Jenny Rees Sugar vs. Foliar Fungicide vs. Check Corn Trial

Protocol: Sugar vs Foliar Fungicide vs Water/Check

2012 Data Summary

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Table of Contents

Trial Information

Protocol ID: Sugar vs. Foliar Fungicide vs. Water/Check

Location: SW-12 Section D, South end
South Central Agricultural Laboratory
Near Clay Center, NE

Previous Crop: Soybean

Disease: Gray leaf spot, common rust & southern rust

Hybrid: DKC 64-83

Treatments: Three

Replications: Six

Timings:

Planting:	4-26-12
Disease rating (R2 app.):	7-12-12
R2 application:	7-12-12
Phytotoxicity rating (7d after R2 app):	7-19-12
Disease rating (29d after R2 app.):	8-10-12
Disease rating (40d after R2 app.):	8-21-12
Stay Green %:	9-4-12
Push Lodging %:	9-25-12
Harvest:	9-26-12

Rows / Plot: Four

Row spacing: 30 inches

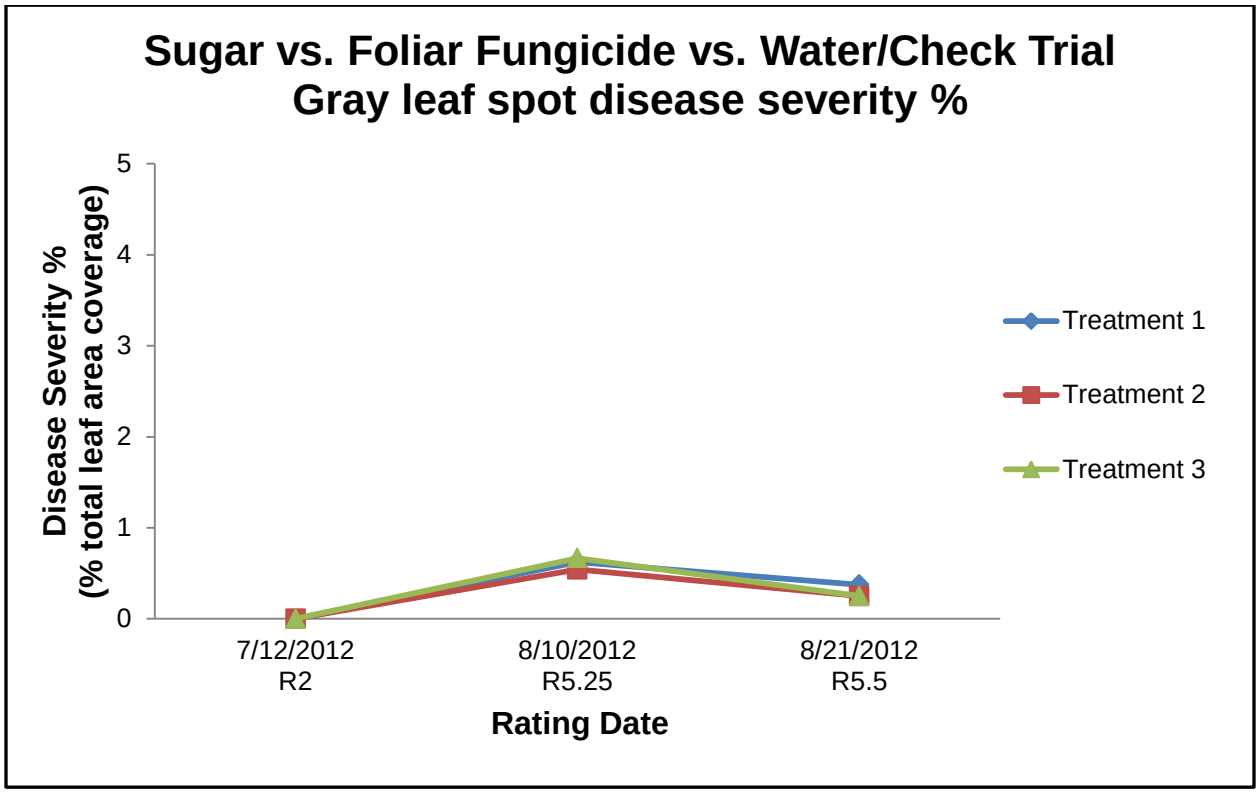
Plot dimensions: 10 ft. (W) x 40 ft. (L) = 400 ft.^{2}

Alley width between plots: 30 inches

Disease Severity % – Gray Leaf Spot

Sugar vs. Foliar Fungicide vs. Water/Check Trial Gray Leaf Spot Disease Severity %			
	R2	R5.25	R5.5
Treatment	7/12/2012	8/10/2012	8/21/2012
1	0 a	0.6 a	0.4 a
2	0 a	0.5 a	0.3 b
3	0 a	0.7 a	0.3 b

Note: Letters are inserted into table to indicate statistical significance between treatments means at P=0.05 according to Waller-Duncan K-ratio t Test. Means with the same letter are not significantly different. Coefficient of variation is 0%, 31.4%, and 27.1% for July 12th, August 10th, and August 21st, respectively.



