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Maximizing Wheat Yields In North Dakota
In A Crop Rotation System

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TITLE: Maximizing Wheat Yields in North Dakota in a Crop Rotation
System

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LOCATION:

The experimental site is located on the North Central Experiment Station south of Minot, North Dakota. This is the fifth year of the study with durum wheat planted for the second time on Block 1 of the three year rotation (Durum - Sunflower - Flax). The soil on this block is a Williams loam (fine-loamy, mixed typic argiboroll). The initial chemical and physical properties of the site were reported in the 1982 annual report. The 1986 growing season air temperature and precipitation data are summarized in Tables 1 and 2.

Block	Year				
	1982	1983	1984	1985	1986
1	Flax	Durum	Sunflower	Flax	Durum
2	Durum	Sunflower	Flax	Durum	Sunflower
3	Sunflower	Flax	Durum	Sunflower	Flax

OBJECTIVES:

1. Maximize wheat yields in central North Dakota under a crop rotation system utilizing the best current management practices that influence ultimate yield.
2. Identify and quantify those management factors studied or combination of factors that contribute to maximum yields obtained.
3. Equate the chemical properties of the plant and soil and physical condition of the soil to the maximum yields obtained.

PROCEDURE AND RESULTS:

The 1986 main wheat experiment was set up similar to the 1985 trial which was also slightly different from previous years (1982, 1983 and 1984) but in a split-split plot arrangement with four replications. The main split plots were fertilizer treatment (F_1 , F_2 , and F_3 are the same identical plots established in 1982) with the fertilizer treatments split by varieties (V_1 and V_2). A third split within varieties included supplemental nitrogen (S_0 , S_1 , S_2 and S_3). Individual unit plots were 6 feet x 48 feet. The treatments were as follows:

Fertilizer Treatment

- F_1 = Fertilizer rate based on soil tests (collected in fall of 1985 from the F_1 plots established in 1982) and a yield goal of 35 bu/acre.
- F_2 = Nitrogen and phosphorus fertilizer rate based on F_1 soil tests and a maximum yield goal of 80 bu/acre.
- F_3 = Same as F_2 except a rate of potassium fertilizer applied.

Supplemental Nitrogen

S₀ = no supplemental nitrogen applied.

S₁ = a foliar application of nitrogen (20 lb N/acre as 28-0-0) was applied at Feekes growth stage 8.

S₂ = a soil application of nitrogen (20 lb N/acre as 28-0-0) was surface band (dribble) applied preplant.

S₃ = a combination of foliar N and soil applied N was applied (S₁ and S₂).

Variety

V₁ = Lloyd durum (a semidwarf variety).

V₂ = Vic durum (a normal height variety).

Soil test of samples collected in the fall of 1985 from F₁ plots indicated 51 lb NO₃-N/acre in 2 feet, P = 23 lb/acre and K = 650 lb/acre. The F₁ treatment required no additional fertilizer for a 35 bu/acre yield goal. F₂ and F₃ received 120 lbs N/acre and 30 lbs P₂O₅/acre with the deep band applicator (12 inch spacing) utilizing liquid 28-0-0 and 10-34-0. The F₃ treatment also received a spring broadcast application of 100 lb K₂O/acre as KCl. No tillage was performed prior to planting with direct seeding into the flax residue. The two durum varieties were planted on May 2 with a 92 to 93 lb/acre seeding rate utilizing a no-till Haybuster drill with 6-inch row spacing. The seed of both varieties was treated with Vitavax 200 prior to planting. All plots received 61 lb/acre of 11-52-0 fertilizer with the seed at planting. The plot area was sprayed in the spring with 1 pt Roundup plus surfactant to control weed growth, mainly quack grass. The plots were sprayed in late May with 1 pt/acre Bronate for broadleaf weed control.

The foliar nitrogen was applied in the morning (June 19) at Feekes plant growth stage 8 with a bicycle type sprayer with boom. The nitrogen fertilizer (28-0-0) at a rate of 20 lb/acre was mixed with water in a 3:2 ratio (water:fertilizer) and applied in two passes. The durum crop was sprayed with fungicides on June 17 (2 lb/acre Manzate 200 plus oil). Tram lines were used for spraying either herbicides, fertilizer or fungicides. Plant samples were collected at the soft dough stage (July 30) for total dry matter production and nutrient analysis. The durum wheat was harvested on August 13 with a small research combine (182 ft² area).

The flax area of the rotation (Block 3 - sunflower stubble) was spring disc plus field cultivated once and planted with the Haybuster drill on May 4 with Culbert-79 flax at a rate of 40 lb/acre. No fertilizer was applied to this block area. The area was sprayed in early June with a post application of 1 pt/acre Bronate for weed control. Harvested (September 8) yields averaged 26.2, 29.0 and 27.9 bu/acre for the F₁, F₂ and F₃ previously established areas, respectively. Test weights for these respective areas were 52.5, 52.7 and 52.0 lb/bu.

The sunflower area of the rotation (Block 2 - Durum stubble) was spring plowed. Treflon at 1 lb/acre was incorporated during field cultivation for weed control. No fertilizer was applied to the block. Cargill 207 hybrid was planted on May 28. Sunflower heads were harvested on October 14, threshed and cleaned for yield determinations. Average yields of 2081, 2264 and 2304 lb/acre were obtained for the respective F₁, F₂ and F₃ areas and oil content measured 38.6, 37.3 and 38.2 percent. Test weight measured was 31.3, 31.3 and 30.9 for the F₁, F₂ and F₃ areas, respectively.

Statistical analysis of the data was performed on a computer utilizing the SAS procedures with tests of significance by Duncan-Waller K-Ratio T test (Bayes LSD). Statistical results are summarized in Table 22.

Plant Growth and Yield

Data on plant dry matter production, plant height, grain yield, test weight and 1000 seed weight of the durum crop as influenced by fertilizer treatment, variety and supplemental N are summarized in Tables 3-5. Total plant dry matter production at soft dough stage was increased 24% (4660 to 5800 lb/acre) by adding the maximum fertilizer rate of NP or NPK. Dry matter production was also maximized when supplement N was applied as both soil and foliar (S₃). A significant interaction occurred in dry matter production with fertilizer by variety. The Lloyd (semidwarf) variety had maximum dry matter production with NPK whereas the Vic (normal height) variety had maximum production with only NP, then production decreased with K added. Height of the durum plants was significantly increased (1 inch) when supplemental N was applied to the soil when compared to plants receiving no supplement N or supplemental N supplied as a foliar application. This coincides with greater dry matter production associated with early N supplies which in some cases, although not apparent in the study this year, cause potential lodging problems.

