. Cadillac Treatment with USG 74F96:
    - Seed treatment (ApronMax RTA + Moly @ 5 oz/100 lbs of seed)
    - 100 lbs of N/a @ planting and 42 days post-planting with ESN (44-0-0)
    - Headline 6 oz/a @ V5 and R2
    - Irrigation applied when temperatures were > 95° F
3. Cadillac Treatment with Pioneer 94Y70
    - Seed treatment (Allegiance & Gaucho)
    - 100 lbs of N/a @ planting and 42 days post-planting with ESN (44-0-0)
    - Headline @ V5 and R2
    - Irrigation applied when temperatures were >95° F
4. Cadillac Treatment with Pioneer 94Y70 minus Nitrogen
5. Cadillac Treatment with Pioneer 94Y70 minus Headline
6. Cadillac Treatment with Pioneer 94Y70 minus seed treatment
7. Cadillac Treatment with Pioneer 94Y70 minus Irrigation

Irrigation was administered through overhead micro-sprinklers on timers, July 16 to August 8, from 1:45 pm to 3:15 pm each day. Operation of the sprinklers was terminated on August 8 due to soils staying saturated caused by frequent and large rain events (Figure 1). Plots were harvested on October 30 with a Massey Ferguson plot combine that recorded weight and moisture. Statistical analysis was performed using Agricultural Research Data Management (ARM).

Table1. Treatments

Treatment	Rate
Check	USG 74F96 with no additional practices and/or inputs
USG 74F96 Cadillac Treatment	Seed treatment (ApronMax RTA + Moly @ 5 oz/100 lbs of seed), 100 lbs of N applied @ planting and 42 days after planting using ESN, foliar fungicide application @ growth stage V5 and R2 with Headline @ 6oz/a, irrigation was used to cool plants when temperature went above 95° F
Pioneer 94Y70 Cadillac Treatment	Seed treatment (Allegiance & Gaucho), 100 lbs of N applied @ planting and 42 days after planting using ESN, foliar fungicide application @ growth stage V5 and R2 with Headline, irrigation was used to cool plants when temperature went above 95° F
Pioneer 94Y70 Cadillac Treatment minus Nitrogen	Everything in the cadillac treatment except N
Pioneer 94Y70 Cadillac Treatment minus Foliar Fungicide	Everything in the cadillac treatment except foliar fungicide
Pioneer 94Y70 Cadillac Treatment minus Seed Treatment	Everything in the cadillac treatment except seed treatment
Pioneer 94Y70 Cadillac Treatment minus Irrigation	Everything in the cadillac treatment except irrigation

Figure 1. Temperature and Precipitation Data of the 2013 Northeast Ag Expo Field Day site.



Results

The Pioneer 94Y70 Cadillac treatment minus seed treatment was significantly higher than the Pioneer 94Y70 Cadillac treatment minus foliar fungicide treatment, Pioneer 94Y70 Cadillac treatment, USG 74F96 Cadillac treatment and check (USG 74F96 without additional management and/or inputs). Pioneer's 94Y70 was selected for its high yield potential based on its performance in this region of the state while the USG 74F96 was an average yielding group IV variety based on soybean OVT data. Other than the Pioneer 94Y70 Cadillac treatment, the treatments that included USG 74F96 were statistically different and lower than the remaining treatments that included Pioneer's 94Y70, which indicates the importance of selecting varieties that produce high yields in response to more intensive management. Also, the fact that the Cadillac treatments (which included irrigation) for both varieties were the lowest yielding treatments for those varieties, along with the Pioneer 94Y70 minus irrigation being the next to highest treatment, appears to suggest that irrigation may have not been managed closely enough to prevent excess soil moisture from limiting yields. It appears that obtaining maximum yields is impacted by a set of management practices/inputs that are used in combination with a well adapted high yielding variety. Additional tests are needed to confirm this finding. The year did not lend itself to a high yield effect because of excess rain and cloudy weather. A year with more normal weather conditions may lend itself more to testing the effects of irrigation on yield for evaporative cooling, and additional nitrogen.

Table 2. Impact of Intensive Management on Maximizing Soybean Yields

Treatment	Moisture	Yield	
Pioneer 94Y70 Cadillac Treatment minus Seed Treatment	12.9	74.1	a
Pioneer 94Y70 Cadillac Treatment minus Irrigation	13.2	73.6	ab
Pioneer 94Y70 Cadillac Treatment minus Nitrogen	13	72.9	ab
Pioneer 94Y70 Cadillac Treatment minus Foliar Fungicide	12.8	70.5	bc
Pioneer 94Y70 Cadillac Treatment	13.1	69	c
Check	13.6	67.4	cd
USG 74F96 Cadillac Treatment	13.7	64.5	d

*Yields with the same letter do not differ statistically (0.05)

CV	2.26	2.64
LSD	0.53	3.31
Average	13.6	67.4

Translocation of Assimilates: Key to Increasing Soybean Yield

Dr. Ron Heiniger and Leah Boerema,
NC State Crop Science Department

Study Design

This test was designed to evaluate the impact of assimilates stored in the leaves of the soybean plant in increasing soybean yield. The idea is to develop a large soybean plant with a large leaf area. These leaves then provide the source of photosynthates that supports seed development during the reproductive period with the potential for improving yield when environmental stress is present. In this study plant density (seeding rate) was used to manipulate plant size and leaf area.

The two seeding rates used were:

1. 20 000 seeds per acre
2. 360 000 seeds per acre

Within each seeding rate treatments were applied which either increased plant stress (shading or defoliation) or reduced stress (thinning or added N). The treatments used at the low seeding rate (20 000 seeds per acre) were:

1. No treatment (check)
2. Defoliation at R5 – leaf area reduced by 50%
3. Thinned to a density of 10000 plants per acre at R5
4. Shaded at R5 – shading to reduce light by 50%
5. 30 lbs of N applied at R5
6. Fungicide applied at R5 and R7

Within the 360 000 seeding rate the treatments applied were:

1. No treatment (Check)
2. Defoliation at R5 – leaf area reduced by 50%
3. Thinned to a density of 20000 plants per acre at R5
4. Shaded at R5 – shading to reduce light by 50%
5. 30 lbs of N applied at R5
6. Fungicide applied at R5 and R7

Soybeans at the two seeding rates were planted on 22 May. Treatments were applied to plots that were 40' long and 7.3' wide (4 rows each 22" wide) on 27 June. Plots were harvested with a small plot combine in early October.

Results

The highest soybean yields were obtained by seeding at 360 000 seeds acre^{-1} and then treating with 30 lbs of N at R5 (85.1 bu acre^{-1}) or by seeding at 20 000 seeds acre^{-1} and then treating with fungicide at R5 and R7 (80.7 bu acre^{-1}) (Figure 1). Several plots within this treatment reached yields of over 99 bu acre^{-1}. At the high seeding rate the added N was needed to support the plants where the small root area did not have the amount of nodules needed. At the lower seeding rate the fungicides improved the translocation of starch to the seed. The next highest soybean yields came from both seeding rates where no treatments were applied. The lowest yield came from the low seeding rate thinned to only 10000 plants acre^{-1} (30 bu acre^{-1}). It is interesting to compare this with the high seeding rate thinned to 20000 plants acre-1. The yield from this treatment (> 60 bu acre-1) was one of the highest achieved in this study. This shows the value of having an increase in photosynthesis or assimilates from R5 to maturity. Likewise, the low seeding rate defoliated or shaded had greater yield than the high seeding rate treated with defoliation or shade. This comparison shows the value of translocation of assimilates from the large leaf area of the larger plants in the low seeding rate which helped overcome the loss of light.

