CELIA WINTER TRITICALE AND STEPHENS SOFT WHITE WINTER WHEAT RESPONSE TO NITROGEN FERTILIZER

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Abstract

Celia winter triticale and Stephens soft white winter wheat response to nitrogen fertilizer rates was tested at the Central Oregon Agricultural Research Center (COARC) at Madras, Oregon. The site chosen for the trial had higher nitrogen supplying ability than anticipated. The check had the highest yield, statistically, and there was no advantage to higher nitrogen fertilizer rates. Celia significantly outyielded and had better lodging resistance with 118.2 bu/a and 34 percent lodging, compared to Stephen's yield of 87.6 bu/a and 100 percent lodging. Heavy lodging was caused by a July thunderstorm. Lodging lowered test weights. Protein content was increased with additional nitrogen, which was advantageous for Celia. Stephens protein content, with no nitrogen fertilizer, was already higher than the current market demands.

Introduction

More acreage is devoted to soft white winter wheat in central Oregon than any other cereal grain crop. Winter triticale is a "new" feed grain crop with high yield potential. Interest in triticale is growing for both grain and forage purposes. The grain is excellent for livestock feed, especially in swine and poultry rations. Stephens is a soft white winter wheat that has been grown extensively, and Celia is a recently released OSU winter triticale variety for grain with superior test weight compared to other triticale varieties. A nitrogen fertilizer rate trial was initiated to compare yield, quality, and agronomic response by Celia and Stephens. The information will allow better production practice decision making.

Materials and Methods

Celia winter triticale and Stephens soft white winter wheat were planted on October 7, 1994, at 30 seeds per square foot with a plot cone-type planter. The design was a randomized complete block, two factorial design with three replications. Row spacing was 8 inches and plot size was 5 feet x 20 feet. The soil sample was taken to bedrock in early March of 1995. The soil analysis was performed by Agri-Check, and soil test results are in Table 1. It was assumed that 20 pounds of nitrogen had been taken up by the plants. The plots were individually fertilized by hand with 40 pounds of sulfur (gypsum source), and 0, 40, 80, 120, and 160 pounds of nitrogen per acre (ammonium nitrate nitrogen fertilizer) on March 27, 1995. Irrigation was with solid set sprinkler lines and was applied as needed. Weeds were controlled with an application of Bronate (2 pints/a) and surfactant (1 pint/a) on March 27, 1995. Heading dates (50 percent heading), plant height, and lodging scores were recorded prior to harvest. Seventy-five square feet were harvested in mid-September, 1995. Grain was cleaned, test weights, and 1,000 kernel weights measured, and protein contents determined with a whole grain infra-red analyzer by the

state-wide cereal variety testing team in Corvallis. Grain nitrogen recovery, grain protein yield, seeds per pound, and future seeding rates were calculated. The MSTAT statistical program was used to analyze the data. Protected least significant differences (PLSD's) are used in the mean separations. The grain yield, test weight, protein content, grain nitrogen uptake, and grain protein yield data are presented on a 10 percent, 10 percent, 12 percent, 11 percent and 11 percent moisture basis, respectively. Grain yield is presented on a 60 pound bushel basis.

Results and Discussion

Two factors greatly influenced the trial results - the nitrogen supplying power of the soil and the July thunderstorm. All of the measured variables were affected to varying degrees. The results for grain yield, protein content, test weight, height, lodging, and Julian heading date are presented in Table 2. Results for grain nitrogen uptake, grain protein yield, 1,000 kernel weight, seeds per pound, and future seeding rates are presented in Table 3.

Celia winter triticale significantly outyielded Stephens soft white winter wheat 118.2 bu/a to 87.6 bu/a. Nitrogen fertilizer rates had no statistically significant effect on grain yield, height, lodging, Julian heading date, 1,000 kernel weight, seeds per pound, and future seeding rate. There was a definite trend to decrease grain yield and significantly decrease test weight with increasing nitrogen fertilizer rates. Protein content increased significantly with higher nitrogen rates. Stephens protein content was already too high for current soft white wheat market standards with no additional fertilizer. Celia benefitted from the higher fertilizer rates with higher protein content, which would be beneficial for use as a livestock feed.

Stephens lodged at 100 percent (at every nitrogen rate), which was significantly higher than Celia which only lodged at 33 percent. There was a trend for Celia to lodge more as nitrogen rates increased, but with only 53 percent lodging at the highest nitrogen fertilizer rate. Celia straw strength and lodging resistance was superior to Stephens.

Celia had significantly greater grain nitrogen uptake and grain protein yield than did Stephens. Statistically, traits for both Celia and Stephens were at their highest level with no nitrogen fertilizer. Additional nitrogen fertilizer significantly decreased grain nitrogen uptake and grain protein yield. The trends were different, though, for the two varieties. Celia maintained the level, but Stephens decreased with higher rates of nitrogen. Heavy lodging affected the plants.