The Lloyd variety had significantly higher yields than the Vic variety which was in line with total dry matter production. An estimate of straw production (plant dry matter minus grain dry matter) showed similar amounts for both varieties. Supplemental N, applied to the soil (S₂ or S₃) gave significantly higher yields than no supplemental N (S₀)

or foliar N (S_1). A significant fertilizer x variety interaction occurred in grain yield. Vic durum responded to NP and NPK (increased 11 bu/acre) more than Lloyd which showed, on the average, a moderate 5 bu/acre increase. Test weight was not significantly influenced by the treatments variable but a significant x variety interaction was obtained. Lower test weights were obtained on the Lloyd variety with maximum fertilizer rates but had no influence on the Vic variety. Actual seed weights (grams/1000) were significantly higher on the Lloyd variety than Vic. Seed weight also decreased as fertilizer rates were increased with a significant fertilizer x variety interaction. Adding higher rates of NP or NPK decreased the seed weight of the Lloyd variety. The seed weight of Vic was only depressed when K was added.

Plant and Seed Nutrient Concentration and Uptake

The NPKSMnFeCuZn concentration and uptake by durum plants are summarized in Tables 6-13. The concentration of NKSMn was increased in the plant by high rates of NP or NPK, but the concentration of P decreased. Concentrations of Fe, Cu and Zn were not significantly influenced by fertilizer treatment even though Fe tended to decrease. Concentration of K was significantly lower on the Vic variety compared to Lloyd. The concentration of N was lower in plants that received foliar N (S_1) compared to soil applied N (S_2). The uptake of NPKSFeCu was not influenced by fertilizer rate. Plant uptake of Mn and Zn was greatly increased, mainly associated with increased dry matter, by the high NP and NPK fertilizer treatments. The uptake of both N and S was increased by supplemental N, applied as S_2 and S_3 methods. The uptake of K by the Lloyd durum plant exceeded the Vic variety by some 6 lb/acre. A number of significant fertilizer by variety interactions were obtained in uptake

of N, S, Mn and Cu. Uptake peaked with NP for the Vic variety and required NPK for maximum uptake by the Lloyd variety.

The NPKSMnFeCuZn concentration and uptake by the durum seed are summarized in Tables 14-21. N concentration and uptake by the seed was increased by the high N rates (F₂ and F₃). P concentration in the seed was decreased by NP and NPK but uptake tended to increase. The concentrations of NPKFeCuZn in the seed were lowest in the Lloyd variety, but uptake of PKSMn was significantly higher in the Lloyd variety compared to Vic. The concentration of N in the seed was lowest with foliar N when comparing all supplemental N treatments. P concentration was lower in the seed with soil applications of supplemental N. However uptake in the seed by both elements was highest in plots receiving supplemental soil N. Both K and S uptake by the seed were also significantly increased by plots receiving supplemental N applied to the soil compared to no supplemental N at a foliar N application alone. Significant variety x fertilizer interactions indicated that the concentration and uptake by the Vic variety was greater than the Lloyd variety although the levels under the F₁ treatment were much higher for Lloyd than Vic. This suggests that under low fertility the Lloyd variety will perform better in both yield and nutrient uptake, but once fertilized at a high rate, the Vic variety made better use of the fertilizer applied.

YIELD LIMITING FACTORS:

Climatic conditions were "unusual" throughout the year. A late frost occurred on May 17, shortly after the crop emerged. Both May and June were below normal in precipitation which influenced early growth. An extremely warm period, maximum air temperature exceeding 90 degrees, occurred in late May and early June. This warm period, accompanied with low precipitation, definitely placed the plant under stress because extremely low tillering was observed. The number of accumulated growing degree days for the season was lower than normal. Growing season precipitation was 1.4 inches below normal. The 2 inches above normal in July provided for excellent head/seed fill for the limited head number available. The wet July created very good yields for late seeded small grains, unfortunately this study was one of the first planted in the area. Although sprayed with fungicides, tan spot was evident (ratings not taken). Generally tan spot was more serious on the semidwarf varieties in the area in 1986.

PLANNED CHANGES FOR NEXT YEAR:

The maximum wheat yield trial will not be continued in 1987.

DATA CITATION AND ECONOMIC EVALUATION:

The data as reported is available for use by PPI/FAR, the project supporter. No economic evaluations were conducted on the data.

Table 1. Daily Growing Season Maximum and Minimum Air Temperatures at the Maximum Wheat Yield Trial: Minot, ND - 1986.

Day	April		May		June		July		August		September	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	54	24	57	28	96	45	71	53	77	50	78	43
2	61	32	53	31	72	49	76	53	73	47	69	45
3	47	30	62	32	92	59	80	55	78	50	66	49
4	48	29	76	43	78	51	85	57	85	54	70	45
5	47	31	84	49	76	51	80	55	89	59	65	40
6	47	37	52	32	75	54	70	50	88	59	52	31
7	67	33	48	29	75	50	75	51	82	54	65	37
8	59	28	51	30	78	48	82	49	81	54	68	34
9	58	32	49	39	75	53	82	54	89	57	72	39
10	68	40	64	37	73	54	81	59	72	40	61	46
11	69	45	72	47	79	46	75	57	69	45	57	44
12	47	14	74	41	83	55	70	52	78	51	71	42
13	32	15	65	40	73	48	62	52	85	59	51	37
14	24	13	72	42	75	44	80	56	85	58	50	40
15	25	12	61	41	79	50	81	57	83	59	53	42
16	38	15	60	34	68	40	84	54	92	54	58	43
17	52	30	52	29	72	43	80	63	76	41	51	47
18	45	38	67	31	79	55	84	57	75	52	59	44
19	44	36	72	51	88	58	83	57	85	59	57	44
20	54	32	69	50	95	54	73	52	90	50	52	45
21	44	25	77	47	77	54	78	55	71	46	58	48
22	53	30	75	50	74	53	83	57	72	49	60	39
23	79	45	67	47	80	53	87	61	72	51	68	37
24	66	33	60	42	76	51	87	61	82	59	72	45
25	55	35	68	41	88	55	77	55	87	53	67	47
26	46	35	78	45	84	67	83	59	75	46	64	45
27	44	33	80	50	89	54	78	60	63	44	70	39
28	39	26	87	55	78	53	80	52	69	42	70	40
29	63	29	86	54	79	54	82	56	75	50	57	45
30	62	30	88	59	59	52	87	49	86	55	60	36
31			90	61			77	49	85	61		
Mean (1985)	51	28	68	42	79	52	79	57	80	52	64	42
Mean (1905-1980)	53	28	66	40	75	50	82	55	81	52	70	42

