Northeast Ag Expo
2011 Small Grains On-Farm-Test Report
White Hat Seed Farm; Perquimans County

Al Wood- Pasquotank County
Lewis Smith- Perquimans County
Mark Powell- Camden County
Paul Smith- Gates County
Tim Smith- Chowan County
Tommy Grandy- Currituck County

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A&T State University
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Acknowledgements

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Table of Contents

General Production Information

These tests were conducted on White Hat Seed Farm in Perquimans County. All treatments were replicated 4 times. Plots were planted using conventional tillage following corn. Planting date was November 9 and 10 for all of the tests except the Seeding Rate study, which was planted on November 17. Population used unless otherwise noted was 25 seeds/row foot. All tests except the Fertilizer Additives and N Timing tests received 16 lb N, 10 lb P, 21 lb K, and 8 lb S per acre preplant incorporated. Thirty gallons per acre 30% UAN plus 0.9 oz per acre Harmony Extra was applied on March 14. Plots were harvested on June 13 using a K2 Gleaner combine equipped with a Harvestmaster GrainGage which recorded plot weight, test weight, and moisture for each plot. Yields were standardized to 13.5% moisture. Statistical analysis was performed using Statistical Analysis Software (SAS). Significance is reported at the 95% confidence level unless otherwise noted.

Wheat Variety Test

Study Design

Thirty-seven wheat varieties were evaluated for yield performance and response to fungicide application. Varieties were randomized within replications and planted in 60' plot. These were then divided in half so that half of the length of the plot was treated with fungicide and insecticide (10 oz/acre Quilt + 1.8 oz/acre Baythroid) at early boot stage (April 19) and the other half left untreated. This resulted in a split-block design with four replications. In late April and early May, warm and humid weather conditions resulted in substantial Stagonospora Nodorum leaf and glume blotch (SNB), powdery mildew, and leaf rust development. Insect pressure was minimal at this location.

Results

For yield (Table 1, Figure 1), all varieties had statistically higher yield in the fungicide/insecticide treatment. The average unsprayed yield was 85.0 bu/a compared to 95.3 bu/a for the varieties sprayed with a fungicide/insecticide. The varieties did not differ in their yield response to the fungicide/insecticide treatment. This was probably due to the presence of multiple diseases that overwhelmed resistance to any individual disease.

For test weight (Table 1, Figure 2), the response to fungicide/insecticide differed by variety. On average, the unsprayed varieties had a test weight of 58.5 compared to 59.0 for the sprayed treatment

Table 1. Yield and test weight for soft winter wheat varieties, and the change in yield and test weight that resulted from fungicide/insecticide application.

Variety	Unsprayed Yield (bu/a)	Yield Rank	Fungicide Yield Benefit (bu/a)[1]	Unsprayed Test Weight (lb/bu)	Test Weight Rank	Fungicide Test Weight Benefit (lb/bu)[2]
AP Coker 1566	96.1	1	6.0*	57.8	29	0.4
DG Shirley	93.9	2	12.7*	58.0	27	0.3
USG 3120	93.6	3	13.5*	59.9	6	0.7
Croplan 8925	93.3	4	11.7*	59.3	11	-0.3
DG Dominion	91.8	5	7.2*	58.7	18	0.9*
DG 9012	91.6	6	5.2*	58.8	15	1.1*
DG 9042	91.5	7	10.2*	58.0	24	0.4
P 26R20	90.9	8	9.6*	59.5	10	0.2
P 26R12	90.0	9	9.1*	59.8	8	-0.3
AP Coker 9553	88.4	10	11.7*	60.1	3	-0.1
P 26R22	88.2	11	14.6*	56.4	35	1.2*
SS 8700	88.2	12	11.7*	57.4	31	0.3
P 26R15	87.8	13	13.8*	57.4	32	1.2*
AP Coker Branson	87.6	14	9.5*	57.3	33	1.5*
USG 3209	87.6	15	14.2*	58.8	16	0.4
SS 8600	87.5	16	7.4*	59.6	9	-0.8
AP Coker Oakes	87.1	17	5.0*	59.9	4	0.1
SS 8404	87.0	18	13.3*	59.8	7	0.6
SS 5205	86.8	19	10.5*	58.9	13	0.5
NC Yadkin	86.7	20	9.6*	58.2	23	0.3
SS 8641	85.3	21	3.7*	58.6	19	0.5
SS 8302	84.7	22	9.5*	58.0	26	1.2*
Progeny 185	84.5	23	13.6*	57.7	30	1.3*
AP Coker 9978	84.3	24	9.7*	58.6	21	0.4
USG 3555	83.9	25	11.6*	58.3	22	0.5
P 25R32	83.6	26	15.9*	57.8	28	1.0*
AP Coker 9436	81.0	27	8.5*	55.8	37	1.0*
AP Coker Cooper	80.3	28	10.4*	58.6	20	0.4
AP Coker 9184	79.0	29	3.3*	58.7	17	1.0*
NC Neuse	77.9	30	7.4*	60.2	1	0.0
USG 3592	77.3	31	7.0*	59.0	12	-0.3
AP Coker 9804	76.9	32	12.8*	56.6	34	1.3*
AP Coker Panola	76.3	33	15.6*	58.0	25	0.5
Roane	75.8	34	14.7*	60.2	2	-0.8
USG 3409	72.7	35	6.0*	59.9	5	-0.2
USG 3665	72.5	36	8.6*	58.9	14	0.5
Croplan 554	72.3	37	17.9*	56.2	36	0.4
Average	85.0		10.3	58.5		0.5

[1] Fungicide yield benefits that are statistically significant are indicated with a “*”
[2] Fungicide test weight benefits that are statistically significant are indicated with a “*”