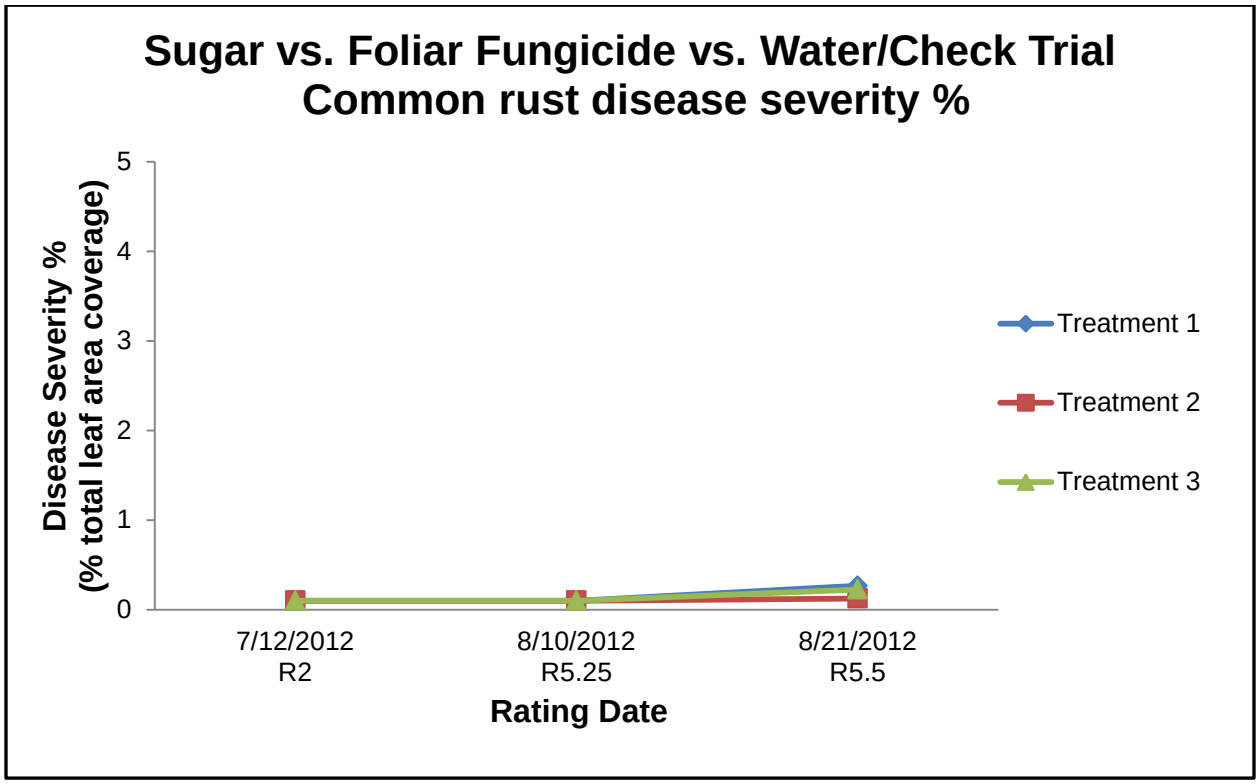
Treatment List

Treatment	Chemical	Application Timing	Application Rate
1	Water/Check	R2	20 gal/A
2	Headline AMP	R2	10 fl oz/A
3	Sugar	R2	3 lb. sugar per 10 gal. water

Disease Severity % – Common Rust

Sugar vs. Foliar Fungicide vs. Water/Check Trial Common Rust Disease Severity %			
	R2	R5.25	R5.5
Treatment	7/12/2012	8/10/2012	8/21/2012
1	0.1 a	0.1 a	0.3 a
2	0.1 a	0.1 a	0.1 b
3	0.1 a	0.1 a	0.2 ab

Note: Letters are inserted into table to indicate statistical significance between treatments means at P=0.05 according to Waller-Duncan K-ratio t Test. Means with the same letter are not significantly different. Coefficient of variation is 0%, 0%, and 46.9% for July 12th, August 10th, and August 21st, respectively.



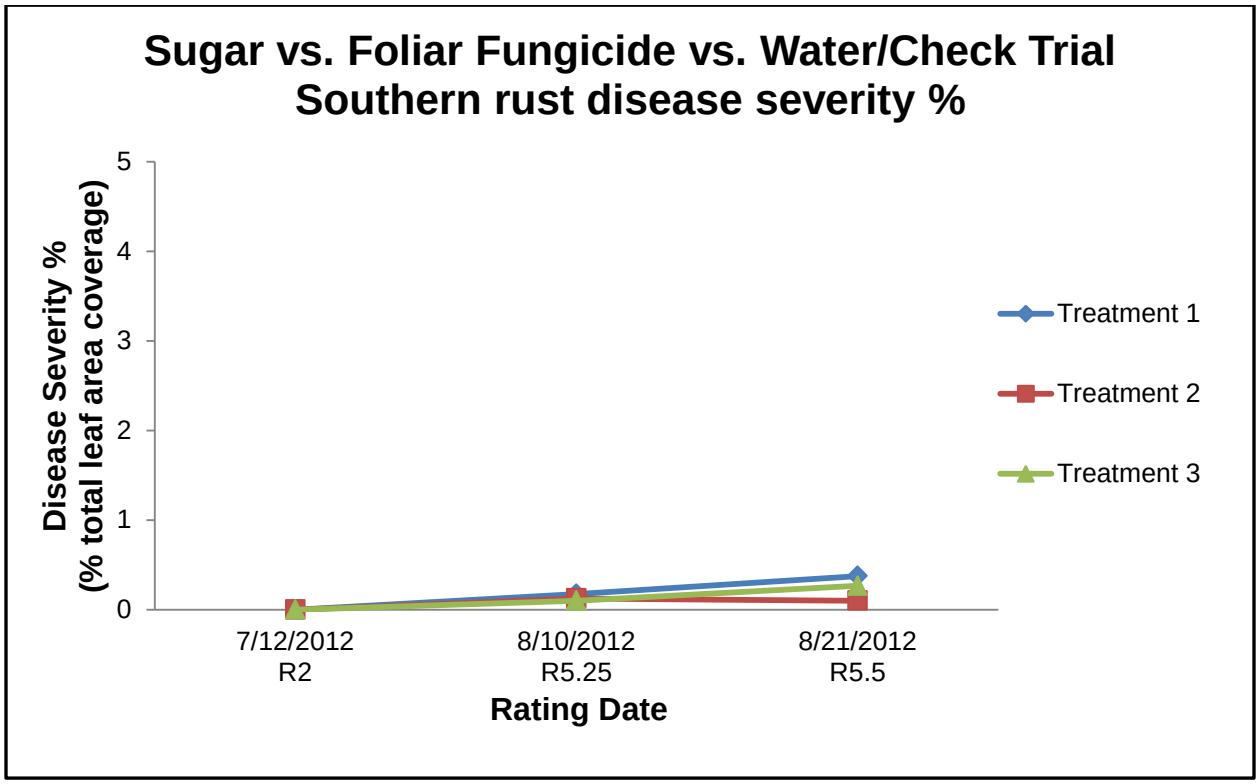
Treatment List

Treatment	Chemical	Application Timing	Application Rate
1	Water/Check	R2	20 gal/A
2	Headline AMP	R2	10 fl oz/A
3	Sugar	R2	3 lb. sugar per 10 gal. water

Disease Severity % – Southern Rust

Sugar vs. Foliar Fungicide vs. Water/Check Trial Southern Rust Disease Severity %			
	R2	R5.25	R5.5
Treatment	7/12/2012	8/10/2012	8/21/2012
1	0 a	0.2 a	0.4 a
2	0 a	0.1 a	0.1 b
3	0 a	0.1 a	0.3 a

Note: Letters are inserted into table to indicate statistical significance between treatments means at P=0.05 according to Waller-Duncan K-ratio t Test. Means with the same letter are not significantly different. Coefficient of variation is 0%, 48.9%, and 45.5% for July 12th, August 10th, and August 21st, respectively.