Table 2. Daily Growing Season Precipitation Received at the Maximum Wheat Yield Trial: Minot, ND - 1986.

Day	Month					
	April	May	June	July	August	September
				inches		
1				.58	.10	
2				T		.18
3	.69	.01	.15			.03
4						
5	.04			.20	.06	
6	T	.85		T		
7		T	T		.03	
8		.02				
9		.52	.06		T	
10		.04	.07	.37		.03
11				T		T
12	.02		T	.55		
13	T			.25		T
14	.43*			.16	.51	T
15	.10*		.68	.22		.01
16			.03	.67		
17				.71		.21
18	.93			.11	T	.01
19	.55					.03
20	.01	T	.01			.13
21			.13	.04		.04
22					.11	
23		.03		T	.02	
24		.10			.03	
25	.19	T	.03			.67
26	.05				.20	
27	T					T
28			T	.21		.02
29	T					.49
30	.61		.14	.09		T
31						
* Snow						
Total (1985)	3.62	1.57	1.30	4.16	1.06	1.85
Average (1905-1980)	1.53	2.18	3.15	2.19	1.94	1.53

Table 3. Total Dry Matter and Height of Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}										Variety ^{3/}					
	S ₀		S ₁		S ₂		S ₃		V ₁	V ₂	Ave.	V ₁	V ₂	Ave.		
	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂								
F ₁	4394	4514	4454	4433	3632	4032	4032	5335	4390	4862	5613	5013	5313	4944	4387	4665
F ₂	4999	5603	5301	5877	5843	5860	5860	5344	6500	5922	5742	6385	6064	5491	6083	5787
F ₃	5810	5349	5579	6021	5157	5588	5588	6087	5167	5627	6289	6596	6643	6052	5567	5810
Ave.	5068	5156	5112	5443	4877	5160	5160	5589	5352	5470	5882	5998	5939	5495	5346	
	Total Dry Matter (lb/acre)															
F ₁	21.6	26.5	24.0	21.5	27.1	24.3	24.3	24.7	27.9	26.2	23.7	28.9	26.3	22.9	27.6	25.2
F ₂	23.5	30.2	26.9	23.7	29.5	26.6	26.6	24.2	29.1	26.7	24.4	30.6	27.5	24.0	29.9	26.9
F ₃	22.2	28.0	25.1	22.9	28.6	25.8	25.8	22.9	29.9	26.4	23.9	28.6	26.3	23.0	28.8	25.9
Ave.	22.4	28.2	25.3	22.7	28.4	25.6	25.6	24.0	29.0	26.5	24.0	29.4	26.7	23.3	28.7	
	Plant Height (inches)															

^{1/}Fertilizer treatment: F₁ = Fertilizer rate based on soil tests from F₁ fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F₂ = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;

Note: All treatments received 61 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Supplemental nitrogen: S₀ = no nitrogen applied; S₁ = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8; S₂ = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S₃ = 20 lb N/acre foliar and 20 lb N/acre soil applied (S₁ + S₂).

^{3/}Variety: V₁ = Lloyd durum (semidwarf variety); V₂ = Vic durum (normal height variety).

Table 4. Yield and Test Weight of Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}										Variety ^{3/}			
	S ₀		S ₁		S ₂		S ₃		Ave.		V ₁	V ₂	Ave.	
	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	Ave.	
F ₁	35.8	30.0	32.9	28.4	32.4	43.6	35.7	39.7	41.7	33.8	37.7	39.4	32.0	35.7
F ₂	45.4	43.3	44.4	43.8	43.9	48.1	42.8	45.5	45.5	42.8	44.2	45.8	43.1	44.5
F ₃	42.2	38.8	40.5	42.7	43.7	44.5	45.7	45.1	47.6	44.4	46.0	44.7	42.9	43.8
Ave.	41.1	37.4	39.2	38.3	40.0	45.4	41.4	43.4	44.9	40.3	42.6	43.3	39.3	
	Yield (bu/acre)													
F ₁	59.4	59.2	59.3	59.4	59.4	59.5	59.3	59.4	59.8	59.0	59.4	59.5	59.2	59.4
F ₂	58.7	59.3	59.0	59.5	59.3	59.2	58.7	59.0	59.2	59.2	59.2	59.0	59.2	59.1
F ₃	59.0	58.5	58.8	58.8	58.9	59.0	59.1	59.0	59.0	59.2	59.1	59.0	58.9	59.0
Ave.	59.1	59.0	59.0	59.2	59.2	59.2	59.0	59.1	59.3	59.1	59.2	59.2	59.1	59.1
	Test Weight (lb/bu)													

^{1/}Fertilizer treatment: F₁ = Fertilizer rate based on soil tests from F₁ fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F₂ = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;

Note: All treatments received 61 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Supplemental nitrogen: S₀ = no nitrogen applied; S₁ = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8; S₂ = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S₃ = 20 lb N/acre foliar and 20 lb N/acre soil applied (S₁ + S₂).

^{3/}Variety: V₁ = Lloyd durum (semidwarf variety); V₂ = Vic durum (normal height variety).