This study shows that high yield soybean will depend on identifying multiple factors such as high population and additional nitrogen or using low seeding rates combined with fungicides to improve translocation. Additional research is needed to identify multiple factors that can be combined to reach a yield of 100 bu acre^{-1} or more.

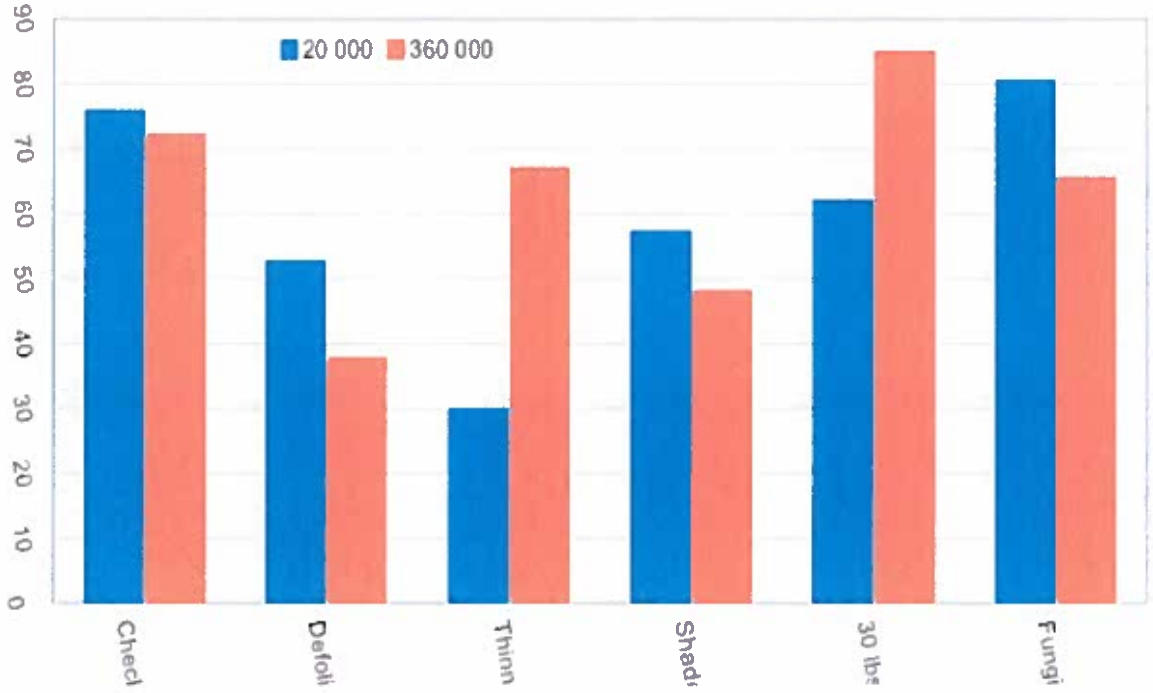


Figure 5. Yield from soybean treated with five treatments designed to increase or decrease plant stress. **LIGHT BLUE** bars were planted at 20 000 seeds acre^{-1}. Red bars were planted at 360 000 seeds acre^{-1}.

Evaluating the Impact of Potential Yield Enhancer Products on Soybean Yield

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With historically high yields, growers are inquiring about products that are being offered in the marketplace that claim to enhance soybean yields. The purpose of this test was to evaluate soybean potential yield enhancer products marketed in the region as to whether they impact yield.

Methods

On May 28, 2013 this test was planted at the Northeast Ag Expo site on the farm of Roberts Brothers, Inc. in Shawboro, NC. The entire test received 200 lbs per acre of 9-23-30 fertilizer prior to planting. Asgrow's AG4730 was planted at a seeding rate of 160,000 seeds per acre, using a John Deere MaxEmerge II four-row vacuum planter with 15 inch rows. The plots were 8 rows wide, 40 feet in length. Weed control consisted of a postemergence application of Roundup Ultra at 24 ounces per acre and FirstRate at 0.2 ounce per acre. A randomized complete block design was used with two replications of the treatments. There were a total of thirteen treatments in the test (Table 1.) Dummy plots were placed either beside or between plots to allow for application of treatments after planting with an ATV boom sprayer. Plots were harvested on October 28 with a Massey Ferguson plot combine that recorded weight and moisture. Statistical analysis was performed using Agricultural Research Data Management (ARM).

Table1. Treatments *

Trt No.	Treatment &	Rate
1	Radiate @ Roundup application & @ R2-R3	2 oz./a
3	Quick Ultra Awaken @ Roundup application & @ R2-R3	1 qt/a
4	BOMO @ Roundup application & 10-14 days later	8 oz./a
5	Re-Nforce K/Headline/Karate @ R2-R4	1.5 gallons/a; 8 oz/a; 1.96 oz/a
7	Combination of Radiate, Quick Ultra Awaken, BOMO, and Re-Nforce K/Headline/Karate	2 oz/a; 1 qt/a;8 oz/a; 1.5 gals/a; 8 oz/a; 1.96 oz/a
9	Monty's Carbon @ Preplant/AgriHance-V @ 4 - 5 Trifoliate /AgriHance-R @ R2	0.5 gal/a; 1 qt/a; 1qt/a
10	Graph-EX SA Inoculant	0.5 oz by weight/140,000 seeds
11	Seed Coat Seed Treatment	4 oz/50 lbs of seed
12	PercPlus/Microvite @ 4-5 Trifoliate	28 oz./a; 32 oz./a
13	CropKarb @ R3 & R4	32 oz./a
15	Micro 581@4-5 Trifoliate/Quantum+Impact F @ R2 & R5/Domark @ R5	1.5 qts/a; 1 gal/a; 1qt/a; 4 oz./a
17	Micro 581 @ 4-5 trifoliate/Quantum+Impact F/Domark/Headline @ R2	1.5 qt/a; 1 gal/a; 1qt/a; 4 oz./a; 8 oz/a
18	Check	Nothing

* Treatments 2, 6, 8, 14, and 16 were dummy plots.

& The treatments were provided by 4 different companies in the following groups: 1,3,4,5,and 7; 9 and 10; 11,12, and 13; 15 and 17.

Results

Local agribusinesses were solicited for products that could potentially enhance yields. Four businesses provided products that by themselves or in combination were evaluated based on their ability to impact yield. The dummy plots were not needed in the test due to the fact that treatments were applied with a backpack boom sprayer. The dummy plots were harvested and their yields recorded in order to evaluate the uniformity of the site. The dummy plots, which yielded as high as any of the treatments, were also consistent throughout the test, suggesting that the test site was relatively uniform, and differences seen between the actual treatments were not due to differences in the test site.