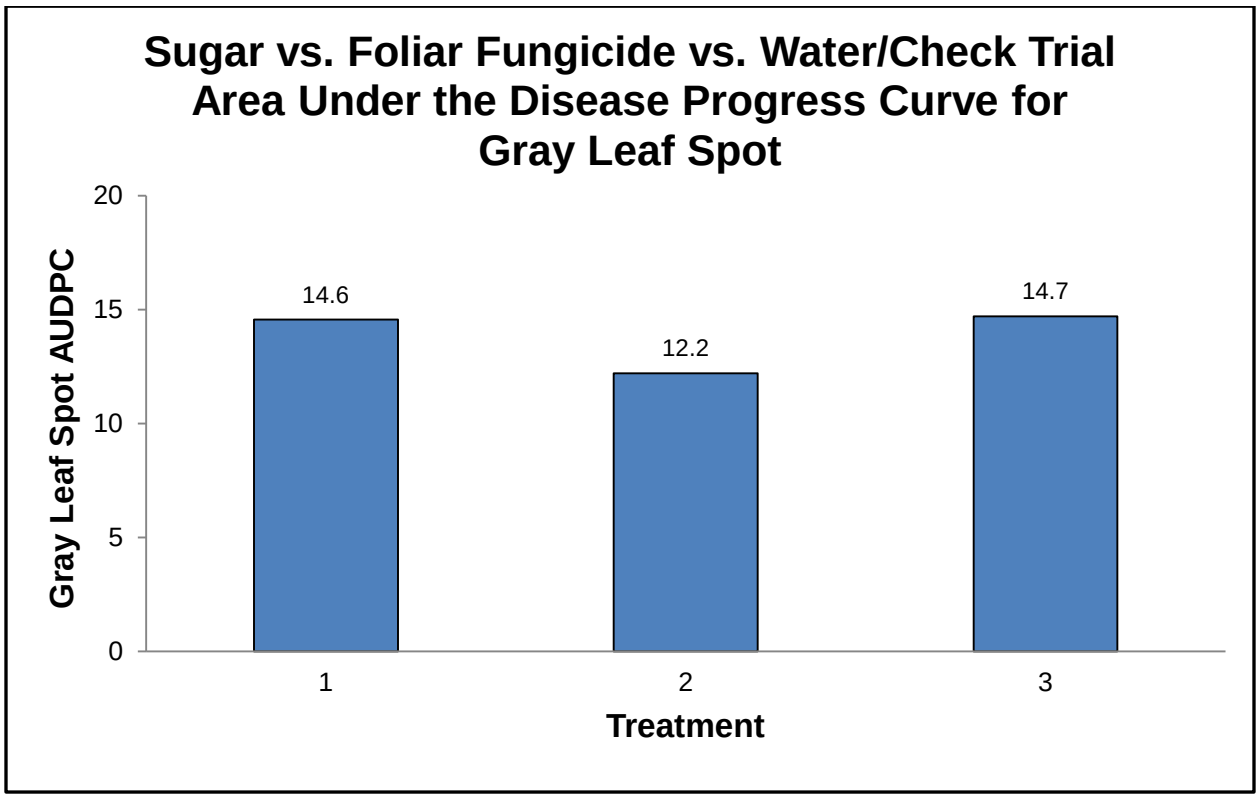
Treatment List

Treatment	Chemical	Application Timing	Application Rate
1	Water/Check	R2	20 gal/A
2	Headline AMP	R2	10 fl oz/A
3	Sugar	R2	3 lb. sugar per 10 gal. water

Gray Leaf Spot AUDPC

Sugar vs. Foliar Fungicide vs. Water/Check Trial Gray Leaf Spot AUDPC	
Treatment	**GLS AUDPC**
1	14.6
2	12.2
3	14.7

Note: AUDPC was calculated based on gray leaf spot disease severity using intervals of Days After Planting (DAP) between rating dates for disease severity. There were no statistical differences observed between treatment means at P=0.05 according to Waller-Duncan K-ratio t Test. Coefficient of variation is 27.2%.



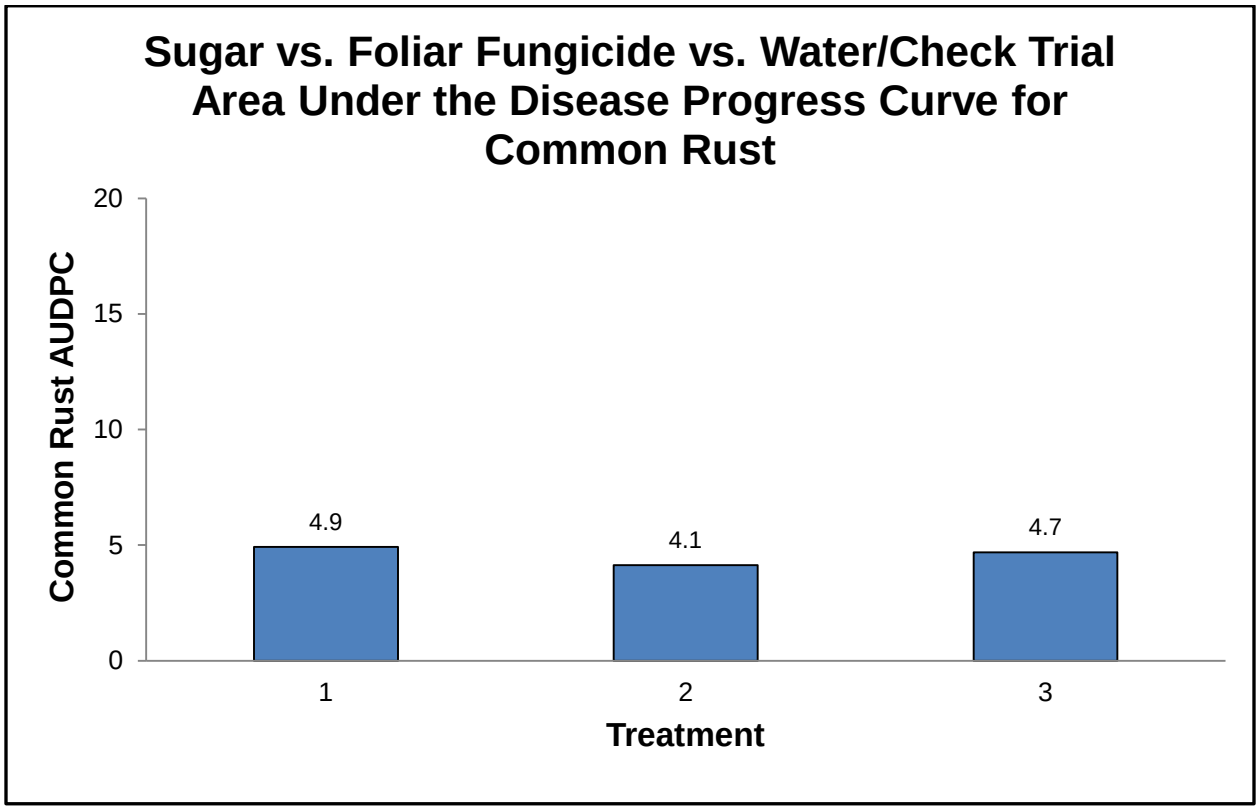
Treatment List

Treatment	Chemical	Application Timing	Application Rate
1	Water/Check	R2	20 gal/A
2	Headline AMP	R2	10 fl oz/A
3	Sugar	R2	3 lb. sugar per 10 gal. water

