Northeast Ag Expo Small Grains Field Day 2018 Test Results

Cooperator: Cherry Hill Farms
Camden County

NORTHEAST AG EXPO
CAMDEN• CURRITUCK • CHOWA N • CATES
PASQUOTANK • PERQUIMANS

North Carolina Small Grain Growers Association Inc
1986

NC COOPERATIVE EXTENSION
N.C. A&T

Acknowledgements

Any effective on-farm-test requires a great deal of assistance from a number of different individuals. The Nmtheast Expo Team would like to officially recognize these people for their contribution to the 2018 Nmtheast Expo Small Grains Field Day. Collaboration with a willing and effective landowner/cooperator is a key component to all successful field research. The cooperator for these tests was Cheny Hill Farms of Camden County. We would like to thank Craig, Wade, and Nicholas Sawyer for allowing this work to be conducted on their farm and for conducting many of the field operations during the growing season. Several NCSU Extension specialists were also vital to this process. Dr. Ron Heiniger, Dr. Angela Post, Ryan Heiniger, and their suppo1t staffs assisted in planning, planting, applying treatments, harvesting plots, and data analysis. Dr. Christina Cowger assisted with the scab fungicide test. Additionally, these specialists and Dr. Wes Everman were presenters for the Nmtheast Expo Small Grains Field Day held on February 21, 2018. Financial suppmt from the No1th Carolina Small Grain Growers Association was instrumental, we extend a ve1y special thank you to the association. The various seed and agribusiness companies represented in our data donated seed and treatment materials used in the trials. Thanks to everyone who contributed in the generation of this data. In addition, we appreciate the suppo1t of the agriculture community and all that attended the field day.

Northeast Ag Expo Team

The Northeast Ag Expo Team, listed below, consists of a six-county North Carolina Cooperative Extension group located in northeastern North Carolina. This six-county team serves Camden, Chowan, Currituck, Gates, Pasquotank, and Perquimans Counties. This team conducts on-farm research, field days, and crop variety trials annually to promote the profitability and sustainability of area farming operations.

Nettie Baugher- Chowan/Gates/Perquimans Commercial Hmticulture Agent
Austin Brown- Camden County Agriculture Agent
Erin Eure-Commercial Fruits & Vegetables Area Specialized Agent
Jared Harrell- Chowan/Gates/Perquimans Livestock Agent
Matthew Leary- Chowan County Agriculture Agent
Dylan Lilley- Perquimans County Agriculture Agent
Paul Smith- Gates County Agriculture Agent
AI Wood- Pasquotank County Agriculture Agent

Site Characteristics

Trials were conducted at Cherry **Hill** Farms of Camden, N01th Carolina (36.382669, -76.238118). Pre-plant fertilizer consisted of200 pounds of 7-18-36 per acre, based on North Carolina Department of Agriculture and Consumer Services soil test recommendations. The soil type for the Head Scab test, and USG 3404 p01tions of the Foliar Enhancement tests was Tomotley Fine Sandy Loam. The soil type for the Identifying Management Practices that Increase Kernel Number in Wheat test was Augusta Fine Sandy Loam. The soil type for the Hilliard p01tions of the Foliar Enhancement tests, and Wheat Variety test was Altavista Fine Sandy Loam.

All tests except the Identifying Management Practices that Increase Kernel Number in Wheat test received additional fertilization consisting of 100 pounds of nitrogen per acre applied on 3/3/18, and 50 pounds of nitrogen per acre applied on 3/23/18. Trials were planted on 11/18/17, and harvested on 6/15/18. A herbicide application of Zidua and Osprey was applied on 12/1/18 to all plots. A fungicide with the active ingredient propicanozole was applied on 3/23/18 to reduce disease impacts on these studies. Plot combines utilized for harvest 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 rep01ted at the 95% confidence level, unless othe1wise noted.

Wheat Variety Test

Study Design

The performance of twenty-seven wheat varieties was evaluated. Varieties were randomized within four replicated blocks, in a randomized complete block design.

Results

Yield and test weight results, averaged over the four replications, from the variety trial can be found in Table 1. The varieties highlighted gold in the top yield group produced a statistically equivalent yield to the top yielding variety.