The data were analyzed both with the dummy plots included and not included in the statistical analysis. For the data that included the dummy plots, one of the dummy plots was statistically higher than the lowest yielding treatment in the test. The test included a check, which was lower than the dummy plots. No logical reason could be attributed to the dummy plots being numerically as high as the highest yielding treatment as well as higher than the check, since both the check and dummy plots had the same management. The data shown here are without the dummy plots. There were no statistical differences between the treatments. The two highest yielding treatments were the Graph-EX SA inoculant followed by the Seed Coat Treatment. The Check was the third lowest yielding treatment of the test. Although there were no statistical differences between the treatments, there were numerical differences in the test. Additional replications may have made the test more definitive. Additional tests on such products appear to be warranted.

Table 2. Evaluation of Potential Yield Enhancer Products Impact on Soybean Yield

Trt No.	Treatment	Moisture (%)	Yield (bu/a)	Significance *
10	Graph-EX SA Inoculant	12.4	80.2	a
11	Seed Coat Seed Treatment	12.5	79.4	a
13	CropKarb @ R3 & R4	12.6	78.8	a
4	BOMO @ Roundup application & 10-14 days later	12.2	78.5	a
15	Micro 581@4-5 trifoliate/Quantum+Impact F@ R2 & R5/Domark @R5	12.3	77.6	a
12	PercPlus/Microvite @ 4-5 Trifoliate	12.1	77.3	a
9	Monty's Carbon @ Preplant/AgriHance-V @ 4 - 5 trifoliate /AgriHance-R @ R2	12.9	77.0	a
7	Combination of Radiate, Quick Ultra Awaken, BOMO, and Re-Nforce K/Headline/Karate	12.7	75.0	a
5	Re-Nforce K/Headline/Karate @ R2-R4	12.4	73.5	a
17	Micro 581 @ 4-5 Trifoliate/Quantum+Impact F/Domark/Headline @ R2	12.2	73.4	a
18	Check	12	73.3	a
1	Radiate @ Roundup application & @ R2-R3	12.3	72.6	a
3	Quick Ultra Awaken @ Roundup application & @ R2-R3	12.3	67.3	a

LSD	0.77	12.55
CV	2.86	7.61
Average	12.38	75.68

*Yields followed by the same letter have greater than a 5% chance of having the same true yield.

Impact of a Foliar Fungicide Application on the Yield of Soybean Varieties of Maturity Groups IV to VII

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Soybeans make more total dollars for the farmers of northeastern North Carolina than any other agricultural commodity and soybean hybrid selection is one of the most important tasks to help insure a profitable crop. Foliar fungicide use is relatively common for wheat in northeast North Carolina and its benefit has been documented through on-farm tests conducted in the region. The use of foliar fungicides is less common in soybean production because growers have not observed significant yield increases as a result of fungicide application and there has been limited on-farm test data to demonstrate the impact of foliar fungicide on soybean yield in the northeast region. This test was conducted to see if foliar fungicide would impact the yield of varieties from maturity groups IV to VII.

Methods

On May 15, fifty-five varieties of soybeans including twenty-four varieties of maturity group IV, twenty-eight varieties of maturity group V, two varieties of maturity group VI and one variety of maturity group VII were planted. The seeding rate was 140,000 seeds per acre with a Great Plains six foot no-till drill in 7.5 inch rows at the Northeast Ag Expo site on the farm of Roberts Brothers, Inc. in Shawboro, NC. A randomized complete block design split by maturity group was used with four replications. Plots were 9 rows 80 feet in length and were divided so that fungicide (Priaxor 6 oz/a at R4-5 for group IV's to R1 for group VII's) could be applied to half of each plot. This resulted in a split-block design with four replications. Fertility management included 200 pounds per acre of the analysis 9-23-30 broadcasted prior to planting. Weed control consisted of a postemergence application of Touchdown at 25 oz/a and Flexstar 1.25 pt/a. The fungicide was broadcast over the top of the canopy at a ninety degree angle to the direction of the plot rows with a commercial sprayer. Plots were harvested on October 31 with a Massey Ferguson plot combine that recorded weight and moisture. Statistical analysis was performed using Statistical Analysis Software (SAS) General Linear Model (GLM) for analysis of variance. Significance is reported at the 95% confidence level unless otherwise noted.

Results

The foliar fungicide application significantly increased soybean yields for each of the maturity groups (see Table 1, 3, and 5). The change column indicates whether the fungicide increased or decreased yield (see Table 2, 4, and 6). For group IV's, all but three of the varieties had a positive response to fungicide application with the highest response of 6.88 bu/a. For group V's, all but one variety had a positive response to the fungicide application with the highest response of 8.5 bushels per acre. All group VI and VII varieties had a positive yield response to the foliar fungicide application. Group IV yields ranged from 71.29 to 95.78 bushels per acre. The four highest yields from Group IV did not differ statistically. Group V yields ranged from 75.45 to 94.75 bu/a. The three highest yields from Group V did not differ statistically. Group VI and VII yields ranged from 61.97 to 71.88 bushels per acre. Group VI yields were significantly higher than group VII.

Weather conditions at the variety test site were conducive to both foliar diseases and to high yields, although there were no obvious symptoms of foliar disease. With this test and Soybean Foliar Fungicide Application Timing test at the Expo site showing significant increases due to a fungicide application, it is obvious that additional testing is needed to determine the conditions and timing of foliar fungicide applications that result in economically beneficial returns.

Table 1. Foliar Fungicide Treatment for Maturity Group IV*

Treatment	Yield (Bu/a)	
Foliar Fungicide	86.87	a
No Foliar Fungicide	83.61	b

* Foliar fungicide did significantly increase yields ($p<0.05$)

Table 2. Impact of a Foliar Fungicide Application on the Yield of Soybean Varieties of Maturity Groups IV

Variety	Maturity Group	No Fungicide bu/a	Fungicide bu/a	Change bu/a	Avg. Yield bu/a	
Syngenta S49-F8	4.9	94.93	96.63	1.70	95.78	*
Mycogen 5N479R2	4.7	92.30	98.78	6.48	95.54	*
Schillinger 4990	4.9	92.10	93.93	1.83	93.01	*
Pioneer 49T80	4.9	94.50	91.45	-3.05	92.98	*
Hornbeck HBK RY 4721	4.7	93.03	89.47	-3.56	91.25	
Seed Consultants 9474	4.7	88.23	93.48	5.25	90.85	
Progeny P4850	4.8	88.33	93.25	4.93	90.79	
Mycogen 5N451R2	4.5	90.15	90.85	0.70	90.50	
Asgrow AG 4934	4.9	88.03	92.35	4.32	90.19	
Progeny P4710 RY	4.7	86.83	92.28	5.45	89.55	
Southern States SS 4711N R2	4.7	86.55	90.90	4.35	88.73	
Great Heart GT 478 CR2	4.7	81.03	85.73	4.70	83.38	
Beck's 495 NR	4.9	80.48	86.03	5.55	83.25	
Pioneer 48T53	4.8	81.18	84.30	3.13	82.74	
Pioneer 94Y70	4.7	84.38	79.57	-4.81	81.97	
Great Heart GT 460 CR2	4.6	80.78	82.63	1.85	81.70	
Southern States SS 4917N R2	4.9	79.85	83.23	3.38	81.54	
UniSouth Genetics USG 74B81R/STS	4.8	77.78	82.63	4.85	80.20	
Seed Consultants 9443	4.4	77.23	82.13	4.90	79.68	
DynaGro 37RY47	4.7	77.73	80.60	2.88	79.16	
DynaGro 39RY43	4.3	74.53	81.37	6.84	77.95	
Beck's 477 NR	4.7	74.60	81.00	6.40	77.80	
Syngenta S43-K1	4.3	72.65	79.28	6.63	75.96	
Schillinger 4712R2	4.7	69.45	73.13	3.68	71.29	

* Not significantly different.
Fungicide did increase yields significantly.
The change column indicates whether the fungicide increased or decreased yield.