Common Rust AUDPC

Sugar vs. Foliar Fungicide vs. Water/Check Trial Common Rust AUDPC	
Treatment	**CR AUDPC**
1	4.9 a
2	4.1 b
3	4.7 ab

Note: AUDPC was calculated based on common rust spot disease severity using intervals of Days After Planting (DAP) between rating dates for disease severity. Letters are inserted into table to indicate statistical significance between treatments means at P=0.05 according to Waller-Duncan K-ratio t Test. Means with the same letter are not significantly different. Coefficient of variation is 11.5%.



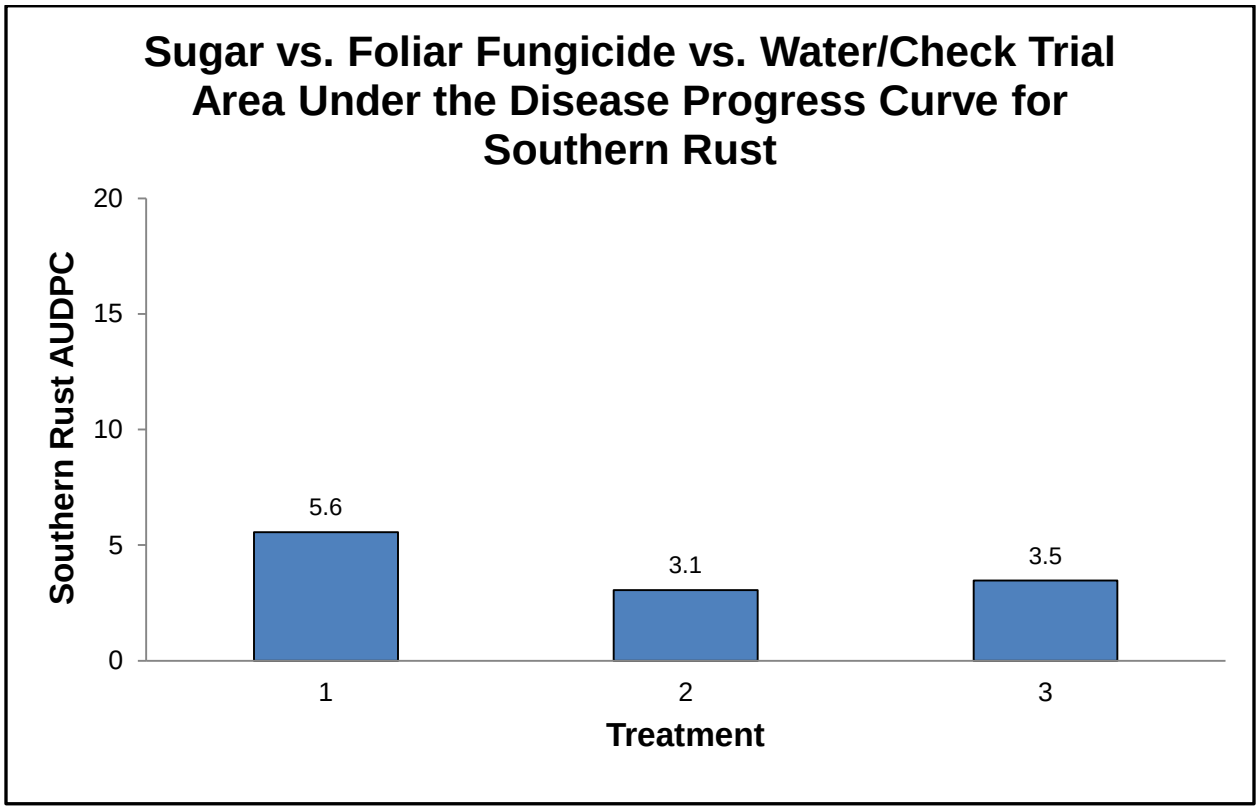
Treatment List

Treatment	Chemical	Application Timing	Application Rate
1	Water/Check	R2	20 gal/A
2	Headline AMP	R2	10 fl oz/A
3	Sugar	R2	3 lb. sugar per 10 gal. water

Southern Rust AUDPC

Sugar vs. Foliar Fungicide vs. Water/Check Trial Southern Rust AUDPC	
Treatment	**SR AUDPC**
1	5.6 a
2	3.1 b
3	3.5 b

Note: AUDPC was calculated based on southern rust disease severity using intervals of Days After Planting (DAP) between rating dates for disease severity. Letters are inserted into table to indicate statistical significance between treatments means at P=0.05 according to Waller-Duncan K-ratio t Test. Means with the same letter are not significantly different. Coefficient of variation is 34.0%.



Treatment List

Treatment	Chemical	Application Timing	Application Rate
1	Water/Check	R2	20 gal/A
2	Headline AMP	R2	10 fl oz/A
3	Sugar	R2	3 lb. sugar per 10 gal. water