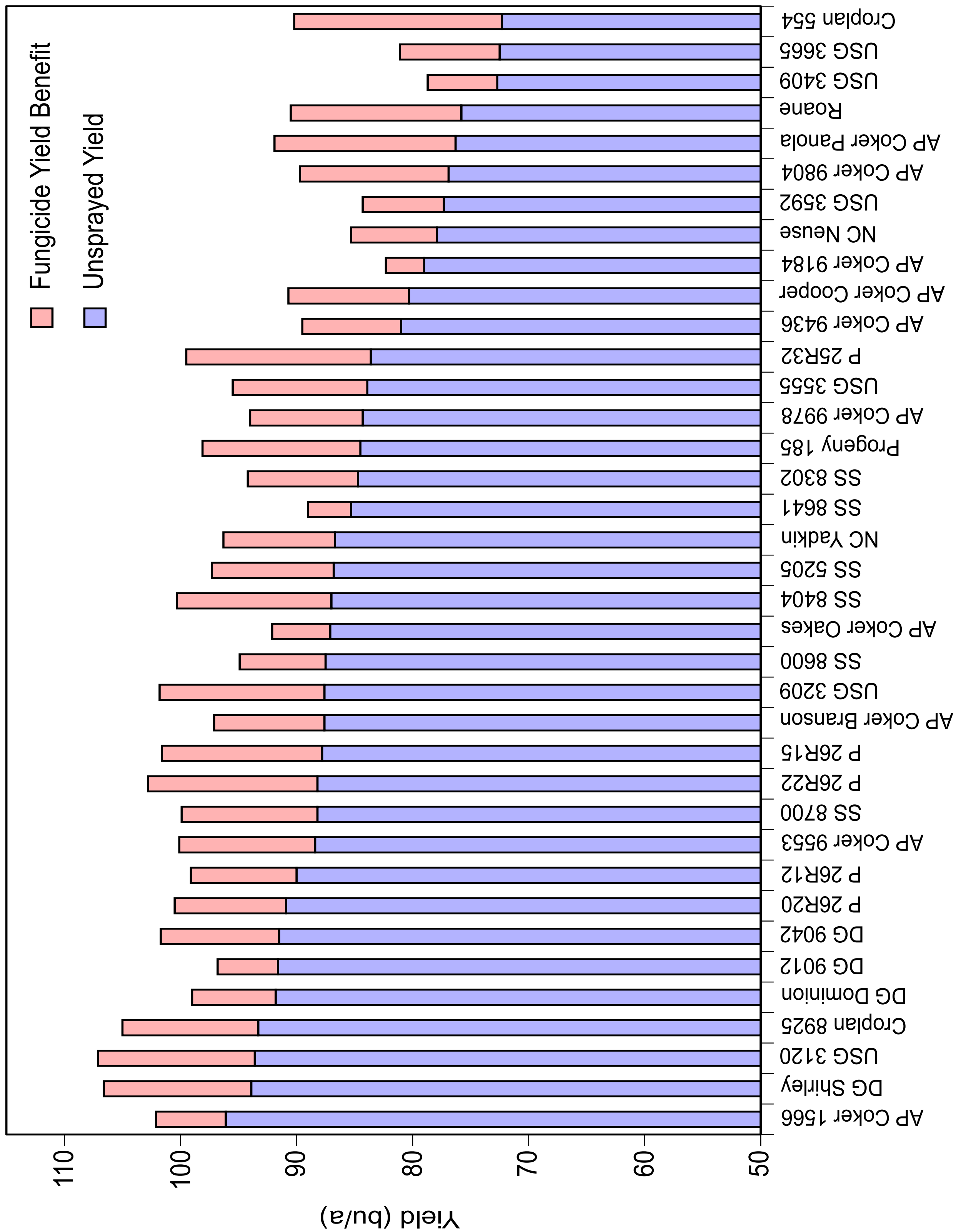

Figure 1. Yield of the unsprayed varieties (Blue), and the additional yield benefit from applying a fungicide/insecticide (Red). All fungicide/insecticide yield benefits are statistically significant.

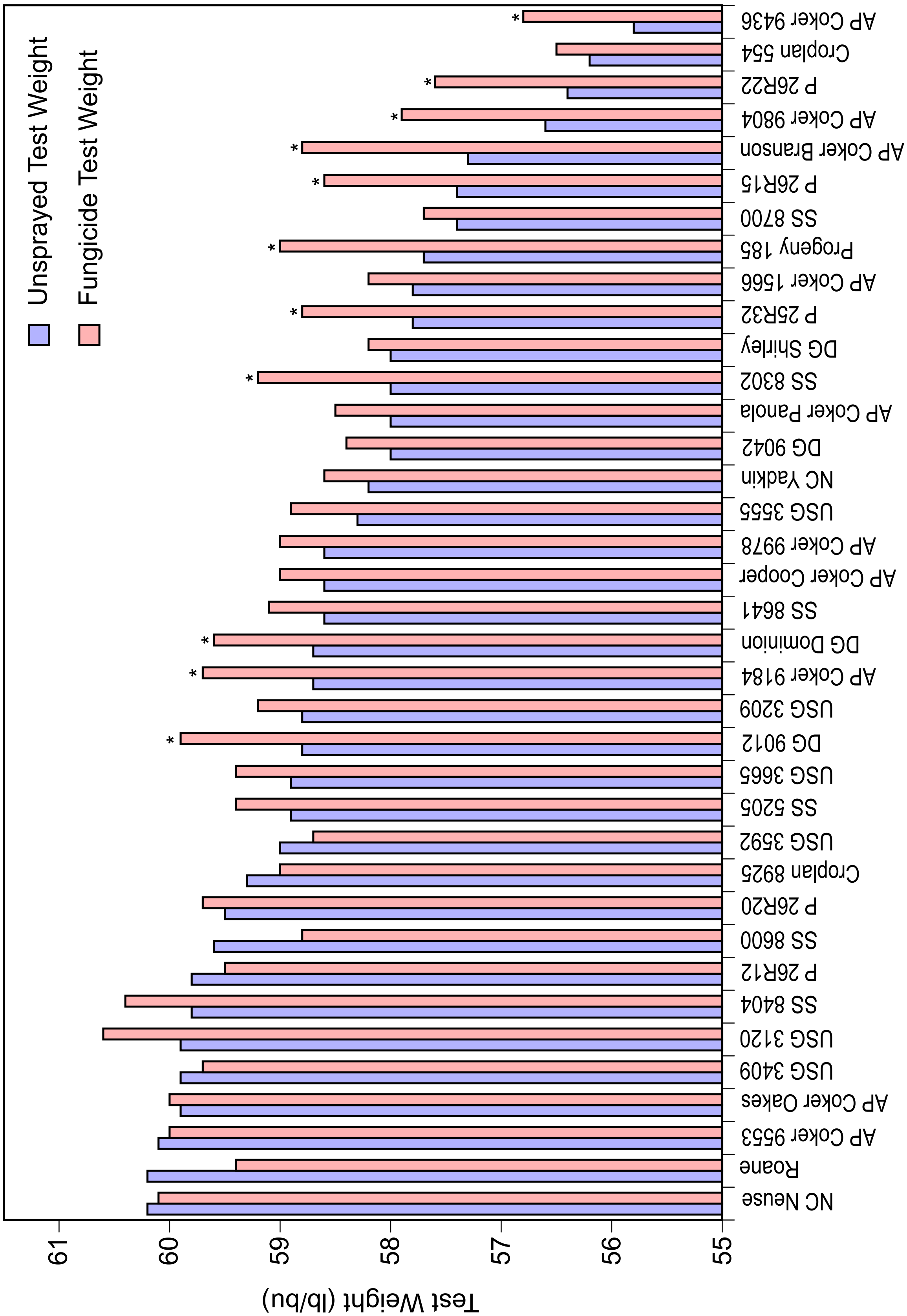

Figure 2. Test weight of the unsprayed (Blue) and sprayed (Red) varieties. "*" indicates the fungicide/insecticide treated test weight is statistically different from the unsprayed test weight.

Barley Variety Test

Study Design

Six barley varieties were evaluated with regard to grain yield and fungicide response. Atlantic, Thoroughbred, and Price are hulled varieties. The other three that end in H25, H31, or H35 are experimental varieties from Virginia that are hulless. Management of these plots was identical to that of the wheat variety trial. In late April and early May weather conditions turned warm and humid. At that time powdery mildew, leaf rust, and Stagonospora Nodorum leaf and glume blotch (SNB) developed. The barley was additionally infected with net blotch. Because most barley varieties are susceptible to leaf rust and some are also susceptible to net blotch a fungicide application is generally recommended for high yielding barley production.

Results

All three hulled varieties (Atlantic, Price, and Thoroughbred), had yield increases when a fungicide/insecticide was applied (Table 2). This was especially true for Atlantic and Price. Thoroughbred is the most resistant of these varieties to net blotch, and that may explain why it had less of a yield increase associated with the fungicide application. Test weights for Atlantic and Thoroughbred were excellent (Table 2). Price had a lower test weight but when a fungicide was applied the sprayed test weight was 47.4 lb/bu.

The varieties H25, H31, and H35 are new hulless varieties. All three have better resistance packages against leaf rust, powdery mildew, and net blotch compared to the hulled varieties, and the yield benefit of the fungicide/insecticide was much less than we saw for Atlantic and Price (Table 2). Also, because they do not have a hull they have much higher test weights that are very similar to wheat. In this test (Table 2)

Table 2. Yield and test weight for hulled and hulless barley varieties. The unsprayed values are shown, along with the change in test weight or yield associated with the fungicide application.