Table 3. Foliar Fungicide Treatment for Maturity Group V*

Treatment	Yield (bu/a)	
Foliar Fungicide	86.72	a
No Foliar Fungicide	82.97	b

* Foliar fungicide did significantly increase yields ($p<0.05$)

Table 4, Impact of a Foliar Fungicide Application on the Yield of Soybean Varieties of Maturity Group V

Variety	Maturity Group	No Fungicide bu/a	Fungicide bu/a	Change bu/a	Avg. Yield bu/a	
Seed Consultants 9544	5.4	94.15	95.35	1.20	94.75	*
Hornbeck HBK RY 5421	5.4	92.55	96.23	3.68	94.39	*
AgVenture 53E5RR	5.3	93.73	91.28	-2.45	92.50	*
Doebler's 5213RR	5.2	86.63	92.13	5.50	89.38	
Seed Consultants 9574	5.7	89.13	89.25	0.13	89.19	
Pioneer 95Y40	5.4	88.18	89.85	1.68	89.01	
Syngenta S52-Y2	5.2	85.50	91.78	6.28	88.64	
Syngenta S56-G6	5.6	86.20	90.50	4.30	88.35	
Mycogen 5N540R2	5.4	85.05	89.93	4.88	87.49	
Asgrow AG 5233	5.2	83.50	89.60	6.10	86.55	
AgVenture 51E1 RR/STS	5.1	86.38	86.68	0.30	86.53	
AgVenture 52B2RR	5.2	85.13	86.85	1.72	85.99	
Doebler's 5711RR	5.7	83.73	87.08	3.35	85.40	
Schillinger 5220	5.2	82.80	87.98	5.18	85.39	
Mycogen 5N510R2	5.1	83.83	86.53	2.70	85.18	
DynaGro 39RY57	5.7	83.65	86.35	2.70	85.00	
Schillinger 557	5.5	79.93	88.43	8.50	84.18	
Southern States SS 5911N R2	5.9	81.53	85.80	4.27	83.66	
Hornbeck HBK RY 5221	5.2	81.45	84.28	2.83	82.86	
Asgrow AG 5633	5.6	78.80	86.00	7.20	82.40	
UniSouth Genetics USG 75J90R2	5.9	78.03	83.55	5.52	80.79	
Southern States SS 5511N R2	5.5	77.28	81.75	4.47	79.51	
Progeny P5210 RY	5.2	75.88	83.08	7.20	79.48	
Progeny P5610 RY	5.6	77.90	79.80	1.90	78.85	
Great Heart 550 CR2	5.5	75.08	82.30	7.22	78.69	
Great Heart GT 543 CR2	5.4	77.38	79.75	2.38	78.56	
DynaGro 32RY55	5.5	76.10	79.00	2.90	77.55	
UniSouth Genetics USG 75Z38R	5.3	73.67	77.23	3.56	75.45	

* Not significantly different.
Fungicide did increase yields significantly.
The change column indicates whether the fungicide increased or decreased yield.

Table 5. Foliar Fungicide Treatment for Maturity Group VI and VII*

Treatment	Yield (bu/a)	
Foliar Fungicide	75.77	a
No Foliar Fungicide	71.82	b

* Foliar fungicide did significantly increase yields ($p<0.10$)

Table 6. Impact of a Foliar Fungicide Application on the Yield of Soybean Varieties of Maturity Groups VI and VII

Variety	Maturity Group	No Fungicide bu/a	Fungicide bu/a	Change bu/a	Avg. Yield bu/a	
Doebler's 6012RR	6	76.9	82.85	5.95	79.88	a
UniSouth Genetics USG 76S22R	6.2	77.05	82.03	4.98	79.54	a
Doebler's 7213RR	7.2	61.5	62.45	0.95	61.97	b

The change column indicates whether the fungicide increased or decreased yield.

Soybean Foliar Fungicide Application Timing

Northeast Ag Expo Team:
Mark Powell, Camden Co.; Tommy Grandy, Currituck Co., Paul Smith, Gates Co.,
Al Wood, Pasquotank Co., Lewis Smith, Perquimans Co.,
Erin Eure, Gates/Chowan/Perquimans Co.

Foliar fungicide use is a relatively common practice for wheat in northeast North Carolina and its benefit has been documented through on-farm tests conducted in the region. The use of foliar fungicides is less common for soybean production in the northeast because growers have not observed significant yield increases and there have been limited on-farm tests to determine the impact on soybean yield in the region. This study was conducted to test the impact of the timing of a foliar fungicide on soybean yield.

Methods

On May 22 Pioneer 95Y40 was planted at 160,000 seeds per acre in 4-row plots on 15 inch rows with a Great Plain No-Till 6 foot drill at the Northeast Ag Expo site on the farm of Roberts Brothers, Inc. in Shawboro, NC. Fertility management included 200 pounds per acre of the analysis 9-23-30 broadcasted prior to planting. Weed control consisted of a post application of Roundup Ultra @ 24 ounces per acre. The four treatments consisted of a check (untreated), early (growth stage V8; applied July 10), late (growth stage R4, applied August 8), and early-late (growth stages V8 and R4). Treatments are listed in Table 1. Treatment plots consisted of 4 rows with a length of 50 feet. The fungicide was broadcast over the top of the canopy with a handheld boom. Plots were harvested on October 30 with a Massey Ferguson plot combine that recorded weight and moisture. Statistical analysis was performed using Statistical Analysis Software (SAS) General Linear Model (GLM) for analysis of variance.

Table1. Treatments

Treatment	Rate
Check	untreated
Early (V8; July10)	Priaxor 6 oz/a
Late (R4; August 8)	Priaxor 6 oz/a
Early-Late (V8 & R4)	Priaxor 6 oz/a + Priaxor 6 oz/a

Results

The late foliar fungicide application significantly increased yield over the check (Table 2). Even though the early-late and early treatments were not statistically higher than the check, they were numerically higher. The early-late treatment resulted in a 4 bushel increase and the early treatment resulted in a two bushel increase. These results indicate that disease pressure must have been greater late in the season. The growing season at this site as well as much of this region of the state received frequent rains of significant amounts (Figure 1). Although there were no obvious visual symptoms of disease during the course of the test, the timing of the late application likely contributed to plant health resulting in higher yields. The results of this test suggest that additional on-farm tests are needed to determine the economic impact of foliar fungicides on soybean yield.

Table 2. Foliar Fungicide Application Timing in Soybeans

Timing	Moisture	Yield	
Late	13.5	82.5	a
Early-Late	13.1	82	ab
Early	13.4	78.1	ab
Check	13.3	76.1	b

* Yields with the same letter do not differ statistically ($p<0.05$).