Table 5. Weight of Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}												Variety ^{3/}		
	S ₀			S ₁			S ₂			S ₃			V ₁	V ₂	Ave.
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.
F ₁	57.9	52.9	55.4	57.7	53.7	55.7	55.0	54.3	54.7	56.1	51.8	53.9	56.6	53.2	54.9
F ₂	54.1	54.2	54.2	52.7	54.8	53.8	54.8	53.8	54.3	53.2	53.0	53.1	53.7	54.0	53.8
F ₃	53.6	53.1	53.3	53.1	51.2	52.2	54.5	52.1	53.3	53.3	52.6	53.0	53.6	52.2	52.9
Ave.	55.2	53.4	54.3	54.5	53.2	53.9	54.8	53.4	54.1	54.2	52.5	53.3	54.7	53.1	

Seed Weight (gram/1000)

^{1/}Fertilizer treatment: F₁ = Fertilizer rate based on soil tests from F₁ fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F₂ = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;

Note: All treatments received 61 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Supplemental nitrogen: S₀ = no nitrogen applied; S₁ = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8; S₂ = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S₃ = 20 lb N/acre foliar and 20 lb N/acre soil applied (S₁ + S₂).

^{3/}Variety: V₁ = Lloyd durum (semidwarf variety); V₂ = Vic durum (normal height variety).

Table 6. Nitrogen Concentration and Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}										Variety ^{3/}				
	S0			S1			S2			S3			V1	V2	Ave.
	V1	V2	Ave.	V1	V2	Ave.	V1	V2	Ave.	V1	V2	Ave.	V1	V2	Ave.
F1	1.69	1.61	1.65	1.60	1.49	1.54	1.70	1.76	1.73	1.66	1.64	1.65	1.66	1.63	1.64
F2	1.70	1.79	1.75	1.74	1.75	1.75	1.73	1.82	1.78	1.77	1.80	1.78	1.74	1.79	1.76
F3	1.74	1.84	1.79	1.71	1.85	1.78	1.78	1.82	1.80	1.78	1.80	1.79	1.75	1.83	1.79
Ave.	1.71	1.75	1.73	1.68	1.70	1.69	1.74	1.80	1.77	1.74	1.75	1.74	1.72	1.75	1.75
	N Concentration (%)														
F1	75.4	74.6	75.0	71.6	54.3	62.9	90.7	77.2	83.9	92.5	82.2	87.3	82.5	72.1	77.3
F2	84.8	100.6	92.7	102.2	102.2	102.2	92.8	118.2	105.5	101.3	113.9	107.6	95.3	108.7	102.0
F3	100.9	98.9	99.9	102.4	95.0	98.7	108.5	93.4	101.0	111.2	118.0	114.6	105.7	101.3	103.5
Ave.	87.0	91.4	89.1	92.1	83.8	87.9	97.3	96.3	96.8	101.7	104.7	103.2	94.5	94.0	94.0
	N Uptake (lb/acre)														

^{1/}Fertilizer treatment: F₁ = Fertilizer rate based on soil tests from F₁ fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F₂ = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;
 Note: All treatments received 61 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Supplemental nitrogen: S₀ = no nitrogen applied; S₁ = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8; S₂ = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S₃ = 20 lb N/acre foliar and 20 lb N/acre soil applied (S₁ + S₂).

^{3/}Variety: V₁ = Lloyd durum (semidwarf variety); V₂ = Vic durum (normal height variety).

Table 7. Phosphorus Concentration and Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}										Variety ^{3/}				
	S0		S1		S2		S3		Ave.		V1	V2	Ave.		
	V1	V2	V1	V2	V1	V2	V1	V2	Ave.	V1	V2	Ave.			
F1	.288	.262	.275	.272	.278	.278	.275	.260	.252	.248	.260	.254	.263	.265	.264
F2	.255	.232	.244	.258	.230	.230	.244	.235	.239	.242	.245	.244	.249	.236	.242
F3	.258	.248	.252	.245	.262	.262	.254	.238	.245	.260	.238	.249	.254	.246	.250
Ave.	.267	.248	.257	.258	.257	.257	.258	.244	.245	.250	.248	.249	.255	.249	
	<u>P Concentration (%)</u>														
F1	12.6	11.8	12.2	12.1	10.1	10.1	11.1	13.0	11.3	12.2	13.6	13.0	12.8	11.6	12.2
F2	12.6	13.0	12.8	15.0	13.3	13.3	14.1	13.0	15.3	14.1	13.8	15.5	13.6	14.3	13.9
F3	15.0	13.3	14.1	14.7	13.5	13.5	14.1	15.3	12.1	13.7	16.1	15.6	15.3	13.6	14.5
Ave.	13.4	12.7	13.0	13.9	12.3	12.3	13.1	13.8	12.9	13.3	14.5	14.7	14.6	13.2	
	<u>P Uptake (lb/acre)</u>														
F1	12.6	11.8	12.2	12.1	10.1	10.1	11.1	13.0	11.3	12.2	13.6	13.0	12.8	11.6	12.2
F2	12.6	13.0	12.8	15.0	13.3	13.3	14.1	13.0	15.3	14.1	13.8	15.5	13.6	14.3	13.9
F3	15.0	13.3	14.1	14.7	13.5	13.5	14.1	15.3	12.1	13.7	16.1	15.6	15.3	13.6	14.5
Ave.	13.4	12.7	13.0	13.9	12.3	12.3	13.1	13.8	12.9	13.3	14.5	14.7	14.6	13.2	

^{1/}Fertilizer treatment: F1 = Fertilizer rate based on soil tests from F1 fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F2 = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F3 = Same as F2 except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;

Note: All treatments received 61 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Supplemental nitrogen: S0 = no nitrogen applied; S1 = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8; S2 = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S3 = 20 lb N/acre foliar and 20 lb N/acre soil applied (S1 + S2).

^{3/}Variety: V1 = Lloydurum (semidwarf variety); V2 = Vic durum (normal height variety).