Variety	Unsprayed Yield (bu/a)	Fungicide Yield Benefit (bu/a)	Unsprayed Test Weight (lb/bu)	Fungicide Test Weight Benefit (lb/bu)
Atlantic	66.9	22.3*	48.7	-1.5
Price	55.7	24.5*	44.6	2.8
Thoroughbred	83.9	5.2	49.0	1.2
VA06-H25 (hulless)	80.0	-2.8	58.8	2.0
VA07-H31 (hulless)	76.3	7.4	57.4	1.3
VA07-H35 (hulless)	72.7	1.9	60.8	-1.2

"*" indicates that the fungicide resulted in a statistically significant yield or test weight increase.

even the unsprayed test weights were close to 60 lb/bu.

Barley can yield higher than wheat, but it is a more demanding crop than wheat. Wheat needs good drainage to achieve high yields, while barley requires excellent drainage. The soil at this test location was poorly-drained and that may partially explain the low yields in Table 2. Additionally, to achieve high barley yields, planting and harvest needs to be a bit earlier than for wheat. This test was planted a week or two later than is ideal for barley, and was harvested along with the wheat (June 13) which may have resulted in some lodging and yield lose due to shattering.

Drilled and Broadcast Seeding Rate Test

Study Design (Drilled Test)

This test was designed to determine how seed size affects plant population when planting decisions are based on pounds per acre. Two varieties were used in this test. AG Coker 9553 is a larger seeded variety and the seed lot that was used had 11,500 seeds per pound. AG Coker Panola is a smaller seeded variety and the seed lot that was used in this test had 14,100 seeds per pound. Recommended seeding rates are 1.3 to 1.5 million seeds per acre for drilling at the start of the season into conventionally tilled seed beds and with seed that has at least 90% germination[1]. This test was planted on November 17, 2010 or about two weeks after the starting dates for this area so the target seeding rate would need to be increased by 10%. Additionally, the seed had only 85% germination so the seeding rate needed to be increased by another 6%. If a grower wanted to plant at the 1.3 million seeds per acre rate, these two increases would raise it to 1.5 million seeds per acre. For AG Coker 9553 that would be 130 lb of seed per acre. For AG Coker Panola that would come to 106 lb seed per acre.

Before planting, the Great Plains Drill was calibrated to determine what rates of seed were actually being planted for each variety across a range of drill settings (Figure 3). There was a 50 to 100 lb per acre difference between the seeding rates we measured and the rates given in the manufacturer's table. A target seeding rate for AG Coker 9553 of 130 lb per acre required a drill setting of about 40. For AG Coker Panola with a target rate of 106 lb per acre the required drill setting would have been 35. The plot design for this test was a randomized complete block with four replications and 100 foot plot lengths.

Study Design (Broadcast Test)

Broadcast planting was also tested with AG Coker Panola. Seeding rates ranging from 100 to 200 pounds per acre (1.5 to 2.7 million seeds per acre) were planted using a Scotts drop seeder. Target populations were achieved by weighing the appropriate amount of seed required for each plot at a given population and then applying that portion of seed evenly to the entire plot area using the drop seeder. Seed was incorporated using a seven-foot field cultivator set to a 2-inch depth. The design for this test was a randomized complete block with 4 replications and 50 foot plots. Plots were planted on November 17.

Results

There were no statistically significant differences in yield between any of the drilled seeding rates for either AG Coker 9553 or AG Coker Panola. Planting at even the lowest seeding rate this year would have been adequate to maximize yield (Figure 4). This may have been, at least in part, due to two factors. First, weather conditions were ideal for tillering during the Spring of 2011 and even thinly planted wheat

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[1] See 2011-12 Small Grain Production Guide at www.smallgrains.ncsu.edu

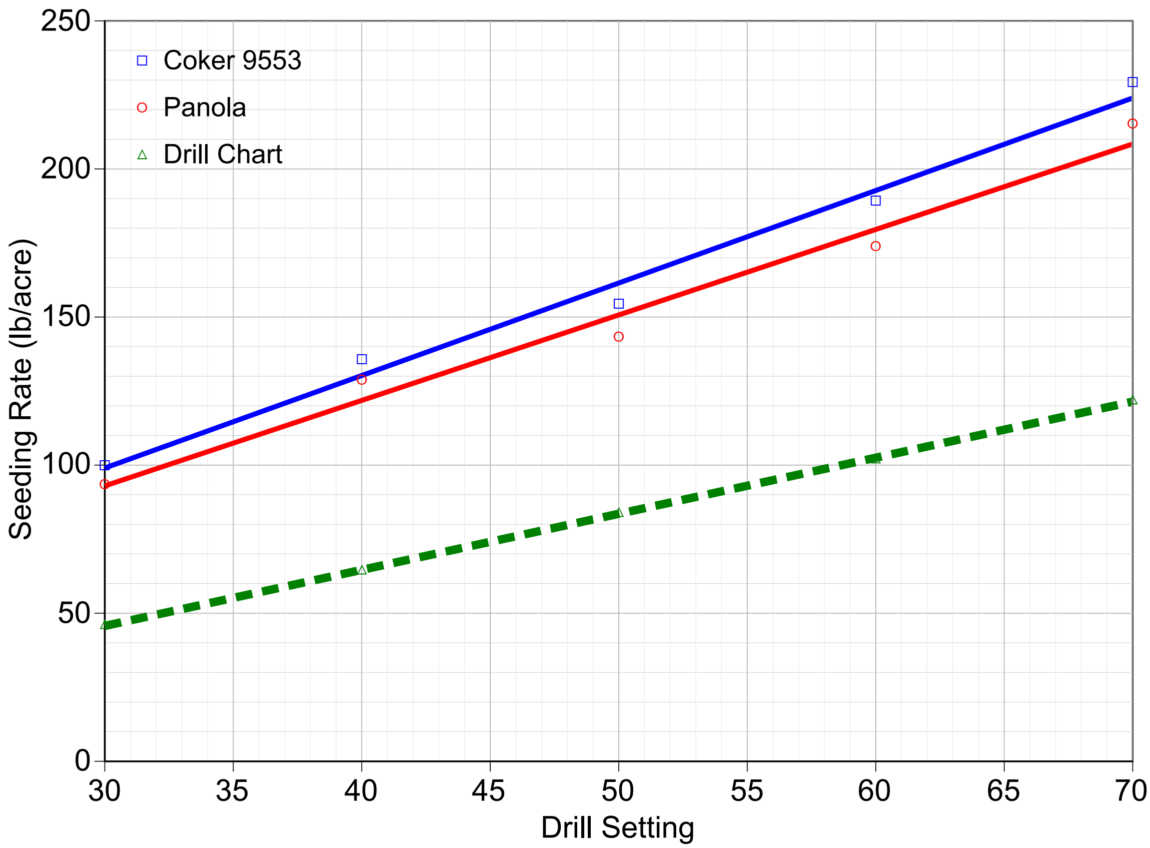


Figure 3. Measured seeding rate for this Great Plains drill. BLUE is for AG Coker 9553. RED is for AG Coker Panola. GREEN is the manufacturer's chart values.