CV	1.28	4.56
LSD	0.27	5.93
Avg.	13.3	79.7

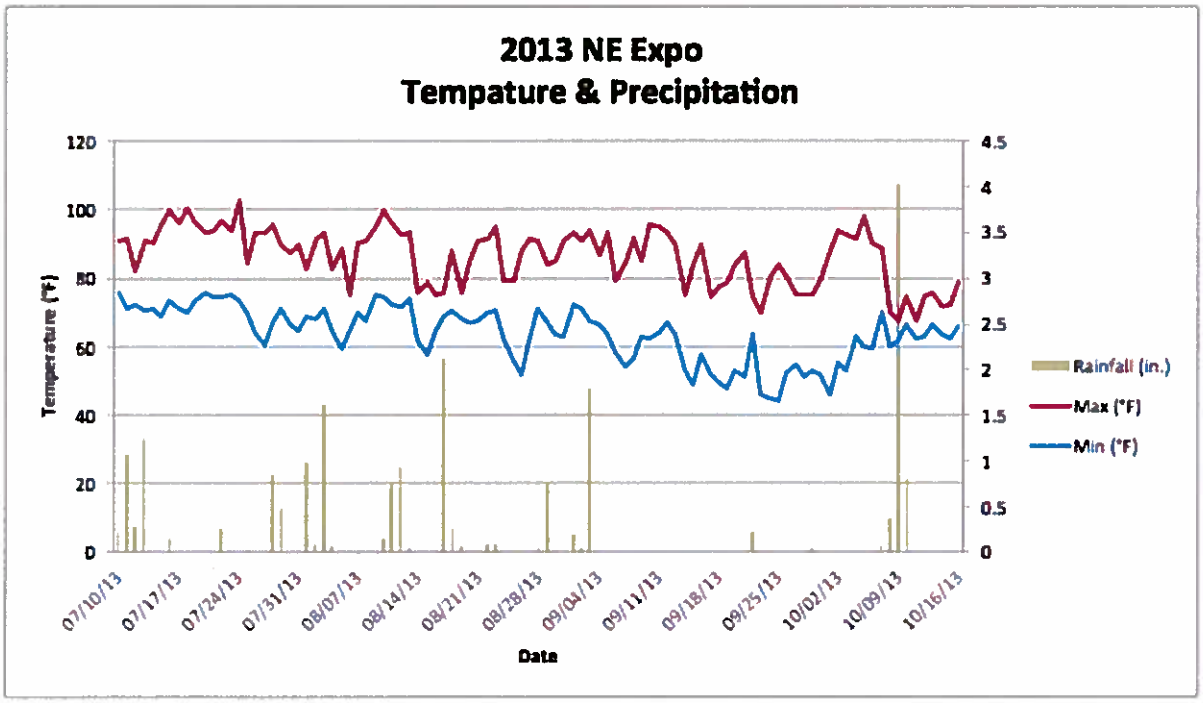

Figure 1. Temperature and Precipitation Data of the 2013 Northeast Ag Expo Field Day site

Precision vs Non-Precision Planting for Soybean

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Much research has been conducted to document the positive impact of precision planting (uniform distribution of seeds) on yield, especially for certain crops such as corn. This test was conducted to determine if precision planting has the same positive impact on yield for soybeans.

Methods

This test was conducted at the Northeast Ag Expo site on the farm of Roberts Brothers, in Shawboro, NC. Planting date was May 28, 2013. Asgrow AG 4730 was planted at two populations, 75,000 and 175,000 with a Great Plains No-till six foot drill with 7.5 inch rows and a 4-row John Deere MaxEmerge II vacuum planter with 15 inch rows for precision and non-precision. The non-precision was simulated by taping holes on the seed plate to create an irregular distribution of seeds. The drilled plots were 6 feet wide (i.e. one pass of the drill) and the plots planted with the John Deere planter were 8-row plots, 10 feet wide. All treatments (Table 1) were replicated 4 times and were randomized within replications and planted in 40 foot plots. Fertility management included 200 pounds per acre of 9-23-30 broadcasted prior to planting. Weed control consisted of a postemergence application of Roundup Ultra at 24 ounces per acre and FirstRate at 0.2 ounces per acre. Plots were harvested on October 29 with a Massey Ferguson plot combine that recorded weight and moisture. Statistical analysis was performed using Statistical Analysis Software (SAS). Significance is reported at the 95 percent confidence level unless otherwise noted.

Table 1. Treatments

Seeding Rate of 75,000 seeds/a	Seeding Rate of 175,000 seeds/a
Drilled (6 ft drill on 7.5 inch row spacing)	Drilled (6 ft drill on 7.5 inch row spacing)
Precision (John Deere planter on 15 inch row spacing)	Precision (John Deere planter on 15 inch row spacing)
Non-Precision (John Deere planter with plates taped to simulate irregular seed placement)	Non-precision (John Deere planter with plates taped to simulate irregular seed placement)

Results

There were no significant differences among yields (Table 2, 3, and 4); however, the more precision that was implemented, the closer the yields were between the two populations. This would indicate that with more precision you could use lower populations. Further testing is needed to confirm these results. Another important observation is that 100,000 more seeds only produced an additional 2 bushel increase in yield. This increase would not justify the additional seed cost.

Table 2. Planting Method vs Yield*

Planting Method	Average Yield (bu/a)	
Drilled	66.2	a
Non-precision	64.1	a
Precision	65.6	a

* Yields with the same letter do not differ statistically ($p<0.05$)

Table 3. Seeding Rate vs Yield

Seeding Rate	Average Yield (bu/a)	
175,000	66.3	a
75,000	64.3	a

* Yields with the same letter do not differ statistically ($p<0.05$)

Table 4. Planting Method and Seeding Rate vs Yield

Planting Method	Seeding Rate (seeds/a)	Average Yield (bu/a)	Standard Deviation
Drill	75,000	64.0	5.78
Drill	175,000	68.4	6.96
Non-Precision	75,000	63.2	6.00
Non-Precision	175,000	65.0	6.56
Precision	75,000	65.8	9.29
Precision	175,000	65.4	7.24

Impact of Late Planting Date and Nitrogen on Soybean Varieties of Maturity Groups III to VI

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Often soybean producers are forced into a position of planting soybeans much later than anticipated due to weather conditions. The decision must then be made as to which maturity group and variety to plant that will be able to reach maturity and maintain a level of profitability. The goal of this research trial was to determine variety performance at a later planting date. Three high yielding varieties from maturity groups III, IV, V, and VI were chosen for the study. In addition to the later planting date, nitrogen was also applied to determine if it has the ability to increase yields for later planted soybeans.

Methods

This test was conducted at the Northeast Ag Expo site on the farm of Roberts Brothers, Inc., in Shawboro, NC. A randomized complete block design was used with two replications of all varieties in each maturity group. Planting took place on July 18, 2013 with a Great Plains plot drill at a seeding rate of 200,000 seeds per acre. Plots consisted of four 15-inch rows, 40 feet in length.

A preplant application of 9-23-30 at 200 pounds per acre was made in May. The site was re-tilled prior to planting. On July 30, 2013, each replication was divided in half, and a broadcast application of ESN (44-0-0) at a rate of 100 pounds per acre was applied to one-half of each replication. This trial received one post application of Roundup Ultra at 24 ounces per acre for weed control.

On August 30, 2013, which was 44 days after planting, the growth stage was determined for all varieties in the test with and without nitrogen (Table 1). The early varieties of maturity groups III and IV were harvested on October 31, 2013 with a Massey Ferguson plot combine that recorded weight and moisture. The varieties in maturity groups V and VI were harvested on November 21, 2013 with the same plot combine. Statistical comparisons were made using Proc Anova with mean separations using Duncan's LSD.