Table 8. Potassium Concentration and Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}										Variety ^{3/}					
	S ₀			S ₁			S ₂			S ₃			V ₁	V ₂	Ave.	
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.				
F ₁	0.85	0.80	0.82	0.84	0.76	0.80	0.84	0.76	0.80	0.89	0.72	0.81	0.86	0.76	0.81	
F ₂	0.90	0.84	0.87	0.93	0.83	0.88	0.91	0.87	0.89	0.90	0.85	0.87	0.91	0.85	0.88	
F ₃	0.98	0.87	0.92	0.96	0.89	0.92	1.01	1.00	1.01	1.02	0.90	0.96	0.99	0.91	0.95	
Ave.	0.91	0.84	0.87	0.91	0.82	0.87	0.92	0.88	0.90	0.94	0.82	0.88	0.92	0.84		
<u>K Concentration (%)</u>																
F ₁	38.6	36.7	37.7	37.4	27.7	32.6	45.2	33.4	39.3	51.6	36.5	44.1	43.2	33.6	38.4	
F ₂	45.2	46.9	46.1	53.9	48.0	51.0	49.0	55.8	52.4	51.5	55.8	53.7	49.9	51.6	50.8	
F ₃	57.5	46.8	52.1	58.1	45.9	52.0	63.0	50.8	56.9	65.9	60.2	63.1	61.1	50.9	56.0	
Ave.	47.1	43.5	45.3	49.8	40.6	45.2	52.4	46.7	49.6	56.4	50.8	53.6	51.4	45.4		
<u>K Uptake (lb/acre)</u>																
F ₁	38.6	36.7	37.7	37.4	27.7	32.6	45.2	33.4	39.3	51.6	36.5	44.1	43.2	33.6	38.4	
F ₂	45.2	46.9	46.1	53.9	48.0	51.0	49.0	55.8	52.4	51.5	55.8	53.7	49.9	51.6	50.8	
F ₃	57.5	46.8	52.1	58.1	45.9	52.0	63.0	50.8	56.9	65.9	60.2	63.1	61.1	50.9	56.0	
Ave.	47.1	43.5	45.3	49.8	40.6	45.2	52.4	46.7	49.6	56.4	50.8	53.6	51.4	45.4		

^{1/}Fertilizer treatment: F₁ = Fertilizer rate based on soil tests from F₁ fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F₂ = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;

Note: All treatments received 61 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Supplemental nitrogen: S₀ = no nitrogen applied; S₁ = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8; S₂ = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S₃ = 20 lb N/acre foliar and 20 lb N/acre soil applied (S₁ + S₂).

^{3/}Variety: V₁ = Lloyd durum (semidwarf variety); V₂ = Vic durum (normal height variety).

Table 9. Sulfur Concentration and Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}										Variety ^{3/}					
	S ₀			S ₁			S ₂			S ₃			V ₁	V ₂	Ave.	
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.				
F ₁	.142	.132	.137	.137	.115	.126	.147	.139	.143	.150	.132	.141	.144	.130	.137	
F ₂	.153	.148	.150	.159	.157	.158	.156	.152	.154	.154	.162	.158	.155	.155	.155	
F ₃	.154	.152	.153	.147	.172	.160	.156	.154	.155	.158	.163	.161	.154	.161	.157	
Ave.	.150	.144	.147	.148	.148	.148	.153	.148	.151	.154	.153	.153	.151	.148	.153	
S Concentration (%)																
F ₁	6.4	6.1	6.3	6.1	4.2	5.2	7.8	6.1	7.0	8.4	6.6	7.5	7.2	5.8	6.5	
F ₂	7.6	8.3	8.0	9.2	9.1	9.2	8.3	9.9	9.1	8.8	10.2	9.5	8.5	9.4	8.9	
F ₃	9.0	8.1	8.5	8.8	8.8	8.8	9.6	7.9	8.7	10.0	10.9	10.4	9.3	8.9	9.1	
Ave.	7.7	7.5	7.6	8.1	7.4	7.7	8.6	8.0	8.3	9.0	9.2	9.1	8.3	8.0	8.3	
S Uptake (lb/acre)																
F ₁	6.4	6.1	6.3	6.1	4.2	5.2	7.8	6.1	7.0	8.4	6.6	7.5	7.2	5.8	6.5	
F ₂	7.6	8.3	8.0	9.2	9.1	9.2	8.3	9.9	9.1	8.8	10.2	9.5	8.5	9.4	8.9	
F ₃	9.0	8.1	8.5	8.8	8.8	8.8	9.6	7.9	8.7	10.0	10.9	10.4	9.3	8.9	9.1	
Ave.	7.7	7.5	7.6	8.1	7.4	7.7	8.6	8.0	8.3	9.0	9.2	9.1	8.3	8.0	8.3	

^{1/}Fertilizer treatment: F₁ = Fertilizer rate based on soil tests from F₁ fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F₂ = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;

^{2/}Supplemental nitrogen: S₀ = no nitrogen applied; S₁ = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8; S₂ = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S₃ = 20 lb N/acre foliar and 20 lb N/acre soil applied (S₁ + S₂).

^{3/}variety: V₁ = Lloydd durum (semidwarf variety); V₂ = Vic durum (normal height variety).

Table 10. Manganese Concentration and Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}										Variety ^{3/}		
	S ₀		S ₁		S ₂		S ₃		Ave.		V ₁	V ₂	Ave.
	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	Ave.
F ₁	41.5	37.8	39.6	33.8	37.0	37.2	38.6	38.0	32.2	35.1	38.3	36.1	37.2
F ₂	42.8	46.5	44.6	42.5	46.2	47.8	44.5	40.8	47.2	44.0	41.8	46.9	44.4
F ₃	40.5	42.0	41.2	43.2	40.8	41.8	41.6	38.5	43.8	41.1	40.9	42.1	41.5
Ave.	41.6	42.1	41.8	39.8	41.3	42.2	41.6	39.1	41.1	40.1	40.3	41.7	
	Mn Concentration (ppm)												
F ₁	.187	.170	.179	.153	.134	.163	.189	.208	.161	.185	.191	.157	.174
F ₂	.216	.262	.239	.246	.273	.314	.269	.232	.310	.271	.229	.289	.260
F ₃	.232	.217	.224	.254	.209	.210	.226	.240	.275	.258	.242	.228	.235
Ave.	.212	.217	.214	.217	.205	.229	.228	.226	.249	.238	.221	.225	
	Mn Uptake (lb/acre)												
F ₁	.187	.170	.179	.153	.134	.163	.189	.208	.161	.185	.191	.157	.174
F ₂	.216	.262	.239	.246	.273	.314	.269	.232	.310	.271	.229	.289	.260
F ₃	.232	.217	.224	.254	.209	.210	.226	.240	.275	.258	.242	.228	.235
Ave.	.212	.217	.214	.217	.205	.229	.228	.226	.249	.238	.221	.225	

^{1/}Fertilizer treatment: F₁ = Fertilizer rate based on soil tests from F₁ fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F₂ = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;
 Note: All treatments received 61 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Supplemental nitrogen: S₀ = no nitrogen applied; S₁ = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8; S₂ = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S₃ = 20 lb N/acre foliar and 20 lb N/acre soil applied (S₁ + S₂).