Variety	Yield (bu/A)	Test Weight (lb/bu)
Pioneer26R59	114.7	54.7
SyngentaSYVi per	113.9	57.4
SyngentaSY547	112.1	56.3
UniSouthGeneticsUSG3458	110.6	55.1
AgriMAXX474	109.3	55.3
ProgenyPGX16-7	108.7	55.4
TidewaterTWS2616	107.9	55.3
SouthernHarvest7200	107.2	57.5
DynaGro9772	106.6	54.4
ProgenyPGX16-4	104.3	57.2
AgriMAXX473	103.6	55.3
CroplanSRW8550	103.0	55.0
TidewaterTWS3516	102.8	54.7
AgriMAXX415	102.8	56.8
Pioneer26R41	101.9	55.1
Pioneer26R45	101.7	53.6
Syngenta SYMiskin	101.2	55.9
UniSouthG enetics USG3895	100.2	53.3
UniSouthGeneticsUSG3536	99.8	55.4
SouthernHarvest7510	97.8	54.0
SouthernHarvest4400	97.6	54.9
CroplanSRW9415	97.3	55.4
TidewaterTWS3416	96.5	53.5
Progeny#Bullet	96.4	54.3
DynaGro9862	95.3	53.8
DynaGro9701	95.2	54.7
CroplanSRW9606	94.2	52.1
Mean	103.1	55.0
LSD p=0.10	7.0	
CV(%)	5.8	
*Indicates the highest yielding variety		
Gold highlighted varieties in the top yield group produced a		
statistically equivalent yield to the top yielding variety		

Foliar Enhancement- Product Test

Study Design

Treatments were established in a randomized complete block design. The plots established in the USG3404 variety were replicated four times, and those in the Hilliard variety were replicated three times due to space limitations. Plots measured 12 feet wide and 20 feet long. Based on an inf01mal survey of growers in the region of northeast North Carolina (NC), a $20 per acre cap for treatment product costs for the season was posed to all participants in these trials. Table 2 contains a full list of treatments.

Table 2: Foliar Enhancement-Product Test Treatment List

Treatment Name (Company)	Product Name	Application Rate/acre	Timing
Check	N/A	N/A	N/A
Triangle	Peg Power	1 quart	Top Dress
	CarboRater	1.5 quarts	Flag Leaf
Brandt	N-Boost	2 quarts	Top Dress
Meherrin	MicroAmp	12.8 ounces	Top Dress+ Flag Leaf
	System Advance	1 pint	Top Dress + Flag Leaf
Helena	**HM1354**	1 quart	Top Dress
	HM0715	1 pint	Flag Leaf
Delta Ag	Pere Plus	22 ounces	Top Dress
	Crop Karb	1 quart	Flag Leaf

Results

Plots were harvested with a small plot combine, which cut the middle 5 foot of each plot. Tables 2 and 3 contain yield and test weight results. The 2017-2018 wheat growing season presented challenges to producers in northeast NC, however wheat yields were exceptional in these trials. No treatments at this site had a statistically significant impact on yield or test weight, at a 95% confidence level, however more data is needed to fmiher explore the use of these products in wheat production in this region.

Table 3: Hilliard Yield and Test Weil!ht

Treatment Name	Yield (bu/A)	Test Weight (lb/bu)
Check	98.7	55.2
Brandt	97.3	55.2
DeltaAg	96.6	55.3
Meherrin	95.7	55.0
Triangle	95.0	55.1
Helena	93.1	55.2
Treatment Pr >F	0.1724	0.9116
CV(%)	2.5	0.67
LSD p=0.05	n/s	n/s

Table 4: USG 3404 Yield and Test Wei!!h

Treatment Name	Yield (bu/A)	Test Weight (lb/bu)
Brandt	85.2	54.7
Triangle	84.9	54.8
Check	83.0	54.5
DeltaAg	81	54.9
Helena	79.0	53.7
Meherrin	74.7	54.2
Treatment Pr >F	n/s	0.3272
CV(%)	6.4	1.4
LSD p=0.05	n/s	n/s

Foliar Enhancement-Nutrient Test

Study Design

Three nutrients were applied at top-dress timing on 3/23/18 to analyze their impact on yield and test weight. The treatment list can be found in table 5. The plots established in the USG 3404 variety were replicated four times, and those in the Hilliard variety were replicated three times due to space limitations . Plots measured 12 feet wide and 20 feet long.