Though not significant, Celia's 1,000 kernel weight decreased from 42.2 to 33.2 grams, while Stephens only decreased from 38.4 to 37.0 grams with increasing nitrogen fertilizer rates.

The trial will be repeated in the 1995-1996 crop year.

Table 1. Soil test results taken at the COARC, Madras, Oregon in March of 1995.

Soil Depth inches	pH	P_2O_5 ppm	K_2O ppm	NO_3 lb/a	NH_4 lb/a
0 -12	8.0	81	784	35	28
12-24	8.1	136	1070	176	21

Table 2. Celia winter triticale and Stephens soft white winter wheat yield, protein content, test weight, height, lodging, and Julian heading date response to nitrogen fertilizer at COARC, Madras, Oregon in 1995.

Treatment	Yield bu/a	Protein	Test Weight lb/bu	Height in.	Lodging	Julian Heading Date 1/1=1
Variety						
Stephens	87.6	12.6	51.5	41.2	100	159.6
Celia	118.2	12.1	52.8	41.0	34	162.1
N Rate lb/a						
0	112.1	12.2	53.5	42.0	58	160.2
40	101.3	12.1	52.3	41.3	67	160.3
80	107.1	12.0	53.9	40.5	67	160.8
120	93.7	12.6	50.7	40.8	67	162.2
160	100.1	12.7	50.2	40.8	76	160.7
Variety x N Rate						
Stephens 0	103.9	12.6	52.6	42.3	100	158.3
40	84.2	12.6	51.4	40.7	100	158.7
80	88.0	12.3	53.5	41.0	100	159.0
120	76.2	12.7	50.5	41.7	100	161.3
160	85.6	12.8	49.4	40.3	100	160.7
Celia						
0	120.3	11.9	54.3	41.7	17	162.0
40	118.4	11.6	53.3	42.0	33	162.0
80	126.2	11.7	54.3	40.0	33	162.7
120	111.2	12.5	50.9	40.0	33	163.0
160	114.7	12.7	51.0	41.3	53	160.7
Mean	102.9	12.3	52.1	41.1	67	160.8
Variety						
PLSD .10	S	S	S	NS	S	S
PLSD .05	S	S	NS	NS	S	S
N Rate						
PLSD .10	NS	0.5	2.1	NS	NS	NS
PLSD .05	NS	NS	2.6	NS	NS	NS
Variety x N Rate						
PLSD .10	NS	NS	NS	NS	NS	NS
PLSD .05	NS	NS	NS	NS	NS	NS
CV%	11.9	3.8	4.1	4.7	34.1	1.5

Table 3. Celia winter triticale and Stephens soft white winter wheat grain N uptake, grain protein yield, 1,000 kernel weight, seeds per pound, and future seeding rate response to nitrogen fertilizer at COARC, Madras Oregon in 1995.

Treatment	Grain N Uptake lb/a	Grain Protein Yield lb/a	1000 Kernel Weight g	Seeds Per Pound	Future Seeding Rate lb/a
Variety					
Stephens	115.8	660.1	37.3	12,315	107.4
Celia	149.4	851.8	38.4	12,006	110.7
N Rate lb/a					
0	143.9	820.3	40.3	11,297	116.0
40	126.8	722.3	37.7	12,336	108.5
80	134.7	768.0	38.5	11,849	110.8
120	123.9	706.3	37.8	12,226	109.0
160	133.8	762.8	35.1	13,095	101.0
Variety x N Rate					
Stephens					
0	137.4	783.7	38.4	11,836	110.5
40	111.1	633.0	35.0	13,121	100.7
80	114.2	650.7	38.6	11,857	111.1
120	101.8	580.3	37.5	12,287	108.1
160	114.6	653.0	37.0	12,474	106.5
Celia	150.4	857.0	42.2		121.4
0				10,758	
40	142.4	811.7	40.4	11,550	116.3
80	155.3	885.3	38.4	11,842	110.5
120	146.0	832.3	38.1	12,164	109.8
160	153.1	872.7	33.2	13,717	95.5
Mean	132.6	756.0	37.9	12,161	109.0
Variety					
PLSD .10	S	S	NS	NS	NS
PLSD .05	NS	S	NS	NS	NS
N Rate					
PLSD .10	12.9	73.6	NS	NS	NS
PLSD .05	NS	NS	NS	NS	NS
Variety x N Rate					
PLSD .10	NS	NS	NS	NS	NS
PLSD .05	NS	NS	NS	NS	NS
CV%	9.7	9.7	12.9	13.3	12.9