^{3/}Variety: V₁ = Lloyd durum (semidwarf variety); V₂ = Vic durum (normal height variety).

Table 11. Iron Concentration and Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}										Variety ^{3/}				
	S0			S1			S2			S3			V1	V2	Ave.
	V1	V2	Ave.	V1	V2	Ave.	V1	V2	Ave.	V1	V2	Ave.	V1	V2	Ave.
F1	65.5	72.5	<u>69.0</u>	80.0	64.2	<u>72.1</u>	62.5	68.0	<u>65.2</u>	64.8	61.0	<u>62.9</u>	68.1	66.4	<u>67.3</u>
F2	67.5	69.0	<u>68.2</u>	68.8	59.5	<u>64.1</u>	61.5	59.8	<u>60.6</u>	60.2	58.0	<u>59.1</u>	64.5	61.6	<u>63.0</u>
F3	59.0	60.2	<u>59.6</u>	63.0	63.8	<u>63.4</u>	60.2	59.5	<u>59.9</u>	62.0	68.2	<u>65.1</u>	61.1	62.9	<u>62.0</u>
Ave.	<u>64.0</u>	<u>67.2</u>	<u>65.6</u>	<u>70.6</u>	<u>62.5</u>	<u>66.5</u>	<u>61.4</u>	<u>62.4</u>	<u>61.9</u>	<u>62.3</u>	<u>62.4</u>	<u>62.4</u>	<u>64.6</u>	<u>63.6</u>	<u>62.4</u>
<u>Fe Concentration (ppm)</u>															
<u>Fe Uptake (lb/acre)</u>															
F1	.288	.328	<u>.308</u>	.345	.234	<u>.289</u>	.331	.302	<u>.316</u>	.351	.306	<u>.328</u>	.329	.292	<u>.311</u>
F2	.334	.390	<u>.362</u>	.401	.345	<u>.373</u>	.326	.387	<u>.356</u>	.342	.367	<u>.354</u>	.351	.372	<u>.361</u>
F3	.334	.319	<u>.326</u>	.373	.326	<u>.350</u>	.352	.300	<u>.326</u>	.374	.427	<u>.400</u>	.358	.343	<u>.350</u>
Ave.	<u>.319</u>	<u>.346</u>	<u>.332</u>	<u>.373</u>	<u>.302</u>	<u>.337</u>	<u>.336</u>	<u>.330</u>	<u>.333</u>	<u>.356</u>	<u>.366</u>	<u>.361</u>	<u>.346</u>	<u>.336</u>	<u>.361</u>

^{1/}Fertilizer treatment: F1 = Fertilizer rate based on soil tests from F1 fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F2 = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F3 = Same as F2 except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;

Note: All treatments received 61 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Supplemental nitrogen: S0 = no nitrogen applied; S1 = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8; S2 = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S3 = 20 lb N/acre foliar and 20 lb N/acre soil applied (S1 + S2).

^{3/}Variety: V1 = Lloyd durum (semidwarf variety); V2 = Vic durum (normal height variety).

Table 12. Copper Concentration and Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}										Variety ^{3/}				
	S ₀		S ₁		S ₂		S ₃		Ave.	V ₁	V ₂	Ave.			
	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂					V ₁	V ₂	Ave.
	Cu Concentration (ppm)														
F ₁	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	4.75	5.00	4.88	4.94	5.00	4.97
F ₂	4.75	4.75	5.00	5.25	5.00	5.00	5.00	5.00	5.00	4.75	5.00	4.88	4.88	5.00	4.94
F ₃	5.00	5.00	4.75	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	4.94	5.00	4.97
Ave.	<u>4.92</u>	<u>4.92</u>	<u>4.92</u>	<u>5.08</u>	<u>5.00</u>	<u>5.00</u>	<u>5.00</u>	<u>5.00</u>	<u>5.00</u>	<u>4.83</u>	<u>4.92</u>	<u>4.92</u>	<u>4.92</u>	<u>5.00</u>	<u>4.97</u>
	Cu Uptake (lb/acre)														
F ₁	.022	.023	.022	.018	.027	.022	.024	.026	.025	.026	.025	.026	.024	.022	.023
F ₂	.024	.027	.025	.030	.027	.032	.030	.027	.032	.027	.032	.030	.027	.030	.029
F ₃	.029	.027	.028	.026	.030	.026	.028	.031	.033	.031	.033	.032	.030	.028	.029
Ave.	<u>.025</u>	<u>.025</u>	<u>.025</u>	<u>.025</u>	<u>.028</u>	<u>.027</u>	<u>.027</u>	<u>.028</u>	<u>.030</u>	<u>.028</u>	<u>.030</u>	<u>.029</u>	<u>.027</u>	<u>.027</u>	<u>.027</u>

^{1/}Fertilizer treatment: F₁ = Fertilizer rate based on soil tests from F₁ fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F₂ = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;

Note: All treatments received 61 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Supplemental nitrogen: S₀ = no nitrogen applied; S₁ = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8; S₂ = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S₃ = 20 lb N/acre foliar and 20 lb N/acre soil applied (S₁ + S₂).

^{3/}Variety: V₁ = Lloydd durum (semidwarf variety); V₂ = Vic durum (normal height variety).