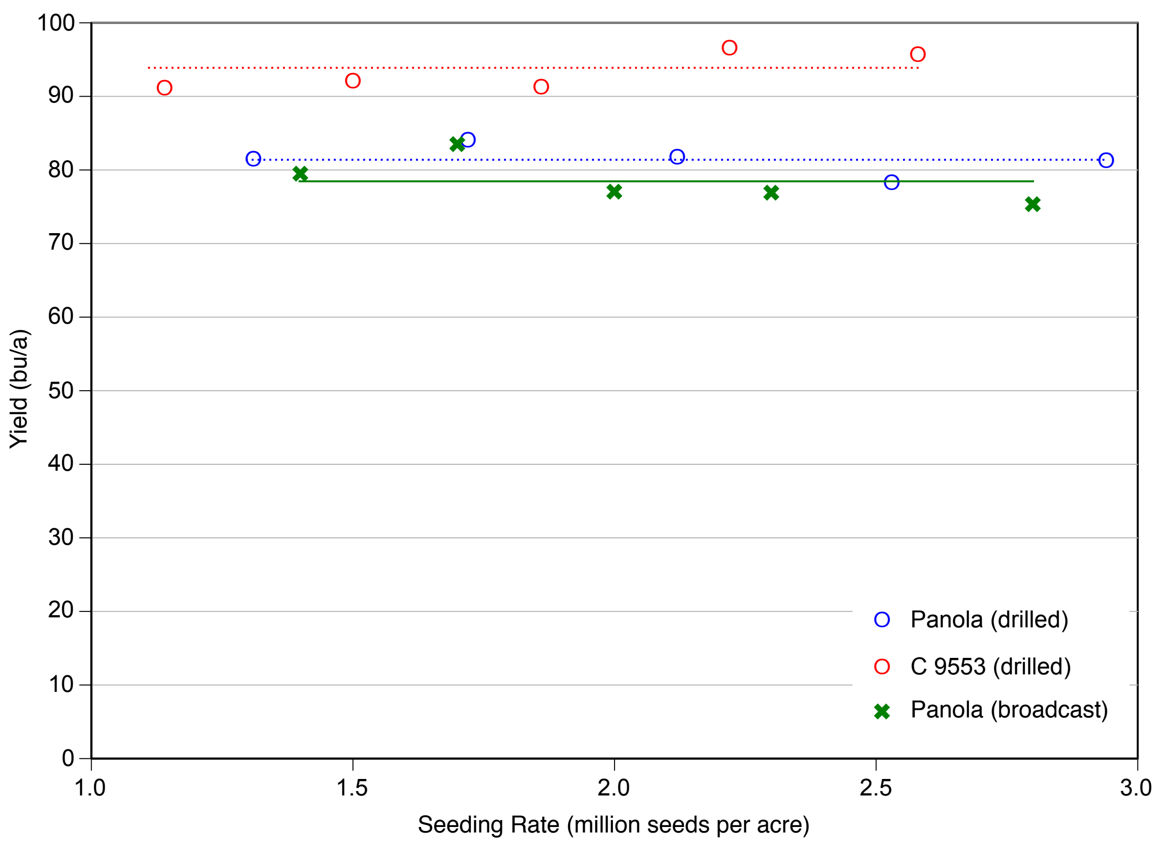


Figure 4. Yield of AG Coker 9553 and AG Coker Panola planted at five different seeding rates from just over 1.0 to just under 3.0 million seeds per acre, and for AG Coker Panola broadcast planted at similar seeding rates

produced enough tillers to maximize yield. Second, the recommended target seeding rate of 1.5 million seeds per acre was already at the lower end of the rates included in this test. The results for broadcast AG Coker Panola were very similar to those found in the drilled test. Even the lowest broadcast rate was high enough to maximize yield this year (Figure 4). The broadcast yields were only a few bushels per acre lower than the drilled yields.

Seed Treatment Test

Study Design

Five seed treatments and an untreated control were tested. These included the fungicidal seed treatments Dividend Extreme (Syngenta), Raxil MD (Bayer CropScience), and Proceed (Bayer CropScience). Two seed treatments that have both fungicidal and insecticidal activity, Dividend Extreme plus Cruiser (Syngenta), and GauchoXT (Bayer CropScience) were also included. Pioneer 26R12 was used for this test.

Results

None of the seed treatments produced yields or test weights that were statistically different from the untreated control (Table 3). In fact, the untreated control had one of the highest yields. Fungicidal seed treatments are most likely to improve stand and yield in years when wheat is planted into cold wet soils, or when the seed germination rate is low. Weather conditions at planting were relatively dry and warm, and the seed used in this test had high germ. Insecticidal seed treatments are most likely to result in yield benefits when planting is early, the weather is warm, and aphids, Hessian fly, or wire worm are active. This test was not planted early, and there was no evidence of Hessian fly or aphid damage in our plots.

Table 3. Yield and test weight results for the seed treatment test.

Treatment	Yield (bu/a)	Test Weight (lb/bu)
Untreated Control	94.0 a	62.1 a
Dividend Extreme	94.7 a	62.4 a
Dividend Extreme & Cruiser	93.6 a	62.5 a
GauchoXT	94.3 a	62.2 a
Proceed	90.1 a	61.9 a
Raxil MD	91.0 a	61.9 a

Yield or test weigh values followed by the same letter do not differ statistically.

Fertilizer Additive Test

Study Design

This test evaluated the effect of both at-plant and topdress fertilizer rates and additives on wheat yield.

Topdress treatments were divided into four classes:

1) no topdress N,
2) 90 lb topdress N per acre,
3) 120 lb topdress N per acre,
4) 150 lb topdress N per acre.

Within the 90 lb topdress N class, the following fertilizer additive treatments were tested:

1) Avail at planting plus standard topdress N
2) Avail at planting plus Agrotain with topdress N,
3) Avail at planting plus Nutrisphere with topdress N,
4) No Avail at planting plus Nutrisphere with topdress N,
5) No Avail at planting plus Agrotain with topdress N,

Within the 120 lb topdress N class, the following fertilizer additive treatments were tested:

1) Avail at planting plus standard topdress N
2) Avail at planting plus Nutrisphere with topdress N,
3) No Avail at planting plus Nutrisphere with topdress N,
4) Liquid Carbon at planting plus standard topdress N.

For the 150 lb topdress N treatments, one included no additive, and the second included Palisade. Palisade is a plant growth regulator that Syngenta may label in the near future for wheat.

Results

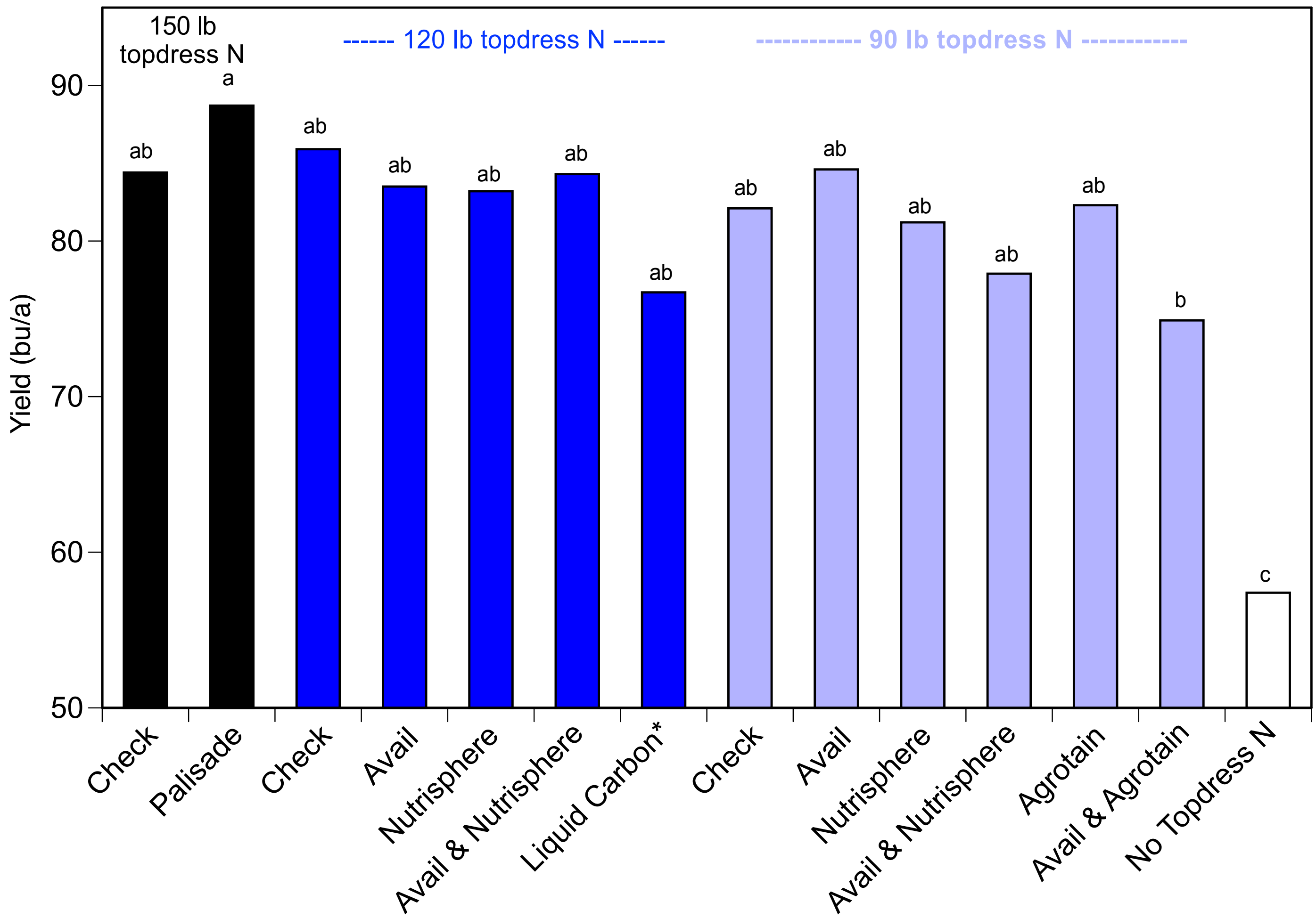
Not surprisingly, the lowest yielding treatment was the one without any topdress N applied (Figure 5). Among the remaining treatments there were very few that resulted in statistically significant yield differences.