Table 1. Growth Stage Determination of Varieties With and Without Nitrogen*

Variety	Nitrogen	No Nitrogen
DG S39RY33	R4	R4
Pioneer 93Y92	R4	R4
Syngenta S39-U2	R4	R4
AG 4730	R2+	R2+
Stine 4782-4	R2+	R2+
DG 37RY47	R2+	R2+
Pioneer 95Y40	R2	R2
SS 5511NR2	R2	R2
DG 32RY55	R2	R2
Syngenta S67-R6	R1-	R1-
USG 76S22R	R1+	R1+
AG 6732	R2	R2

* Growth stage was evaluated on August 30th, which was 44 days after planting. The signs of "-" and "+" after the growth stage indicates that soybeans are not quite to that growth stage, or slightly more developed than the growth stage.

Results

The Late Planted Soybeans with or without ESN only produced significant differences by hybrid (Tables 2 and 3). ESN increased or decreased yields depending on the hybrid. Nitrogen did not uniformly hasten the development of all soybean varieties (Table 1). Varieties that did respond to a nitrogen application must have either had more nodes per plant, more pods per node, seeds per pod, an increase in the grain fill period, or a combination of these yield components, which were not evaluated.

The trial site received ample rainfall and good weather conditions during the growing season that provided higher yields at this late of a planting date than would be expected for

this area of the state. Also, growing conditions appeared to favor the late group IV and early group V varieties, which was observed in other tests such as the soybean variety test at the 2013 Northeast Ag Expo site. The current recommendation is to use a later maturing variety as the planting date gets late in the growing season, but this data suggests that a productive early maturing variety under good growing conditions may perform as well as a later maturing variety. This test shows some interesting trends and should be conducted as a replicated test in the future.

Table 2. Late Planted vs Nitrogen

Treatment	Average Yield (bu/a)
Nitrogen	48.9
No Nitrogen	48.7

Table 3. Response by Variety to Nitrogen

Hybrid	Maturity	No ESN	Change	ESN	Avg. Yield	
AG 4730	4.7	54.9	0.0	ns	54.9	a
DG 37RY47	4.7	53.4	0.2	ns	53.5	ab
USG 76S22R	6.2	56.6	-7.5	*	52.8	ab
DG S39RY33	3.3	56.7	-8.1	*	52.4	abc
Stine 4782-4	4.7	46.4	6.7	*	49.7	cbd
Syngenta S39-U2	3.9	47.8	3.1	ns	49.3	cbd
Pioneer 95Y40	5.4	44.8	7.2	*	48.4	cde
Asgrow AG 6732	6.7	48.8	-1.9	ns	47.8	de
SS 5511NR2	5.5	46.7	1.0	ns	47.1	de
DG 32RY55	5.5	48.3	-5.9	ns	45.3	de
Pioneer 93Y92	3.9	41.7	4.8	ns	44.0	ef
Syngenta S67-R6	6.7	39.0	2.8	ns	40.4	f

ns = not a significant difference in the yield change ($p<0.05$)
Yields with the same letter do not differ statistically ($p<0.05$)
* = significant difference in the yield change ($p<0.05$)

Grain Sorghum Variety Test

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In the last several years, there has been a renewed interest in grain sorghum in the state as well as in northeastern North Carolina. It has been the result of the shortfall in grain supply for the livestock and poultry industry that brought about a tri-state initiative headed by Murphy-Brown to conduct research on grain sorghum production and to increase marketing opportunities. Farmers are asking for information on varieties of grain sorghum that are high-yielding, well adapted varieties for the region. The Extension Centers that are represented in the Northeast Ag Expo are conducting replicated trials to meet that need.

Methods

The grain sorghum test was conducted on the farm of Roberts Brothers, Incorporated, Shawboro, NC, which was also the site of the 2013 Northeast Ag Expo. The major soil type of this test was Roanoke silt loam. Production information is listed in Table 1. There were 25 varieties evaluated from nine brands and their relativity maturity ranged from early to full (Table 2). With four replications, the plots were 50 feet in length, and each variety was planted in five 15 inch rows at seeding rate of 140,000 seeds per acre with a Great Plains NT 6 foot drill. A K2 Gleaner with means of recording weights and moisture were used to harvest the plots. Statistical analysis was performed using Statistical Analysis Software (SAS) General Linear Model (GLM) for analysis of variance.

Table 1. Grain Sorghum Variety Test Production Information

Input/Practice	Time/Rate
Planting Date	May 29, 2013
Harvest Date	October 4, 2013
Previous Crop	Corn
Row Spacing	15 inches
Seeding Rate	140,000
Fertilizer	Preplant:200 lbs/a,9-23-30; 35 gals/a of 32% N
Herbicide	Touchdown 25 oz/a + Atrazine 1.33 qts/a (Preplant); Dual Magnum 1.25 pints/a*

*The Dual Magnum was tank mixed with the 32% N and applied on May 31st

Results

The yields of this test were generally higher than many growers would normally obtain in the region because of the practices, soil type and growing season (i.e. timely and ample rainfall) that was experienced at the site. Yields ranged from 71.10 bushels per acre to 144.8 bushels per acre. The medium maturity hybrids had the highest average yield at 124.8 bu/acre. Yields for all maturity groups are shown in tables 2-4. Individual hybrid yields are compared to the maturity group average in Figures 1-3. For marginal corn land, grain sorghum may be a better choice for the northeast part of North Carolina and other regions of the state.

Table 2. Early to Medium-Early Maturity Hybrids

Variety	**Moisture**	**Test weight**	**Yield**	
Southern States 650	12.38	60.14	136.4	a
Seed Consultants AAS314	11.88	60.53	112.43	b
Pioneer 86P90	11.96	60.43	108.08	bc
Pioneer 86G32	11.96	60.32	102.79	bc
Mycogen 3838	11.58	60.75	92.32	c
Seed Consultants AAS 347	11.97	60.38	71.18	d

*Varieties with the same letter are not statistically different ($p<0.05$)