Phytotoxicity %

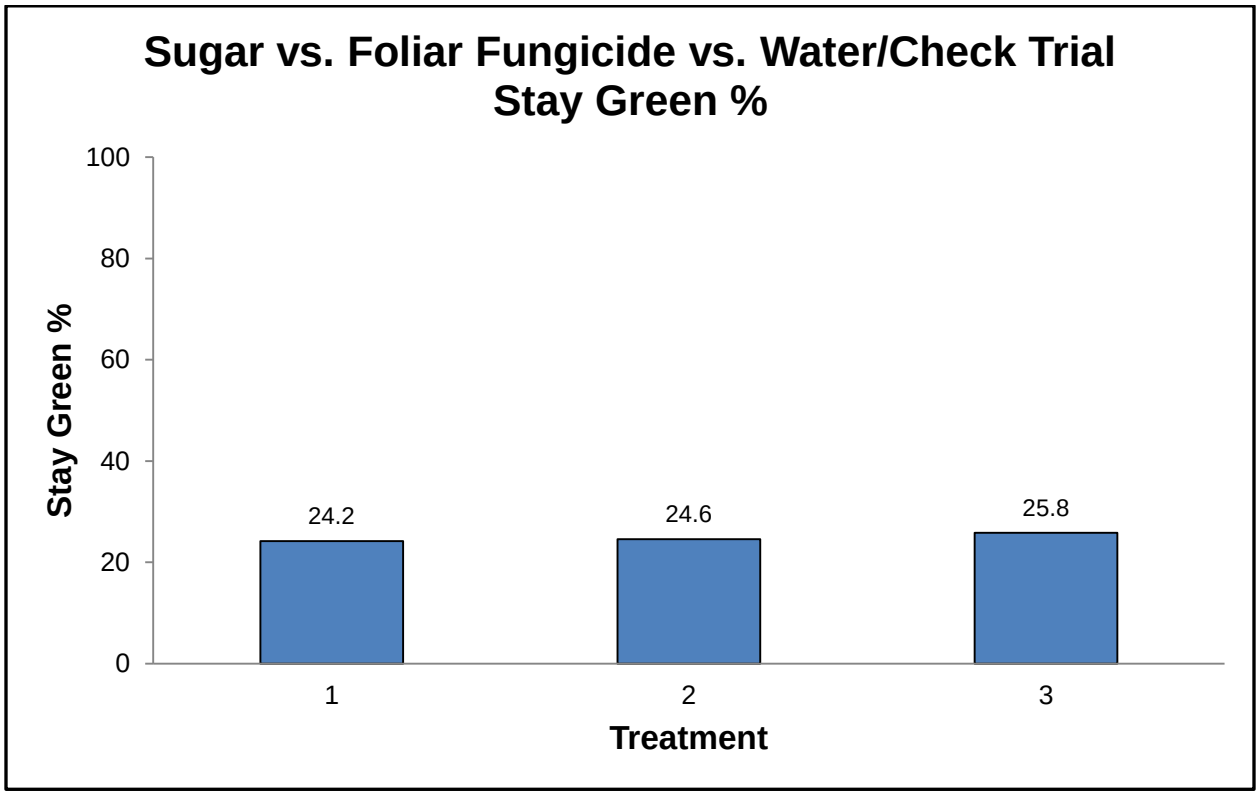
Sugar vs. Foliar Fungicide vs. Water/Check Trial Phytotoxicity % 7/19/2012 Growth Stage: R2	
Treatment	**Phytotoxicity %**
1	0
2	0
3	0

Note: There were no statistical differences observed between treatment means at P=0.05 according to Waller-Duncan K-ratio t Test. Coefficient of variation is 0%.

Stay Green %

Sugar vs. Foliar Fungicide vs. Water/Check Trial Stay Green % 9/4/2012 Growth Stage: R5.8	
Treatment	**Stay Green %**
1	24.2
2	24.6
3	25.8

Note: There were no statistical differences observed between treatment means at P=0.05 according to Waller-Duncan K-ratio t Test. Coefficient of variation is 15.1%.



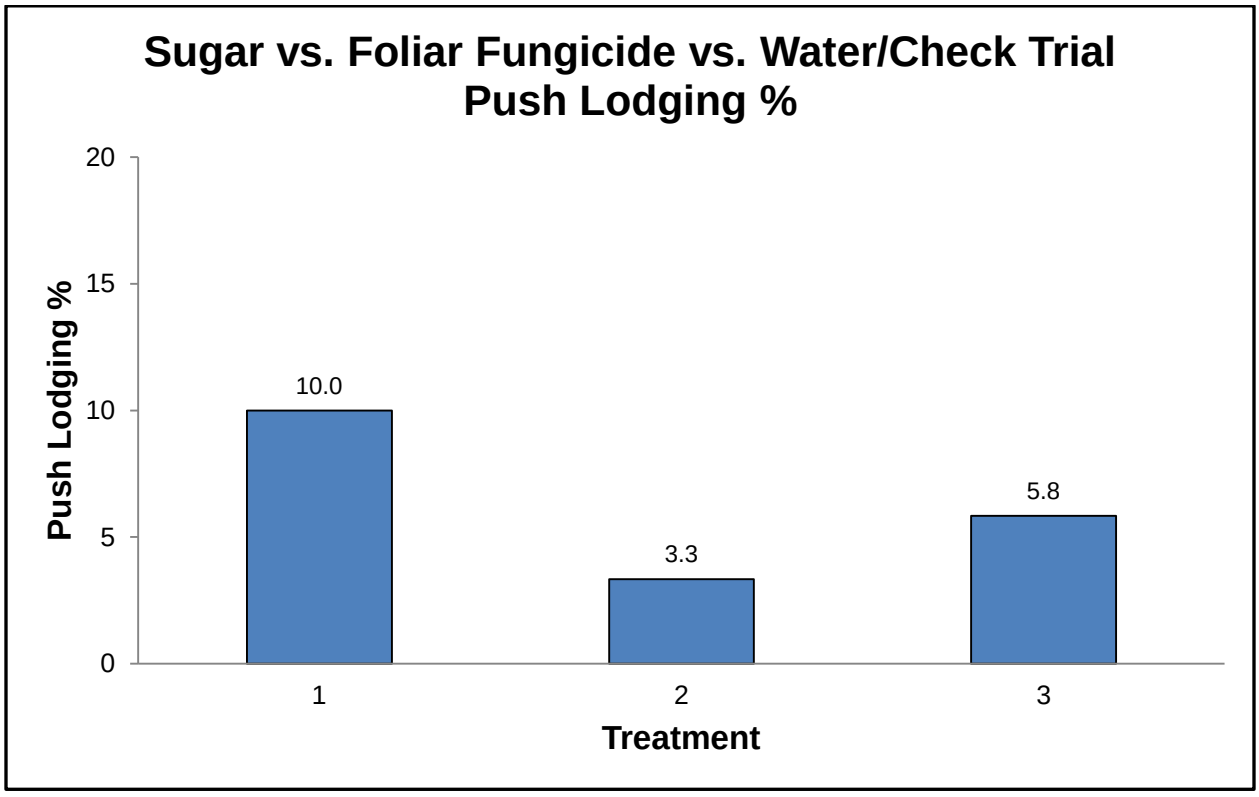
Treatment List

Treatment	Chemical	Application Timing	Application Rate
1	Water/Check	R2	20 gal/A
2	Headline AMP	R2	10 fl oz/A
3	Sugar	R2	3 lb. sugar per 10 gal. water

Push Lodging %

Sugar vs. Foliar Fungicide vs. Water/Check Trial Push Lodging % 9/25/2012 Growth Stage: R6	
Treatment	**Lodging %**
1	10.0
2	3.3
3	5.8

Note: There were no statistical differences observed between treatment means at P=0.05 according to Waller-Duncan K-ratio t Test. Coefficient of variation is 82.9%.