Within the 90 lb N at topdress treatments (**LIGHT BLUE** bars in Figure 5) there were no statistical differences. There also were not any trends to suggest that one or more of the additives contributed to yield.

Within the 120 lb N at topdress treatments (**BLUE** bars in Figure 5) there were no statistical differences in yield. There also were not any trends to suggest that one or more of the additives contributed to yield increases. The only possible trend was for the liquid carbon program to yield less than the other treatments in this group. This trend is likely to be real as the liquid carbon program did not have any starter fertilizer applied while all other treatments did.

Within the 150 lb N at topdress treatments (**BLACK** bars in Figure 5) while there were no statistical differences. There is a trend for the Palisade treatment to have yielded slightly higher than the control. Through visual observation it was apparent that the Palisade was effective in reducing plant height compared to the 150 lb N treatment where no growth regulator was applied. There were no significant rain events following maturity at this site prior to harvest, resulting in ideal dry-down and harvest conditions with little threat of lodging.

There were no differences in test weight among treatments.



* Liquid carbon program did not get any starter fertilizer. All other treatments did.

Figure 5. Yield from the fertilizer additive test. **BLACK** bars received 150 lb N at topdress. **BLUE** bars received 120 lb N at topdress. **LIGHT BLUE** bars received 90 lb N at topdress. **White** BAR received no topdress N or preplant fertilizer.

Fungicide Test

Study Design:

Six fungicides were evaluated for their yield benefit on two wheat varieties. Fungicides applied were Headline, Stratego, Quadris, Folicur, Proline, and Approach. The two varieties were SS 8302 and SS 8641. SS 8302 is rated as moderately susceptible to powdery mildew, susceptible to leaf rust, and moderately susceptible to SNB. SS 8641 has a better disease "package" than SS 8302. It is rated as resistant to powdery mildew, resistant to leaf rust, and moderately resistant to SNB. Fungicides were applied on April 14 at the early boot stage of development. In late April and early May weather conditions turned warm and humid. At that time powdery mildew, leaf rust, and Stagonospora Nodorum leaf and glume blotch (SNB) developed at this location.

Results:

Response to fungicide was related to the disease package of the variety. Each of the fungicides applied to SS 8302 (the more susceptible variety) resulted in similar yields that were about 10 bu/a higher than the unsprayed check (Figure 6). None of the fungicide treatment yields were statistically different from the unsprayed check when applied to SS 8641 (the more resistant variety), but there was a trend for all the fungicides except Approach to yield a few bushels per acre higher. Personal observations confirmed the lower disease pressure associated with the SS 8641 check plots due likely to the resistance of this variety to the foliar diseases present at this site.

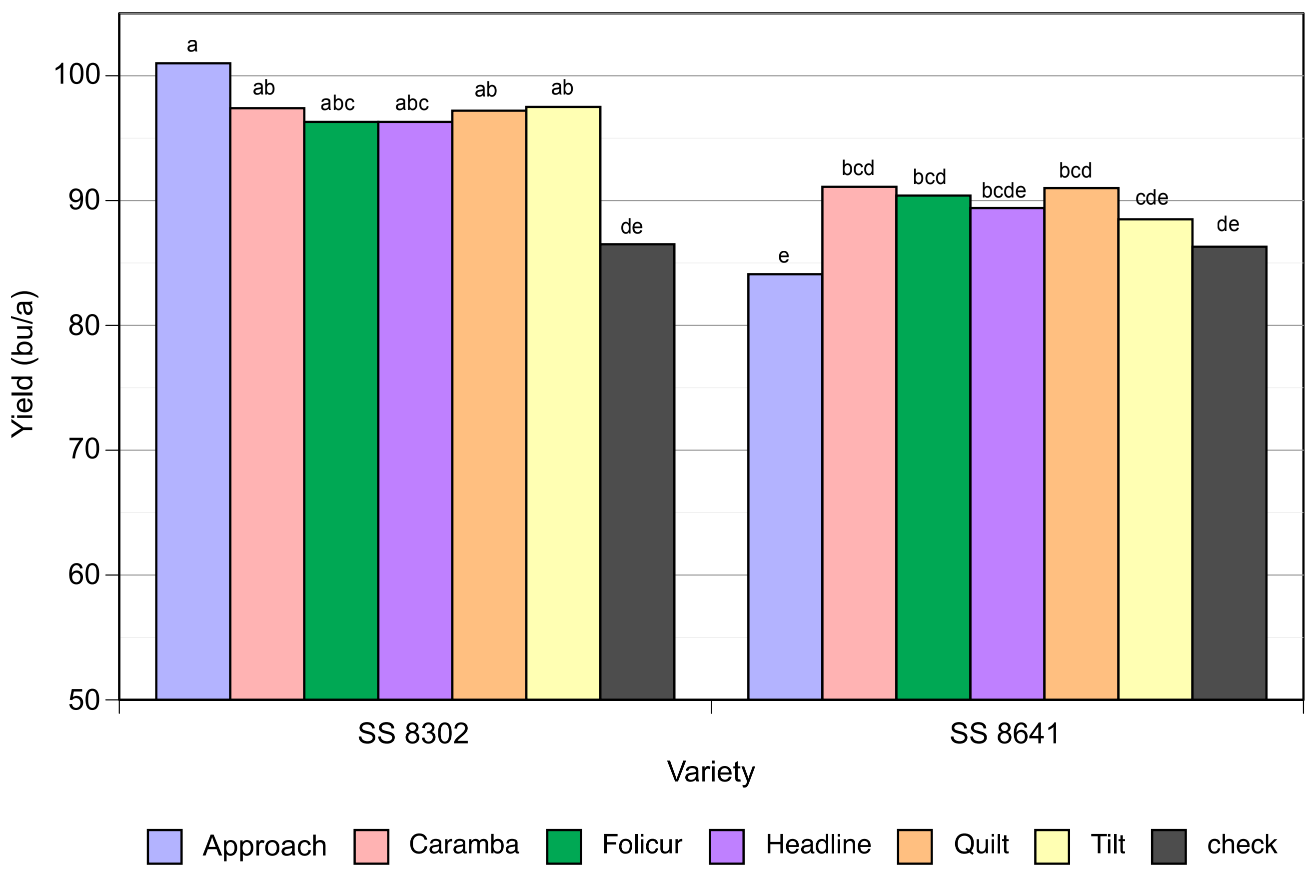


Figure 6. Yield from the fungicide test using six fungicides on SS 8302 a relatively disease susceptible variety, and SS 8641 a variety with a good foliar disease resistance package. Treatment bars with the same letter above them do not differ statistically at the 10% level.