Table 5: Foliar Enhancement-Nutrient Test Treatment List

Nutrient	Application Rate (lb. of actual nutrient/acre)
Check	n/a
Boron	0.5
Zinc	1
Copper	1

Results

Tables 6 and 7 exhibit boron, zinc, and copper treatment application impacts on yield and test weight. Note that the boron treatment produced the highest yield at both sites, however treatment effect did not produce statistically different yields among treatments.

Table 6: Hilliard Results

Treatment	Yield (bu/A)	Test Weight (lb/bu)
Boron	129.4	53.6
Zinc	127.5	53.4
Check	126.4	53.8
Copper	124.0	53.4
Treatment Pr>F	0.1109	n/s
CV(%)	1.75	0.62
LSD (p=0.05)	n/s	n/s

Table 7: USG 3404 Results

Treatment	Yield (bu/A)	Tets Weight (lb/bu)
Boron	113.2	52.1
Check	106.8	52.2
Copper	103.7	52.2
Zinc	102.3	52.2
Treatment Pr>F	n/s	n/s
CV(%)	11.6	2.0
LSD (p=0.05)	n/s	n/s

Head Scab Test

Study Design

Five varieties, with varying degrees of resistance to fusarium head scab, were planted, each replicated four times in a randomized complete block design. Varieties planted in this test and their respective NC State head scab resistance ratings are as follows: Dyna-Gro Shirley-susceptible, Featherstone VA 258-susceptible, Croplan 8550-moderately resistant, USG 3404-moderately resistant, USG 3523-moderately resistant. Any head scab that impacted the performance of these varieties came from the natural environment, as no inoculum was applied to the plots.

Results

The spring of2018 was a low scab pressure year for Northeastern NC. Dyna-Gro Shirley, a variety with high yield potential and no host resistance to head scab, yielded statistically higher than all others. Fusarium head scab can be severely problematic in Northeastern NC in certain years, and the replication of these results is not expected when wheat is produced during heavy head scab pressure springs. Without the ability to predict when scab will be a problem prior to planting, and given the increased incidence of scab at economically significant levels in recent years, the use of tools including planting moderately resistant varieties can be advantageous.