Average	11.95	60.43	103.86
CV%	1.92	0.38	10.8
LSD (p=0.05)	0.35	0.34	16.84

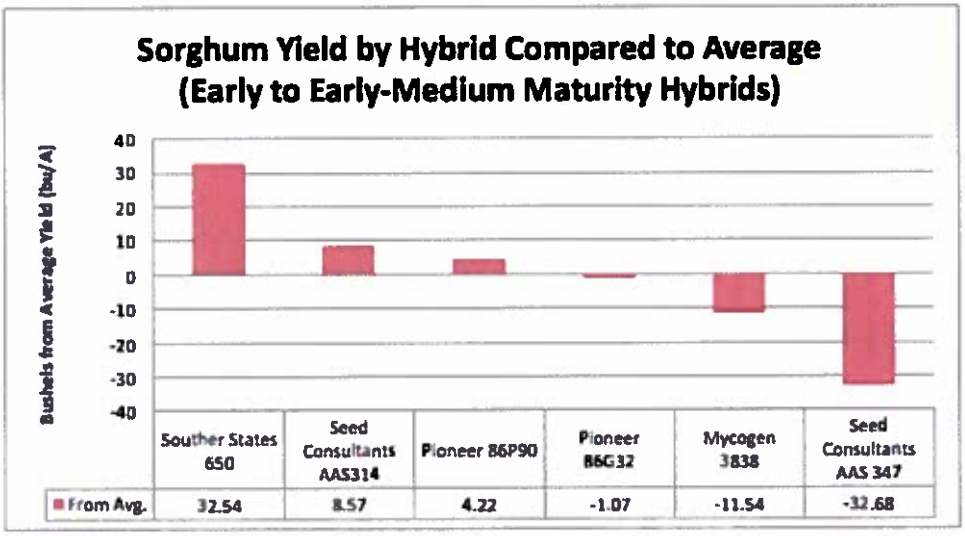

Figure 1. Early to Early-Medium Maturity Hybrids

Table 3. Medium Maturity Hybrids

Variety	Moisture	Test weight	Yield	
Pioneer 84P80	12.54	60.04	144.8	a
DynaGro 765B	12.98	59.81	138.63	ab
DeKalb 44-20	12.61	59.99	130.82	bc
B-H Genetics 3822	12.55	59.99	128.43	bcd
AgVenture P5225	12.12	60.52	126.09	cd
AgVenture 7R01	12.32	60.42	125.24	cde
AgVenture 7R21	12.29	60.3	122.73	cde
DeKalb 49-45	12.38	60.24	121.27	cdef
AgVenture P5226	12.39	60.21	118.61	def
B-H Genetics 5350	12.21	60.33	116.89	def
Golden Acres 3552S	12.7	59.89	113.81	ef
Mycogen M75GB39	12.32	60.22	110.29	f

*Varieties with the same letter are not statistically different ($p<0.05$)

Average	12.45	60.16	124.8
CV%	1.79	0.36	6.58
LSD (p=0.05)	0.32	0.31	11.81

Figure 2. Medium Maturity Hybrids

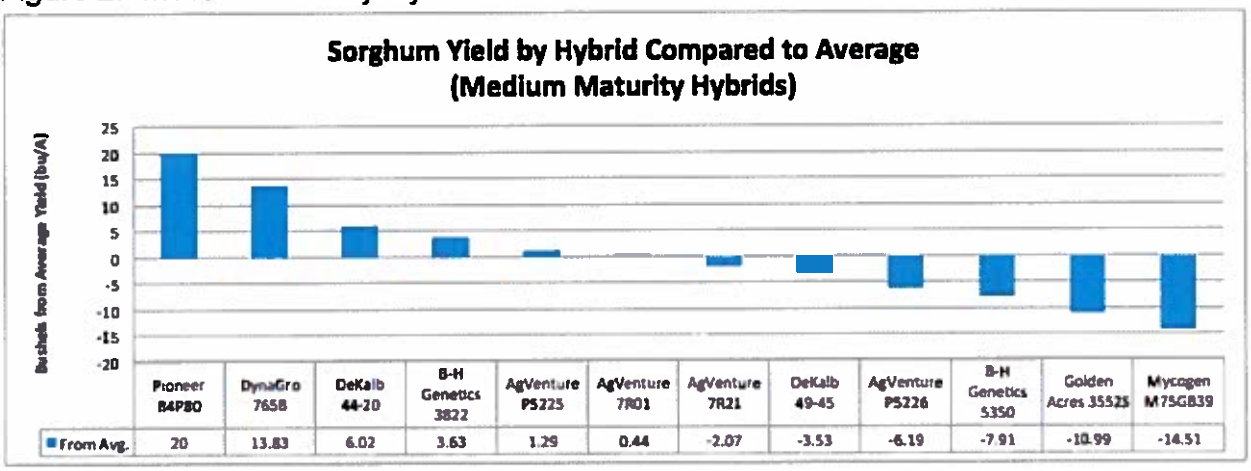

Table 3. Medium-Late to Late Maturity Hybrids

Variety	Moisture	Test weight	Yield	
Seed Consultants AAS 307	13.58	59.22	131.66	a
Seed Consultants AAS 397	13.45	59.38	127.31	ab
Pioneer 83P17	13.29	59.38	124.16	abc
DeKalb 53-67	12.74	60.04	118.13	bcd
DeKalb 54-00	13.14	59.55	113.09	cd
B-H Genetics 5566	13.06	59.6	109.59	d
DynaGro M77GB5	12.67	59.98	91.79	e

*Varieties with the same letter are not statistically different ($p<0.05$)

Average	13.13	59.59	116.53
CV%	5.18	1.1	7.56
LSD (p=0.05)	1.01	0.98	13.09

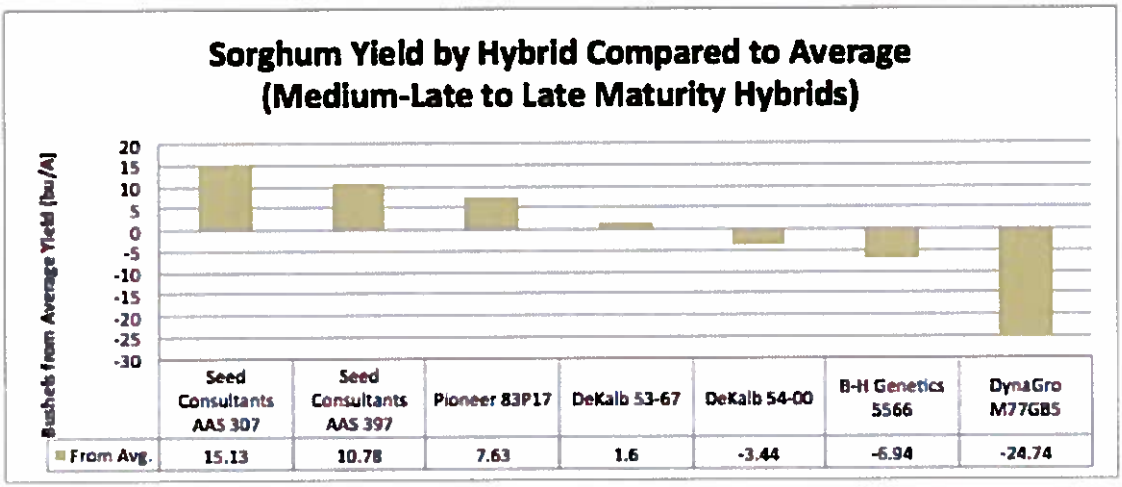

Figure 3. Medium-Late to Late Maturity Hybrids

Palmer Amaranth Control in Soybeans

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Glyphosate-resistant Palmer amaranth is wide-spread across the Coastal Plain and is showing up alarmingly fast in the Piedmont. Not all Palmer amaranth in North Carolina is glyphosate-resistant. However, growers are encouraged to assume that all Palmer amaranth is resistant to glyphosate and to react accordingly.

Growers who currently do not have Palmer amaranth are encouraged to prevent it from becoming established. Learn to recognize the weed and remove any escapes before a seed head is produced. A single female Palmer amaranth can produce a half million seed. If the seed were uniformly distributed, that is equivalent to more than 10 seed per square foot over an entire acre. Don't ignore escaped weeds; devastating populations can build up quickly. Clean equipment as well as possible when moving from infested to non-infested fields.