For the susceptible variety SS 8302, Folicur and Approach resulted in about a 1 lb increase in test weight (Figure 7). The other fungicides were not statistically different from the check although, in general, there was a trend for all fungicides except Quadris to result in small increases in test weight.

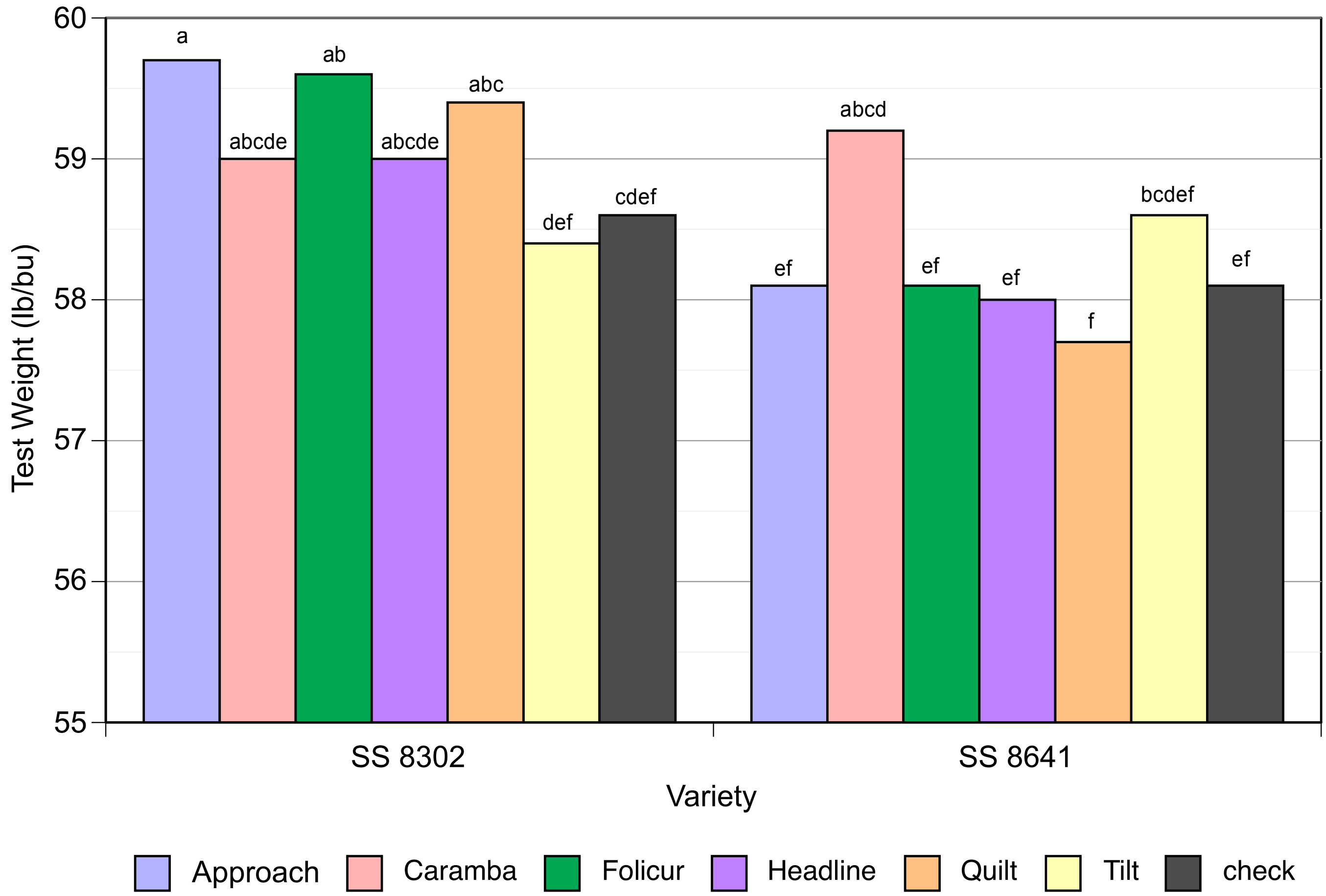


Figure 7. Test weight from the fungicide test using six fungicides on SS 8302 (a relatively disease susceptible variety) and SS 8641 (a variety with a good foliar disease resistance package). Treatment bars with the same letter above them do not differ statistically at the 10% level.

For the resistant variety SS 8641, the only fungicide that resulted in a statistically significant increase in test weight was Proline. There was a trend for Quadris to increase test weight slightly. The other fungicides had no impact on test weight.

Scab Management Test

Study Design

Scab has caused severe economic losses in the past for North Carolina producers. Four varieties (AG Coker 9436, Pioneer 26R12, Southern States 8302, and USG 3592) were selected for their varying levels of scab resistance. Corn inoculated with fusarium was hand applied on April 18 (pre-heading) to increase scab pressure. Treatments applied were Caramba or Prosaro (two fungicides for scab) on April 27 (early flower), or left untreated. A split-plot design with four replications was used with variety as the main-plot and fungicide as the split-plot. The warm and humid weather during heading was conducive to scab development and a moderate infection was produced. However, like the other tests at this location, powdery mildew, leaf rust, and SNB also infected these plots late in the season.

Scab infection occurs at or soon after wheat flowering, when fungal spores come from debris of corn or small grains and reach small-grain heads via rain-splash or air currents. Warm temperatures (59 to 86°F) before and during flowering also favor scab. Consequently, wet weather before, during, and after wheat flowering is the main factor determining if there is a head scab epidemic.

Results

Visual ratings of scab levels in this test (Figure 8) showed that the two varieties that were "moderately resistant" to head scab (AG Coker 9436 and Southern States 8302) had much lower levels of the disease than the other two susceptible varieties (Pioneer 26R12 and USG 3592). When Prosaro or Caramba were applied scab levels were reduced.