Table 13. Zinc Concentration and Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}										Variety ^{3/}				
	S0			S1			S2			S3			V1	V2	Ave.
	V1	V2	Ave.	V1	V2	Ave.	V1	V2	Ave.	V1	V2	Ave.	V1	V2	Ave.
F1	23.8	25.2	24.5	22.5	25.8	24.1	23.0	26.5	24.8	23.0	23.5	23.2	23.1	25.2	24.1
F2	23.5	26.0	24.8	21.8	25.5	23.6	26.5	27.8	27.0	24.5	25.0	24.7	24.0	26.1	25.0
F3	25.8	26.8	26.2	25.8	26.8	26.2	24.2	27.8	26.0	25.8	26.2	26.0	25.4	26.9	26.1
Ave.	24.3	26.0	25.2	23.3	26.0	24.7	24.5	27.3	25.9	24.4	24.9	24.7	24.1	26.1	
<u>Zn Concentration (ppm)</u>															
F1	.106	.114	.110	.098	.094	.096	.121	.115	.118	.122	.118	.120	.112	.110	.111
F2	.116	.148	.132	.124	.143	.134	.140	.177	.158	.138	.157	.148	.129	.156	.143
F3	.146	.140	.143	.147	.135	.141	.134	.133	.134	.147	.165	.156	.144	.143	.143
Ave.	.123	.134	.128	.123	.124	.124	.132	.142	.137	.136	.147	.141	.128	.137	
<u>Zn Uptake (lb/acre)</u>															
F1	.106	.114	.110	.098	.094	.096	.121	.115	.118	.122	.118	.120	.112	.110	.111
F2	.116	.148	.132	.124	.143	.134	.140	.177	.158	.138	.157	.148	.129	.156	.143
F3	.146	.140	.143	.147	.135	.141	.134	.133	.134	.147	.165	.156	.144	.143	.143
Ave.	.123	.134	.128	.123	.124	.124	.132	.142	.137	.136	.147	.141	.128	.137	

^{1/}Fertilizer treatment: F1 = Fertilizer rate based on soil tests from F1 fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F2 = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F3 = Same as F2 except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;

Note: All treatments received 61 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Supplemental nitrogen: S0 = no nitrogen applied; S1 = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8; S2 = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S3 = 20 lb N/acre foliar and 20 lb N/acre soil applied (S1 + S2).

^{3/}Variety: V1 = Lloydd durum (semidwarf variety); V2 = Vic durum (normal height variety).

Table 14. Nitrogen Concentration and Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}										Variety ^{3/}					
	S ₀			S ₁			S ₂			S ₃			V ₁	V ₂	Ave.	
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	
F ₁	2.44	2.64	<u>2.54</u>	2.45	2.48	<u>2.47</u>	2.44	2.78	<u>2.61</u>	2.38	2.59	<u>2.49</u>	2.43	2.63	<u>2.53</u>	
F ₂	2.52	2.76	<u>2.64</u>	2.51	2.77	<u>2.64</u>	2.52	2.80	<u>2.66</u>	2.50	2.78	<u>2.64</u>	2.51	2.78	<u>2.64</u>	
F ₃	2.55	2.83	<u>2.69</u>	2.52	2.80	<u>2.66</u>	2.57	2.85	<u>2.71</u>	2.53	2.85	<u>2.69</u>	2.54	2.83	<u>2.69</u>	
Ave.	<u>2.50</u>	<u>2.75</u>	<u>2.63</u>	<u>2.49</u>	<u>2.68</u>	<u>2.59</u>	<u>2.51</u>	<u>2.81</u>	<u>2.66</u>	<u>2.47</u>	<u>2.74</u>	<u>2.60</u>	<u>2.49</u>	<u>2.74</u>	<u>2.60</u>	
<u>N Concentration (%)</u>																
F ₁	46.2	42.1	<u>44.1</u>	47.1	37.1	<u>42.1</u>	55.8	52.2	<u>54.0</u>	52.1	45.9	<u>49.0</u>	50.3	44.3	<u>47.3</u>	
F ₂	60.1	62.8	<u>61.4</u>	57.9	63.7	<u>60.8</u>	63.7	63.0	<u>63.4</u>	59.6	62.4	<u>61.0</u>	60.3	63.0	<u>61.6</u>	
F ₃	56.4	57.6	<u>57.0</u>	59.1	62.6	<u>60.9</u>	59.8	67.9	<u>63.8</u>	63.0	66.1	<u>64.6</u>	59.6	63.6	<u>61.6</u>	
Ave.	<u>54.2</u>	<u>54.2</u>	<u>54.2</u>	<u>54.7</u>	<u>54.5</u>	<u>54.6</u>	<u>59.8</u>	<u>61.0</u>	<u>60.4</u>	<u>58.2</u>	<u>58.1</u>	<u>58.2</u>	<u>56.7</u>	<u>57.0</u>	<u>57.0</u>	
<u>N Uptake (lb/acre)</u>																

^{1/}Fertilizer treatment: F₁ = Fertilizer rate based on soil tests from F₁ fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F₂ = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;
 Note: All treatments received 61 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Supplemental nitrogen: S₀ = no nitrogen applied; S₁ = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8; S₂ = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S₃ = 20 lb N/acre foliar and 20 lb N/acre soil applied (S₁ + S₂).

^{3/}Variety: V₁ = Lloyd durum (semidwarf variety); V₂ = Vic durum (normal height variety).

Table 15. Phosphorus Concentration and Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}										Variety ^{3/}					
	S ₀			S ₁			S ₂			S ₃			V ₁	V ₂	Ave.	
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	
F ₁	.430	.448	.439	.440	.442	.441	.440	.442	.442	.442	.432	.428	.426	.441	.433	
F ₂	.415	.430	.422	.415	.432	.424	.415	.438	.426	.410	.425	.418	.414	.431	.422	
F ₃	.412	.440	.426	.422	.432	.428	.415	.430	.422	.420	.430	.425	.418	.433	.425	
Ave.	.419	.439	.429	.426	.436	.431	.413	.437	.425	.418	.429	.423	.419	.435		
P Concentration (%)																
F ₁	8.1	7.1	7.6	8.5	6.6	7.5	9.4	8.3	8.8	9.3	7.7	8.5	8.8	7.4	8.1	
F ₂	9.9	9.8	9.8	9.6	9.9	9.8	10.5	9.8	10.2	9.8	9.6	9.7	9.9	9.8	9.9	
F ₃	9.1	8.9	9.0	9.9	9.7	9.8	9.7	10.3	10.0	10.5	10.0	10.3	9.8	9.7	9.8	
Ave.	9.0	8.6	8.8	9.3	8.7	9.0	9.9	9.5	9.7	9.8	9.1	9.5	9.5	9.0		
P Uptake (lb/acre)																
F ₁	8.1	7.1	7.6	8.5	6.6	7.5	9.4	8.3	8.8	9.3	7.7	8.5	8.8	7.4	8.1	
F ₂	9.9	9.8	9.8	9.6	9.9	9.8	10.5	9.8	10.2	9.8	9.6	9.7	9.9	9.8	9.9	
F ₃	9.1	8.9	9.0	9.9	9.7	9.8	9.7	10.3	10.0	10.5	10.0	10.3	9.8	9.7	9.8	
Ave.	9.0	8.6	8.8	9.3	8.7	9.0	9.9	9.5	9.7	9.8	9.1	9.5	9.5	9.0		