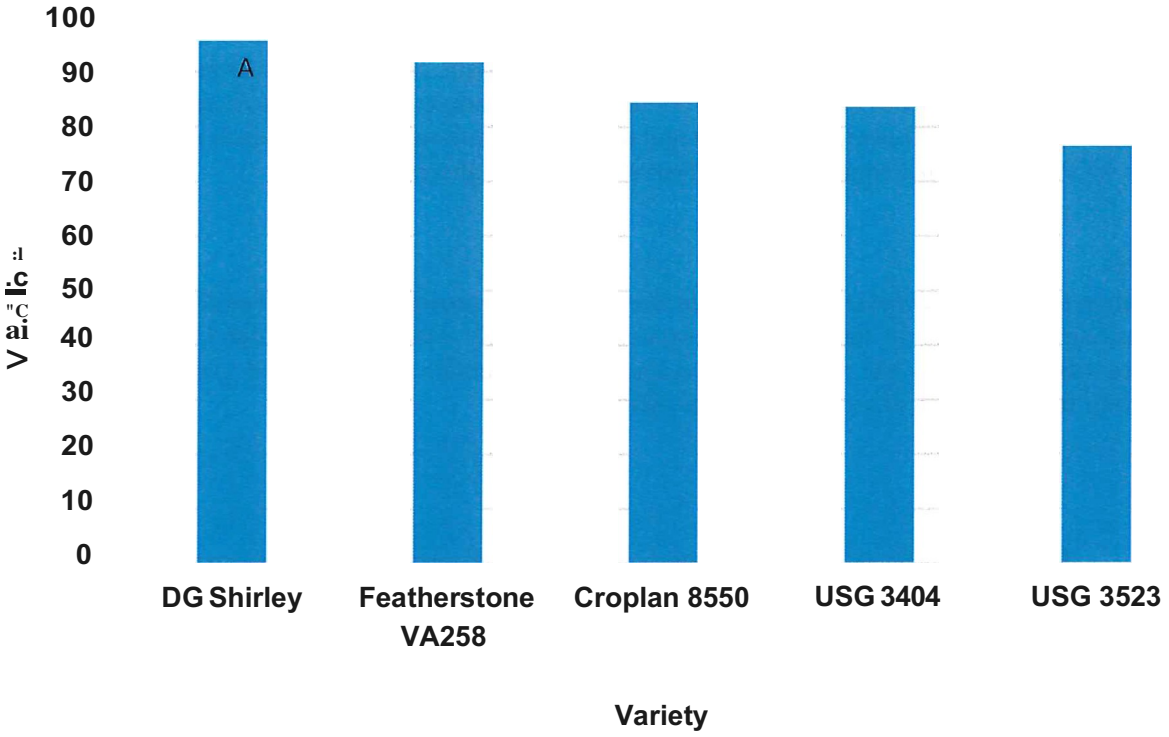

Figure 1: Head Scab Yield Results

Identifying Management Practices that Increase Kernel Number in Wheat

Study Design

The key objective of this study was to identify management practices that lead to increases in kernel number in soft winter wheat. Specific objectives were: 1) to measure the impact of flag leafN concentration and rate of biomass accumulation from boot stage to flowering on kernel number, and 2) to determine if variety selection, Nitrogen (N) rate and/or timing, or the addition of Mg and B could be used to influence kernel number.

The experimental design was a split, split, split plot with wheat variety as the main plot, N management as the sub-plot, and micronutrient application as the sub subplot.

Main Plot - 3 Wheat Varieties: DynaGro Shirley, VA Hillard, and USG 3404
Sub Plot - N Rate: 120 lbs. N per acre or 180 lbs. N per acre
N Timing: Single application at Zadoks Growth Stage (GS) 30 (tillering ended, leaf sheaths strongly erected); Split at GS 23 (main shoot and three tillers) and GS 30; Split at GS 30 and GS 36 (6 node detectable)
Sub-Subplot - Micronutrients: No B or Mg; B and Mg applied at planting; B and Mg at GS 36

Planting was done on 17 Nov along with the application of Band Mg to the appropriate plots. The early split N application was made on 21 Feb, the GS30 applications on 16 Mar, and the GS36 applications on 16 April. Measurements of total above ground biomass and tissue concentrations of nutrients were taken at GS 30, GS36 and at anthesis. At harvest (June 15), head samples were taken to measure the number of kernels per spike and grain weight, moisture and test weight were recorded from each plot using a Kincaid 8XP plot combine equipped with a Harvestmaster weigh system.

Results

How Important is the Number of Kernels in the Spike in Determining Grain Yield? Kernel number in the wheat spike is the major factor that detennines wheat yield. Data from Camden County from each of the three varieties shows the strong relationship between kernels per spike and grain yield (Figure 2) accounting for 66 to 92% of the variability in yield at this site.