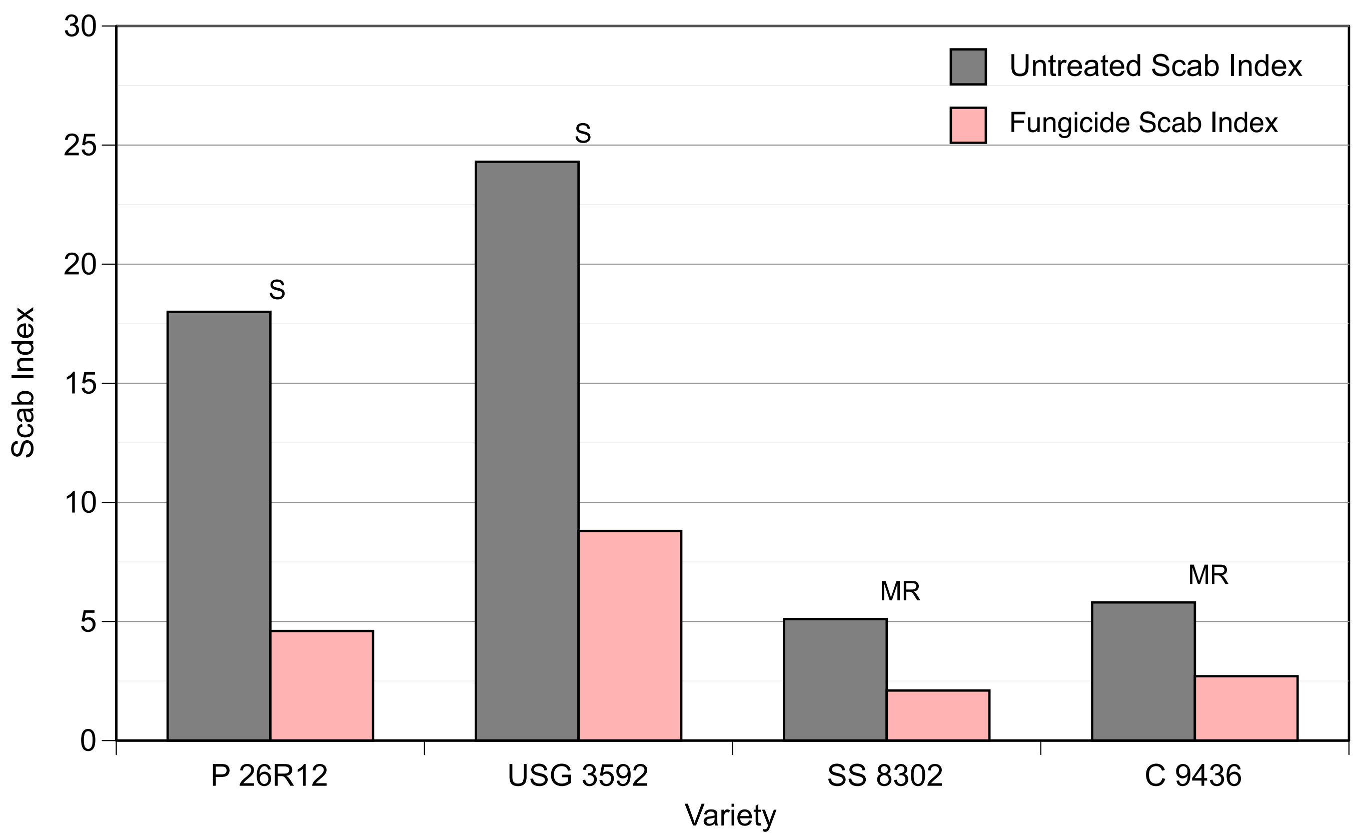


Figure 8. Scab Index: the higher the scab index the worse the disease infection was. Varieties with an "S" are rated as "susceptible" to scab. Varieties with an "MR" are rated as "moderately resistant" to scab. GREY bars are the untreated plots. RED bars are the average of the two fungicide treatments.

Application of either Caramba or Prosaro resulted in statistically higher yield compared to the unsprayed check in all varieties (Figure 9). What was interesting was that the increase in yield was not related to variety resistance level to scab. This is likely because of the other diseases that were present at this site. Each of these four varieties is either "susceptible" or "moderately susceptible" to SNB which was a problem at this location and the fungicides we applied would have helped to control SNB and increase yield regardless of head scab.

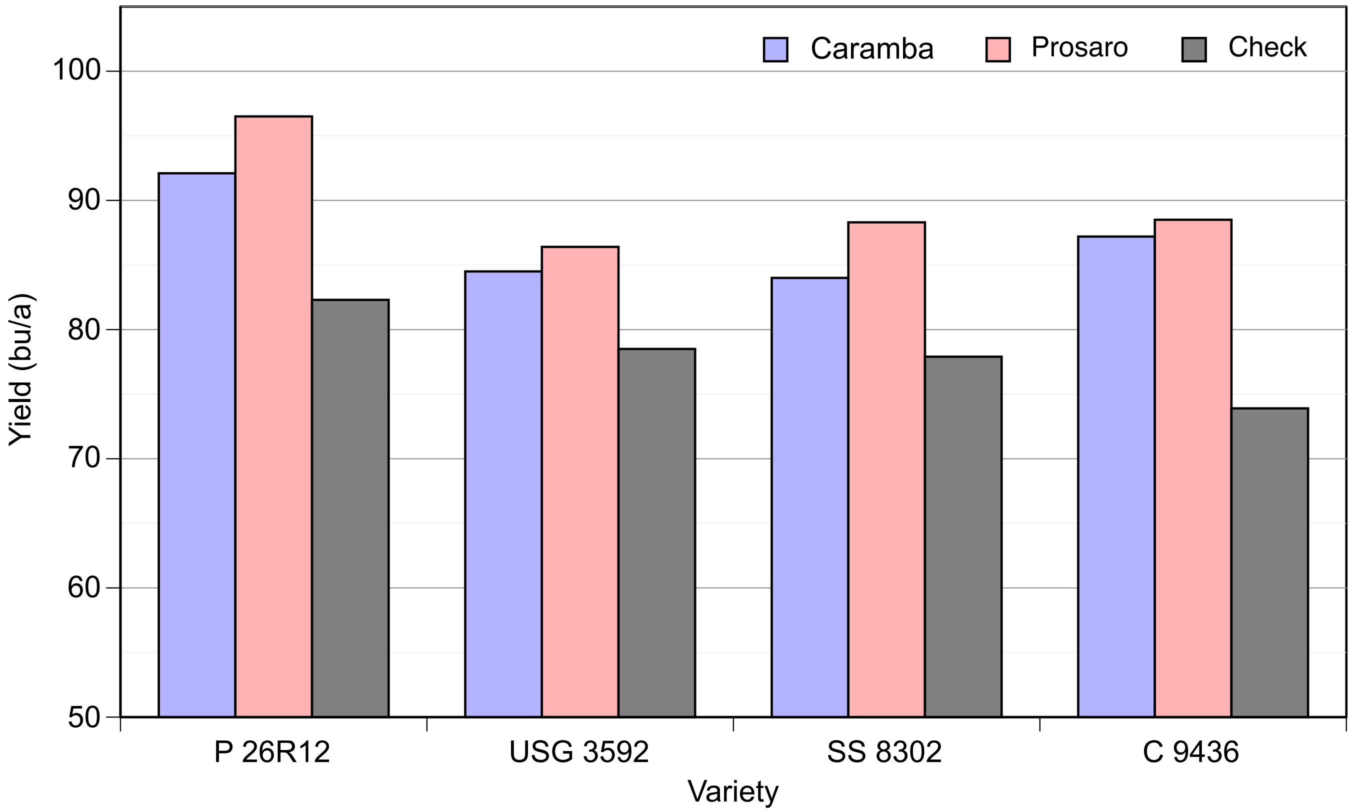


Figure 9. Yield of four varieties in a scab management test. Each variety was either untreated, or sprayed with Caramba or Prosaro.

Nitrogen Timing Test

Study Design
Seven nitrogen fertilizer strategies coupled with starter and no starter treatments were evaluated for their effectiveness on maximizing tiller development and grain yield. This test was a split-plot design with starter use as the main plot and N rate and timing as the split-plot. Thirty-gallons of 11-37-0 were broadcast at planting to half of the plots in the test for the starter treatment. Within these starter and no starter plots, various N rates and timings were applied in either split applications or all at GS-30 as follows:

1. No Sidedress N
2. 120 lb. N at GS-30
3. 150 lb. N at GS-30
4. 60 lb. N December + 60 lb. N GS-30
5. 60 lb. N January + 60 lb. N GS-30
6. 60 lb. N February + 60 lb. N GS-30
7. 30 lb. N each December, January, February + 30 lb. N GS-30

The dates for these applications were November 11 (starter), December 17, January 24, February 22, and March 14 (GS-30). Tiller counts were taken on March 4.

Results
Split N applications increased tiller density above applying all N at GS-30 (Figure 10). Although all three split timings were significantly higher than the single N treatments applied on 14 March there were no significant differences in tiller number among the different split applications. However, the trend in tiller development favored December and January timings over the February split application. These results are sensible as the earlier split timings allow more time for tiller development than a split applied closer to GS-30. Starter fertilizer application also resulted an average increase of around 15 tillers/square foot in the early split (December or January applications) and multiple split N timing plots.