Rotate crops and chemistry as much as possible. Include corn or sorghum in the rotation where practical; atrazine-based programs are very effective on Palmer amaranth. Be careful to not negate the benefits of rotation by allowing a crop of seed to be produced after corn harvest. In the fall, Palmer amaranth can go from seed to seed in about 40 days.

Palmer Amaranth Control in Roundup Ready Soybeans

Programs for Palmer amaranth control in Roundup Ready soybeans are detailed on the back of this sheet. Three key points should be kept in mind. First, a residual herbicide applied preplant or preemergence should always be included in a program. Additional residual control from a postemergence application is also beneficial. All of the postemergence options listed on the back, except Harmony SG, have residual activity on Palmer amaranth. The second key point is timing of application. Palmer amaranth should be treated postemergence before it exceeds 4 inches tall. If the weed is resistant to glyphosate, the material mixed with glyphosate must do all the work; hence, the treatment should be applied to weeds of the size appropriate for the tank-mix partner. Remember, this weed can grow an inch or more per day. Treating larger weeds not only results in less control, but it can also accelerate selection for resistance to PPO inhibitors (Authority, Blazer, Cobra, Envive, Flexstar, Prefix, Reflex, Valor, others), something we can ill afford. Third, fomesafen (the active ingredient in Flexstar and one of the ingredients in Prefix and Flexstar GT) behaves as a contact herbicide. That means good spray coverage is required. While lower spray volumes and air induction nozzles are fine with glyphosate alone, use of flat-fan nozzles and a spray volume of 15 gallons per acre or more will enhance Palmer amaranth control with Flexstar, Flexstar GT, and Prefix applied postemergence.

Palmer Amaranth Control in LibertyLink Soybeans

Management programs for Palmer amaranth in LibertyLink soybeans are basically the same as those for Roundup Ready soybeans (detailed on the back) with the obvious exception that Liberty herbicide is used instead of glyphosate postemergence. Growers are encouraged to not abuse this herbicide. Liberty will likely be increasingly important for us in the future, hence we must avoid selection for resistance. Do not depend entirely on Liberty, do not exceed two applications per year, do not cut rates, and treat small weeds (treating large weeds is equivalent to cutting rates, which encourages resistance). A residual herbicide or herbicides applied preplant or preemergence is always recommended. Additional residual control can be obtained from Dual Magnum, Warrant, Flexstar, or Prefix mixed with Liberty. Timely application is critical for successful Palmer amaranth control with Liberty. For consistent control, Palmer amaranth must be 4 inches or less when treated. A supplemental label was recently issued for Liberty that allows higher application rates on LibertyLink soybeans. The supplemental label allows two in-crop applications, with the first application being 22 to 36 fl oz/acre, and the second application being 22 to 29 fl oz. It is suggested that no less than 29 fl oz be applied. Hit them hard, hit them small. Liberty is a contact herbicide, hence good coverage is critical. It should be applied in a spray volume of at least 15 gallons per acre using flat-fan nozzles. Air-induction nozzles generally will not provide adequate coverage for a contact herbicide.

Programs for Glyphosate-Resistant Palmer Amaranth Control in Roundup Ready Soybeans

Conventionally Tilled Soybeans

	Preplant Incorporated	Preemergence	Postemergence
Option 1	Prowl or Treflan	Authority MTZ[1,2] Authority XL or Sonic Boundary[1,2] Canopy[1,2] Envive[3] Gangster[3] Prefix[4] Valor SX[3] Valor XLT[3]	**No Palmer emerged:** Glyphosate + Dual Magnum or Warrant ***Palmer 4 inches or less:*** Extreme[5] Flexstar + glyphosate Flexstar GT 3.5 Harmony SG[5,6] + glyphosate Prefix + glyphosate Pursuit[5] + glyphosate
Option 2	No Preplant Herbicide	Authority MTZ[1,2] ± Dual Magnum, Intrro, or Prowl Authority XL or Sonic Boundary[1,2] Canopy[1,2] ± Dual Magnum, Intrro, or Prowl Envive[3], Gangster[3], Valor SX[3], or Valor XLT[3] ± Prowl Prefix[4]	

Full-Season No-Till Soybeans

	Early Burndown	Preemergence	Postemergence
Option 1	With residual: Glyphosate + 2,4-D[7] + Envive, Fierce, Gangster,Valor SX, or Valor XLT Gramoxone + 2,4-D[7] + Envive, Fierce, Gangster, Valor SX, or Valor XLT	Gramoxone + one of the following: Boundary[1,2] Canopy[1,2] Dual Magnum Intrro Zidua[2] No residual herbicide[8]	***No Palmer emerged:*** Glyphosate + Dual Magnum or Warrant ***Palmer 4 inches or less:*** Extreme[5] Flexstar + glyphosate Flexstar GT 3.5 Harmony SG[5,6] + glyphosate Prefix + glyphosate Pursuit[5] + glyphosate
Option 2	Without residual: Glyphosate + 2,4-D[7] Gramoxone + 2,4-D[7]	Gramoxone + one of the following: Authority MTZ[1,2] ± Dual Magnum, Intrro, or Prowl Authority XL or Sonic ± Dual Magnum, Intrro, or Prowl Boundary[1,2] Canopy[1,2] ± Dual Magnum, Intrro, or Prowl Envive[3], Gangster[3], Valor SX[3], or Valor XLT[3] ± Prowl Prefix[4]	

Double-Crop No-Till Soybeans

Preemergence	Postemergence
Gramoxone + one of the following: Authority MTZ[1,2] ± Dual Magnum, Intrro, or Prowl Authority XL or Sonic ± Dual Magnum, Intrro, or Prowl Boundary[1,2] Canopy[1,2] ± Dual Magnum, Intrro, or Prowl Envive[4,5], Gangster[4], Valor SX[3], or Valor XLT[3,5] ± Prowl Fierce[2] Prefix[3]	***No Palmer emerged:*** Glyphosate + Dual Magnum or Warrant **Palmer 4 inches or less:** Extreme[5] Flexstar + glyphosate Harmony SG[5,6] + glyphosate Prefix + glyphosate Pursuit[5] + glyphosate

[1] Product contains metribuzin. Check with seed supplier to determine if your variety is metribuzin-sensitive.

[2] Adjust rate for soil texture and organic matter. See label for rates.

[3] Envive, Gangster, Valor SX, and Valor XLT labels caution against mixing Dual Magnum (s-metholachlor), Intrro (alachlor), or Outlook (dimethenamid) with Envive, Gangster, Valor SX, or Valor XLT due to potential soybean injury.

[4] Labels allow only one application per year of fomesafen (an active in Flexstar, Flexstar GT, Prefix, and Reflex). Do not use Prefix preemergence if plans include Flexstar, Flexstar GT, Prefix, or Reflex postemergence.

[5] Product contains an ALS inhibitor. ALS-resistant Palmer amaranth is common in NC. Use suggested only when there is a reasonable assurance that an ALS-resistant biotype is not present.

[6] Rate varies between STS and non-STS varieties; see label. Expect injury on non-STS varieties.

[7] Labels specify a waiting interval before planting of 15 days for 1 pt of 2,4-D amine or 7 days for 1 pt of 2,4-D ester. Higher rates of 2,4-D require a 30-day waiting interval between application and planting.

[8] Suggested only for fields with lighter infestations and only where a residual was included in the preplant burndown.

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