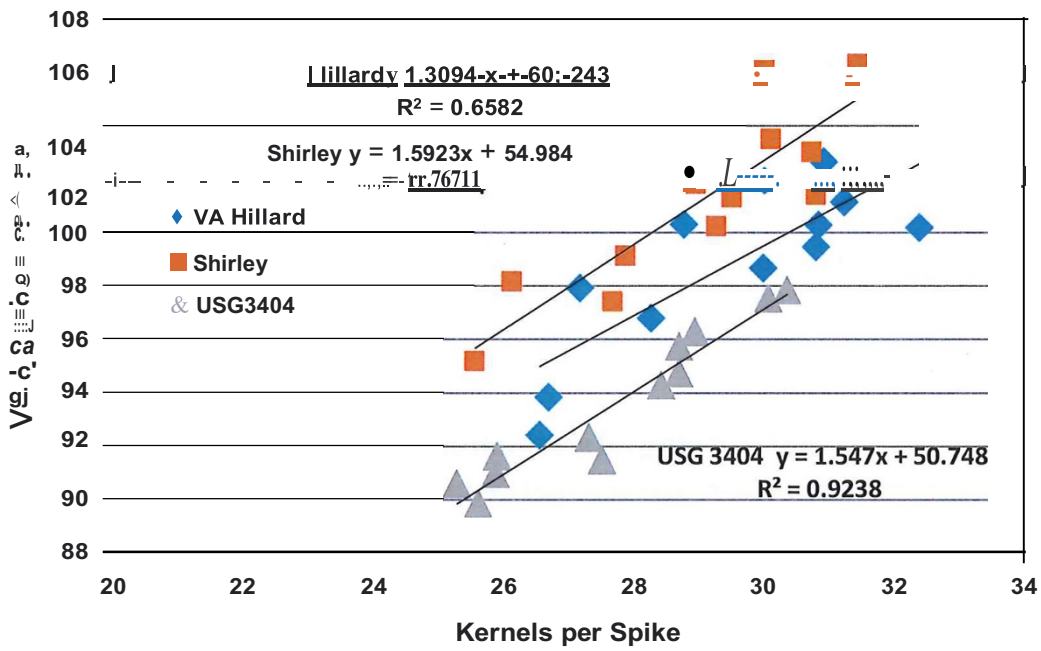

Figure 2. Relationship between kernels per spike and yield for three varieties grown in Camden County in 2018.

What Plant Properties Influence the Number of Kernels in the Spike? Previous research suggests that two factors are impotiant in setting kernels in the spike of the wheat plant, nitrogen (N) concentration in the flag leaf or spike and the accumulation of biomass during the period from boot (GS 40) to stmt of flowering (GS 60). Data from the Camden location confirmed that both of these factors influenced kernel number at this site. The data shows that % N in the flag leaf at anthesis significantly influenced kernel number. Each increase of I% in tissue N concentration resulted in 2.4 more kernels per spike. The data also shows that the rate of growth from GS 41 to GS 59 was significantly correlated to kernels per spike . Each increase of 10 grams per square meter per day resulted in 1.7 more kernels per spike.

What Management Practices Increased% N Concentration in the Plant? Results in 2018 found that, surprisingly, N rate did not increase % N in the flag leaf. However, the timing of N application had a significant impact on% flag leaf N (Figure 4). Both split N treatments (split application of 60 lbs. N per acre applied at GS 23 and GS 30 and split application of 90 lbs. N per acre applied at GS 30 and GS 36) resulted in greater % N in the flag leaf on 8 May and more kernels per spike. The addition of B and Mg either at planting or at GS 36 also increased% flag leafN and kernel number.

What Management Practices increased Growth Rate? The only management practice tested for its impact on growth rate was the use of Band Mg applied either at planting or at GS 36. The addition of Band Mg at either planting or at GS 36 increased the rate of growth from boot stage through flowering resulting in an increase in kernels per spike.

Grain Yield: Analysis of grain yield and yield components found significant main effects of variety, N timing, and the application ofB and Mg. Among varieties Hillard and Shirley had the highest grain yield and both had significantly more kernels per spike compared with USG 3404. Among N rates and split N applications the use of split N either early at GS 23 and GS 30 or later at GS 30 and GS 36 resulted in significantly more kernels per spike and both split N applications had significantly greater grain yield than the single application of 120 lbs. ofN per acre at GS 30. Finally, while the application ofB and Mg at GS 36 resulted in significantly more kernels per spike compared to no B or Mg applied, there were no differences among the micronutrient treatments and the check for grain yield.

Results Summary: This study highlights some critical information for wheat growers looking to increase yield. These are:

1. Kernel number per spike is an important driver of soft red winter wheat yield in North Carolina

2. To achieve greater kernel numbers growers must focus on increasing wheat growth rate from GS 40 (start of the boot stage) to GS 60 (start of flowering) and increasing% N concentration in the flag leaf and spike of the wheat plant.

3. Two management factors are critical in achieving greater kernel number per spike:

a. Split N Applications - A split application of N in early February improves root growth and season long N uptake while a split N application just prior to boot stage (GS 40) increases available N at anthesis. Growers should consider ways they can provide at least two and perhaps three split applications of N at GS 23-25, GS 30 and GS 40.

b. Micronutrients - While it is not clear which micronutrients are most important, it is clear that at least Mg and Bare critical to increasing the growth rate of the plant from GS 40 to GS 60 and that they can improve % N concentration in the flag leaf