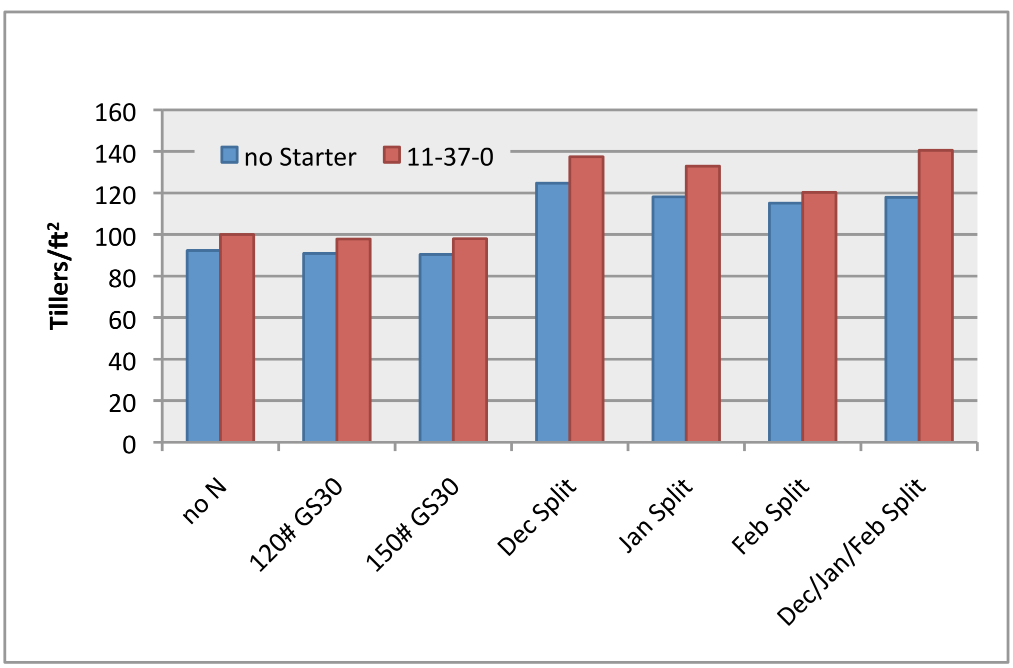


Figure 10. Tiller density resulting from changes in N timing and 11-37-0 starter application.

As expected, the treatments which received no winter or spring N had significantly lower yield than any of the N treatments regardless of whether a starter was used or whether the N was applied in a single or split application (Figure 11). Furthermore, within the starter or no starter treatments there were no significant differences in grain yield among either the single N applications of 120 or 150 lbs applied at GS30 or the split applications. Despite having more tillers on 4 March the split applications did not result in more grain yield when compared to a single application of 120 or 150 lbs of N per acre. This observation is consistent with previous research conducted by Dr. Weisz and others that found that when tiller densities exceed 60 tillers per square foot there is no yield advantage to split applications of N. When grain yields were compared across the starter and no starter treatments there were significant yield differences within the treatment where no N was applied in the winter or spring and the single application of 120 lbs of N per acre. It is quite likely that 30 gal of 11-37 -0 applied at planting supplied enough additional N to help increase yield in both of these cases.

One impact of the split N treatments as well as the no N treatments was a decrease in test weight compared to the single application of N at GS30 (Figure 12). A decrease in seed weight or differences in packing volume (shriveled kernels) can account for differences in test weight. This may help explain why grain yield was lower in the no N treatments and why more tillers in the split N treatments did not result in an increase in yield compared to the single applications of N at GS 30.

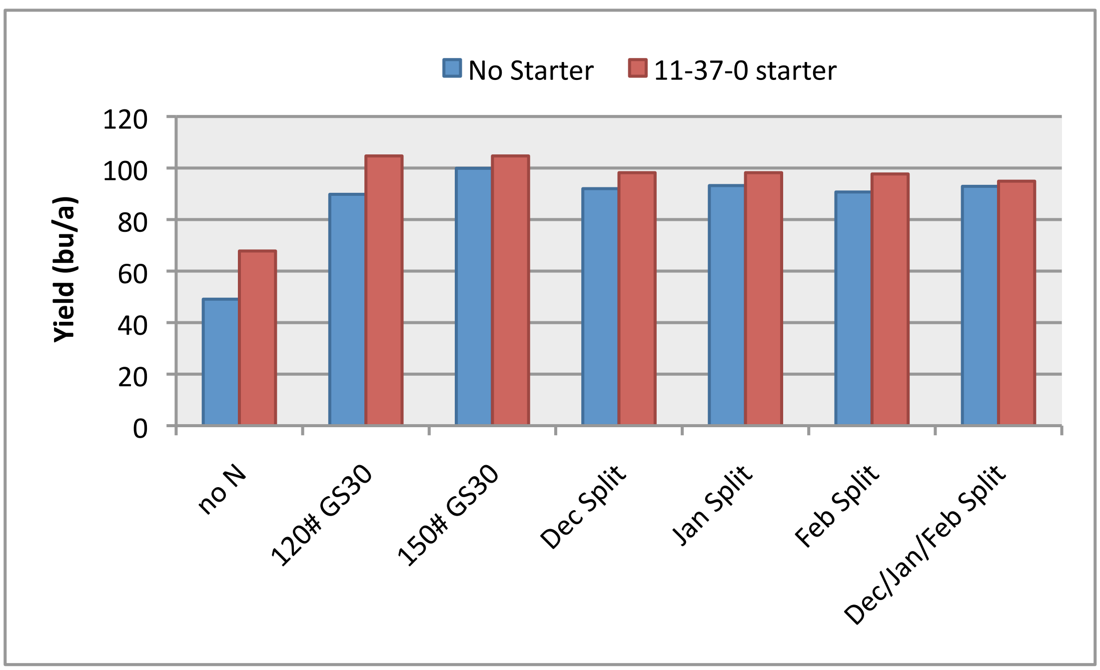


Figure 11. Yield differences among starter treatments and N application timings.

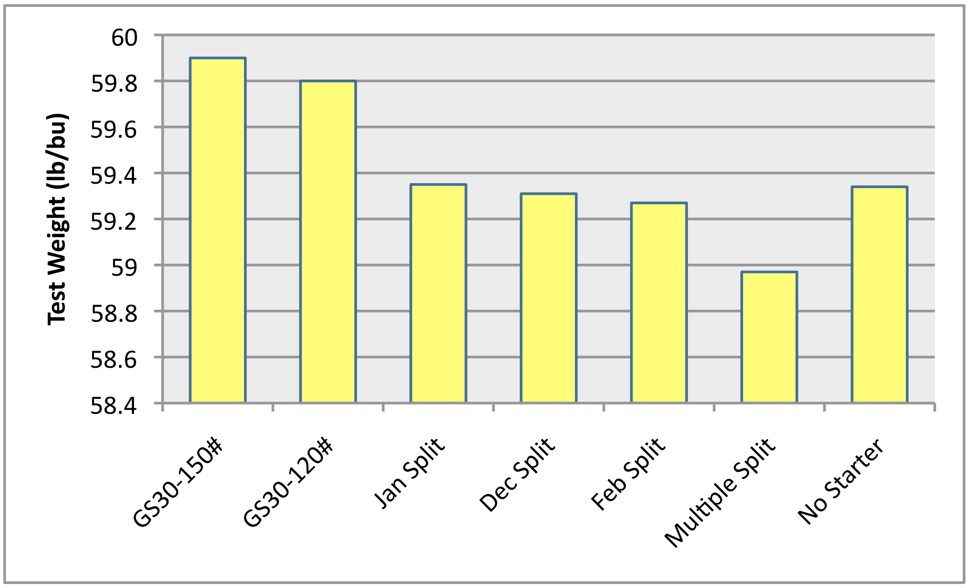


Figure 12. Test weight was lower for the split N timings than for the plots receiving all N at GS-30.