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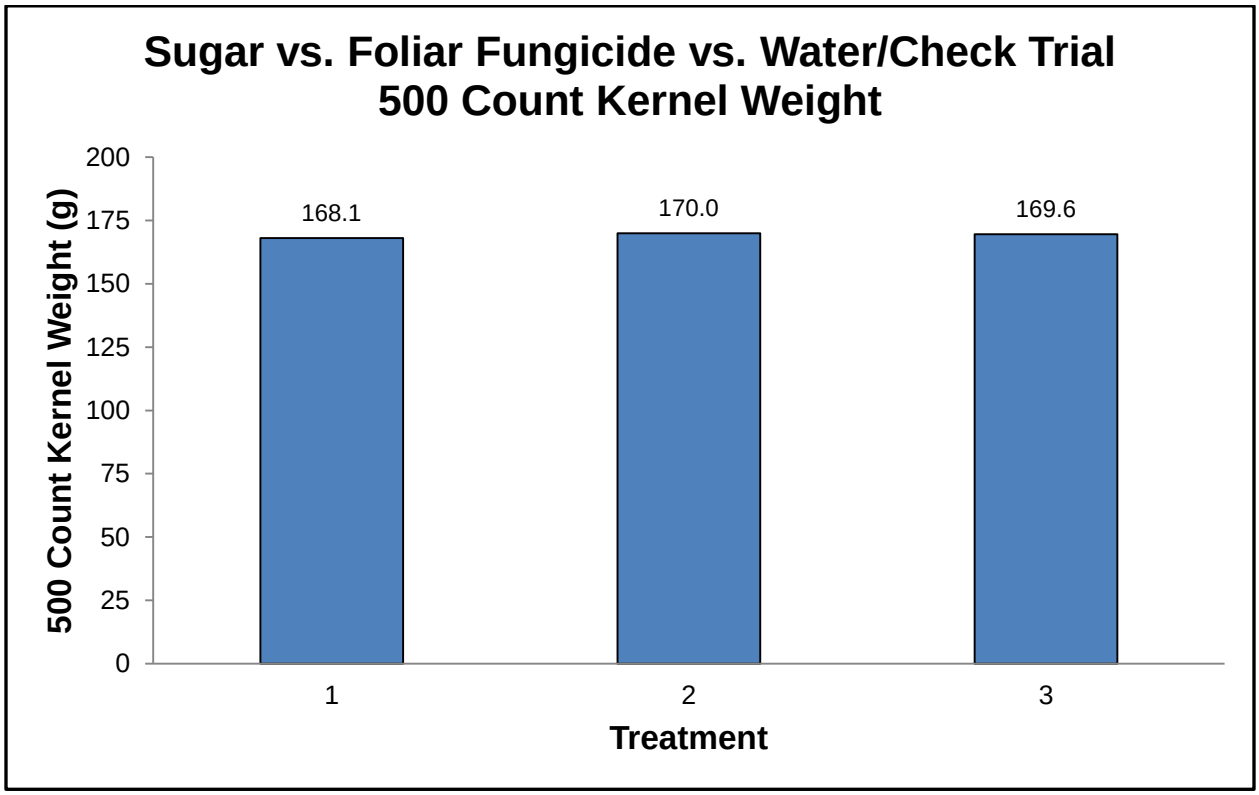
Treatment	Chemical	Application Timing	Application Rate
1	Water/Check	R2	20 gal/A
2	Headline AMP	R2	10 fl oz/A
3	Sugar	R2	3 lb. sugar per 10 gal. water

500 Count Kernel Weight

Sugar vs. Foliar Fungicide vs. Water/Check Trial 500 Count Kernel Weight	
Treatment	**500 Count Kernel Weight (g)**
1	168.1
2	170.0
3	169.6

Note: There were no statistical differences observed between treatment means at P=0.05 according to Waller-Duncan K-ratio t Test. Coefficient of variation is 1.6%.



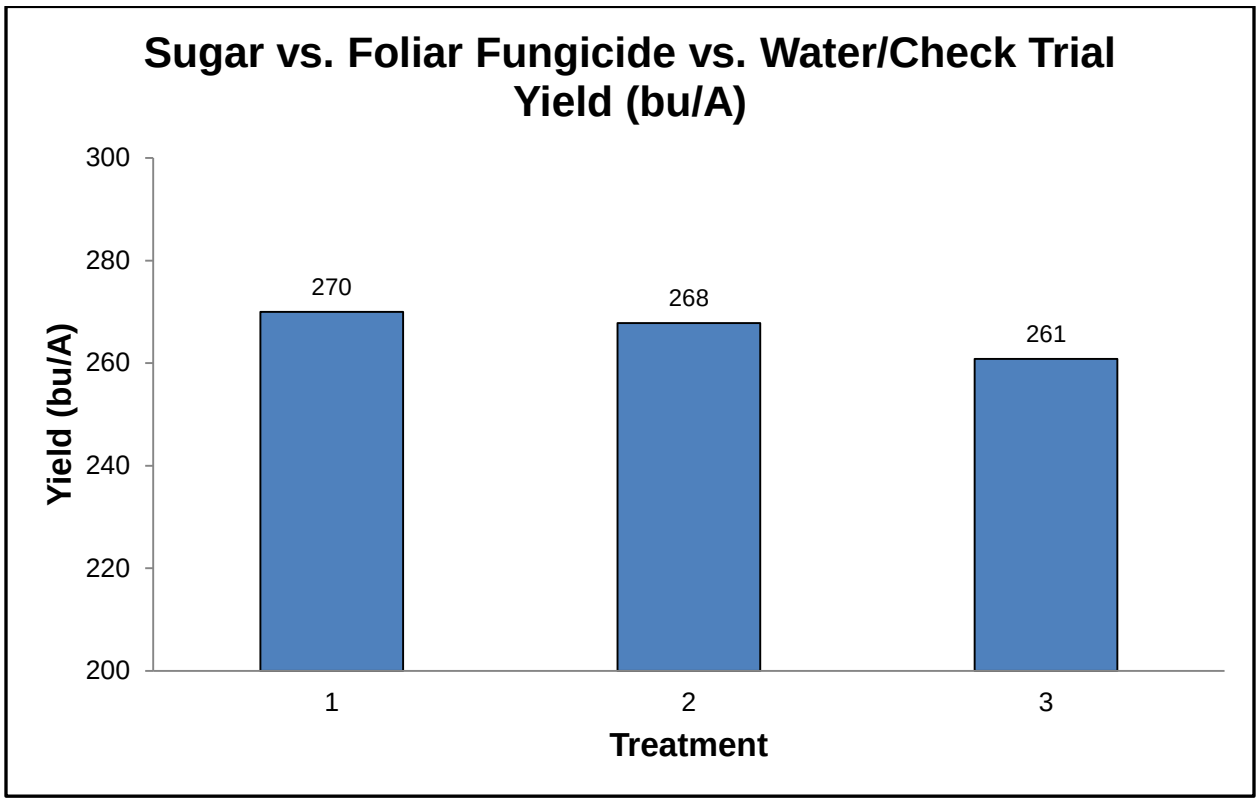
Treatment List

Treatment	Chemical	Application Timing	Application Rate
1	Water/Check	R2	20 gal/A
2	Headline AMP	R2	10 fl oz/A
3	Sugar	R2	3 lb. sugar per 10 gal. water

Harvest Yield

Sugar vs. Foliar Fungicide vs. Water/Check Trial Harvest Yield 9/26/2012	
Treatment	**Yield (bu/A)**
1	270 a
2	268 ab
3	261 b

Note: Letters are inserted into table to indicate statistical significance between treatments means at P=0.05 according to Waller-Duncan K-ratio t Test. Means with the same letter are not significantly different. Coefficient of variation is 2.2%.



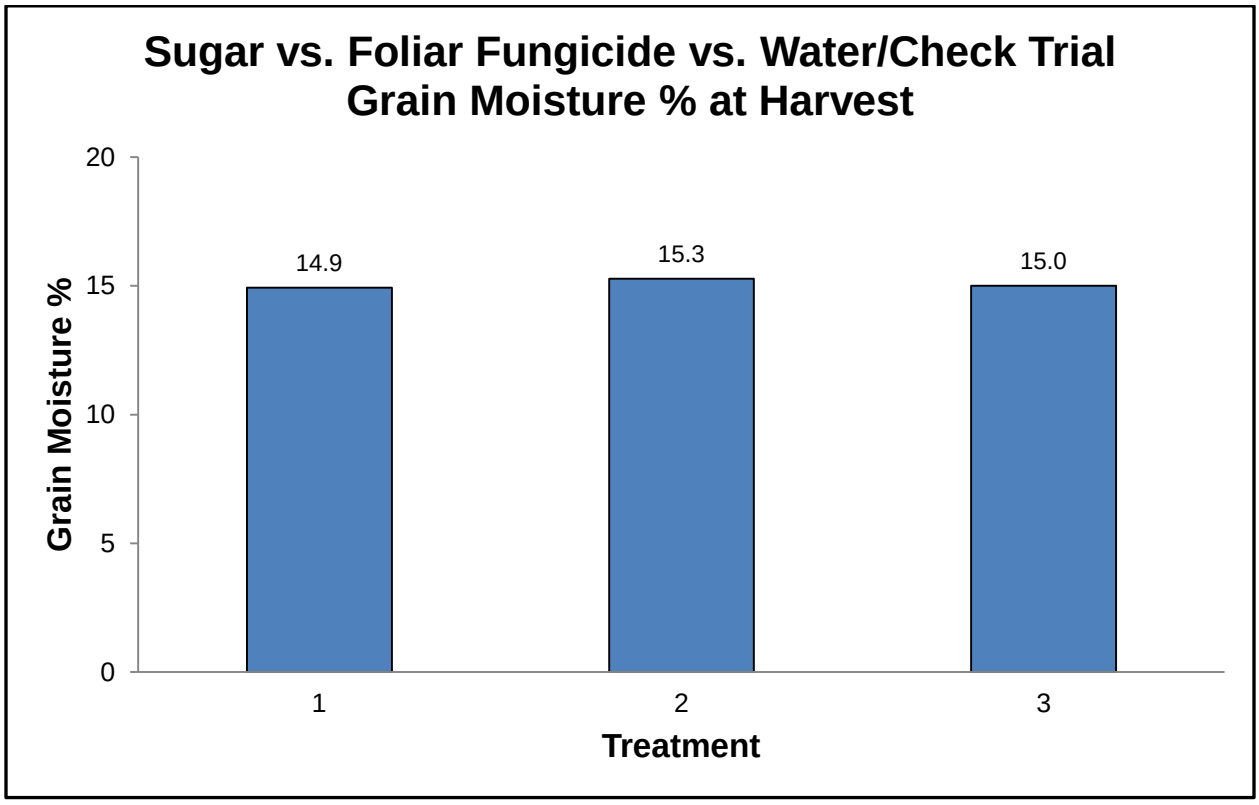
Treatment List

Treatment	Chemical	Application Timing	Application Rate
1	Water/Check	R2	20 gal/A
2	Headline AMP	R2	10 fl oz/A
3	Sugar	R2	3 lb. sugar per 10 gal. water

Grain Moisture % at Harvest

Sugar vs. Foliar Fungicide vs. Water/Check Trial Grain Moisture % at Harvest 9/26/2012	
Treatment	**Moisture %**
1	14.9
2	15.3
3	15.0

Note: There were no statistical differences observed between treatment means at P=0.05 according to Waller-Duncan K-ratio t Test. Coefficient of variation is 1.8%.



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Treatment	Chemical	Application Timing	Application Rate
1	Water/Check	R2	20 gal/A
2	Headline AMP	R2	10 fl oz/A
3	Sugar	R2	3 lb. sugar per 10 gal. water

2012 Weather Data Monthly Averages

	Temperature (^{o}F)			Moisture					
	Mean	High	Low	Dew Point (^{o}F)	Avg. Humidity	Max. Humidity	Min. Humidity	Precipitation Total (in.)	Irrigation Total (in.)
April	56	67	44	47	73	95	50	0.67	0.00
May	66	79	53	49	60	84	35	4.07	0.52
June	75	87	62	60	64	86	41	2.35	0.00
July	81	94	68	62	57	79	33	1.65	9.18
August	73	86	60	56	61	86	36	2.39	1.60
September	66	81	51	45	54	82	25	0.59	0.00
October	56	67	44	47	73	95	50	0.67	0.00

*Monthly average weather data was compiled from the April 26th planting date through the September 26th harvest date.

*Weather data from www.wunderground.com Source: NWS Daily Summary

Trial Summary

The location of Jenny Rees's 'Sugar vs. Foliar Fungicide vs. Water/Check' trial was at the University of Nebraska-Lincoln South Central Agricultural Laboratory near Clay Center, NE. The trial area had soybean as the previous year's crop. DeKalb corn hybrid DKC 64-83, rating of "good" (6 out of 9) for gray leaf spot (GLS), "very good" (4 out of 9) for common rust (CR), and "good" (5 out of 9) for southern rust (SR), was planted on April 26th in 30-inch rows at a target population of 30,600 plants/A with five gallons/A 10-34-0. Three treatments were replicated six times in a randomized complete block design. Each plot was four rows (10 ft.) wide by 40 ft in length. Alley rows between plots were cut 30 inches wide and were maintained weed-free through the duration of the season. Foliar fungicide, sugar solution, and check applications were made with a modified high-clearance sprayer. The 10 ft. spray boom consisted of six nozzles spaced 20 inches apart and was adjusted to 18 inches above the canopy. Each treatment was applied at 40 psi traveling at 3.0 mph resulting in a 20 gal/A application volume. Foliar fungicide applications were applied on July 12th at growth stage R2.

The primary diseases observed at this trial location were GLS, CR, and SR, although at very low severity. Other foliar diseases (common smut, Physoderma brown spot, anthracnose, etc.) were observed sparsely through the trial and did not justify ratings for each plot. All assessments (disease severity, phytotoxicity, stay green, and yield) were taken from the two middle rows (rows 2 and 3) of each plot, except push lodging was assessed in the two outside rows (rows one and four). All trial data was analyzed in SAS using the Waller-Duncan K-ratio t Test at the P=0.05 significance level.

All foliar disease severity ratings were visually assessed by estimating percent leaf area covered with disease lesions in the middle two rows, over the entire plot on July 12th (R2), August 10th (R5.25), and August 21st (R5.5). Overall, the level of GLS severity was very low for the 2012 season. The GLS severity trial average the day of the R2 foliar application was 0%. GLS was not observed in this trial until the August 10th assessment date (R5.25 growth stage). On the August 10th assessment date, GLS severity for treatments ranged from 0.5% for treatment 2 (Headline AMP, 10 fl oz/A) to 0.7% for treatment 3 (3 lbs. sugar/10 gal. water) while the non-treated control had a GLS severity of 0.6%. There were significant differences between treatments on August 21st, the last assessment date.

Common rust was the first foliar disease observed and assessed in this trial. Common rust was first observed on the July 12th rating date. The level of CR severity remained very low throughout the entire growing season as common rust disease severity was 0.1% (trace amounts) for each treatment on the July 12th and August 10th assessment dates. It wasn't until the last assessment date (August 21st) where CR severity increased very slightly. On this rating date, CR severity ranged from 0.1% for

Trial Summary cont.'d

treatment 2 (Headline AMP, 10 fl oz/A) to 0.3% for treatment 1 (Water/Check). There were significant differences between treatments on the August 21st assessment date.

Southern rust was present in this trial and was first observed on the August 10th assessment date in trace amounts (<0.2%) and had very small increases in severity by the last assessment date on August 21st. On the last rating date, SR severity ranged from 0.1% for treatment 2 (Headline AMP, 10 fl oz/A) to 0.4% for treatment 1 (Water/Check). There were significant differences between treatments on the August 21st assessment date.

Area under the disease progress curve (AUDPC) for GLS, CR, and SR was calculated for this trial. The AUDPC calculation is commonly used to observe cumulated disease severity over the entire growing season rather than observing disease severity at one specific rating date. Disease severity data were used in a calculation utilizing disease severity on each rating date and the difference in the number of days between ratings dates in terms of Days After Planting (DAP). In general, the lower the AUDPC value, the lower the accumulated disease severity at the end of the season. GLS AUDPC values for the fungicide treatments ranged from 12.2 for treatment 2 (Headline AMP, 10 fl oz/A) to 14.7 for treatment 3 (3 lbs. sugar/10 gal. water). The Water/Check GLS AUDPC value was 14.6. For GLS AUDPC, there were no significant differences between treatments. CR AUDPC for treatments ranged from 4.1 for treatment 2 (Headline AMP, 10 fl oz/A) to 4.9 for treatment 1 (Water/Check). There were significant differences between treatments for CR AUDPC. SR AUDPC treatment values ranged from 3.1 for treatment 2 (Headline AMP, 10 fl oz/A) to 5.6 for treatment 1 (Water/Check). There were significant differences between treatments for SR AUDPC.

Phytotoxicity ratings were assessed on July 19th, seven days after the R2 application. There were no significant differences between treatments as all treatments had 0% phytotoxicity.

Stay green was visually estimated on September 4th at growth stage R5.8. This assessment was defined as the average percentage of green leaf material remaining on the plant in each plot before plant dry down. Stay green percentages ranged from 24.2% for treatment 1 (Water/Check) to 25.8% for treatment 3 (3 lbs. sugar/10 gal. water). There were no significant differences between treatments.

Corn push-lodging % was assessed near harvest on September 25th. This assessment was defined as the percentage of corn stalks lodged below the ear node or did not return back to its standing position from 20 stalks (10 from each rows 1 and 4) pushed from standing 12 o'clock position to a 2 o'clock (45 degree) position. Corn push lodging ranged from 3.3% for treatment 2 (Headline AMP, 10 fl oz/A) to 10.0% for treatment 1 (Water/Check). There were no significant differences between treatments.

500 count kernel weight ranged from 168.1 g for treatment 1 (Water/Check) to 170.0 g for treatment 2 (Headline AMP, 10 fl oz/A). There were no significant differences between treatments.

Harvest was taken on September 26th. Prior to harvest, a few feet at the ends of each plot were trimmed to eliminate the end-of-row effect and the harvest of end-of-row plants that may have been missed during spraying. The harvested area of each plot was measured after harvest and used to calculate yield. Yield was calculated in bushels per acre (bu/A) and adjusted to 15.5% moisture content. Yields results from this trial were 270 bu/A for treatment 1 (Water/Check), 268 bu/A for treatment 2 (Headline AMP, 10 fl oz/A), and 261 bu/A for treatment 3 (3 lbs. sugar/10 gal. water). There were significant differences between treatments for yield. Grain moisture percentage at harvest ranged from 14.9% for treatment 1 (Water/Check) to 15.3% for treatment 2 (Headline AMP, 10 fl oz/A). There were no significant differences between treatments.

The lack of significant differences in some of the trial assessments are likely due primarily to the very low disease pressure present at the South Central Agricultural Laboratory research farm. Monthly rainfall and temperature readings recorded at the trial location were atypical during the growing season. The research farm received little to no precipitation during about a three week period in July. During this time, high temperatures in the upper 90's to low 100's were recorded. Even though little precipitation was received during much of the growing season, especially during the critical tasseling and grain-fill period, water availability throughout the growing season was not an issue as supplemental water was added as needed by an overhead sprinkler linear irrigation system. Temperatures did get very warm during the VT and reproductive growth stages. However, scouting observations of corn ears did not indicate that temperatures appeared to affect kernel and ear development. There was also a rain/wind/hail event in late May. This left the corn plants slightly tattered, but the corn grew out of the minor damage.