^{1/}Fertilizer treatment: F₁ = Fertilizer rate based on soil tests from F₁ fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F₂ = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;

Note: All treatments received 61 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Supplemental nitrogen: S₀ = no nitrogen applied; S₁ = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8; S₂ = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S₃ = 20 lb N/acre foliar and 20 lb N/acre soil applied (S₁ + S₂).

^{3/}Variety: V₁ = Lloyed durum (semidwarf variety); V₂ = Vic durum (normal height variety).

Table 16. Potassium Concentration and Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}												Variety ^{3/}					
	S ₀						S ₂						S ₃			V ₁	V ₂	Ave.
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.
F ₁	.528	.512	.520	.532	.512	.522	.520	.508	.514	.532	.508	.520	.528	.510	.519			
F ₂	.545	.500	.522	.550	.500	.525	.545	.502	.524	.552	.502	.528	.548	.501	.525			
F ₃	.540	.515	.528	.550	.502	.526	.548	.505	.526	.545	.502	.524	.546	.506	.526			
Ave.	.538	.509	.523	.544	.505	.524	.538	.505	.521	.543	.504	.524	.541	.506				
	<u>K Concentration (%)</u>																	
F ₁	9.9	8.0	9.0	10.2	7.6	8.9	12.0	9.5	10.7	11.7	9.0	10.3	10.9	8.5	9.7			
F ₂	13.0	11.4	12.2	12.7	11.5	12.1	13.8	11.3	12.5	13.2	11.3	12.2	13.2	11.4	12.3			
F ₃	12.0	10.5	11.2	12.9	11.2	12.1	12.8	12.1	12.5	13.7	11.7	12.7	12.8	11.4	12.1			
Ave.	11.6	10.0	10.8	11.9	10.1	11.0	12.9	11.0	11.9	12.8	10.7	11.8	12.3	10.4				
	<u>K Uptake (lb/acre)</u>																	
F ₁	9.9	8.0	9.0	10.2	7.6	8.9	12.0	9.5	10.7	11.7	9.0	10.3	10.9	8.5	9.7			
F ₂	13.0	11.4	12.2	12.7	11.5	12.1	13.8	11.3	12.5	13.2	11.3	12.2	13.2	11.4	12.3			
F ₃	12.0	10.5	11.2	12.9	11.2	12.1	12.8	12.1	12.5	13.7	11.7	12.7	12.8	11.4	12.1			
Ave.	11.6	10.0	10.8	11.9	10.1	11.0	12.9	11.0	11.9	12.8	10.7	11.8	12.3	10.4				

^{1/}Fertilizer treatment: F₁ = Fertilizer rate based on soil tests from F₁ fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F₂ = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;

Note: All treatments received 61 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Supplemental nitrogen: S₀ = no nitrogen applied; S₁ = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8;

S₂ = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S₃ = 20 lb N/acre foliar and 20 lb N/acre soil applied (S₁ + S₂).

^{3/}Variety: V₁ = Lloyd durum (semidwarf variety); V₂ = Vic durum (normal height variety).

Table 17. Sulfur Concentration and Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}										Variety ^{3/}				
	S ₀		S ₁		S ₂		S ₃		Ave.	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂							
F ₁	.190	.183	.186	.189	.180	.185	.189	.195	.192	.183	.183	.183	.188	.185	.186
F ₂	.203	.202	.202	.192	.199	.196	.201	.200	.200	.193	.200	.197	.197	.200	.199
F ₃	.199	.203	.201	.194	.203	.199	.201	.203	.202	.196	.203	.200	.198	.203	.200
Ave.	.197	.196	.197	.192	.194	.193	.197	.199	.198	.191	.195	.193	.194	.196	
S Concentration (%)															
F ₁	3.6	2.9	3.2	3.6	2.7	3.2	4.3	3.7	4.0	4.0	3.2	3.6	3.9	3.1	3.5
F ₂	4.8	4.6	4.7	4.4	4.6	4.5	5.1	4.5	4.8	4.6	4.5	4.6	4.7	4.6	4.6
F ₃	4.4	4.1	4.3	4.5	4.6	4.5	4.7	4.9	4.8	4.9	4.8	4.8	4.6	4.6	4.6
Ave.	4.3	3.9	4.1	4.2	3.9	4.1	4.7	4.4	4.5	4.5	4.2	4.3	4.4	4.1	
S Uptake (lb/acre)															
F ₁	3.6	2.9	3.2	3.6	2.7	3.2	4.3	3.7	4.0	4.0	3.2	3.6	3.9	3.1	3.5
F ₂	4.8	4.6	4.7	4.4	4.6	4.5	5.1	4.5	4.8	4.6	4.5	4.6	4.7	4.6	4.6
F ₃	4.4	4.1	4.3	4.5	4.6	4.5	4.7	4.9	4.8	4.9	4.8	4.8	4.6	4.6	4.6
Ave.	4.3	3.9	4.1	4.2	3.9	4.1	4.7	4.4	4.5	4.5	4.2	4.3	4.4	4.1	

^{1/}Fertilizer treatment: F₁ = Fertilizer rate based on soil tests from F₁ fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F₂ = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;

Note: All treatments received 61 lb/acre 11-52-0 applied with the seed at planting.
^{2/}Supplemental nitrogen: S₀ = no nitrogen applied; S₁ = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8; S₂ = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S₃ = 20 lb N/acre foliar and 20 lb N/acre soil applied (S₁ + S₂).

^{3/}Variety: V₁ = Lloyd durum (semidwarf variety); V₂ = Vic durum (normal height variety).

Table 18. Manganese Concentration and Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}										Variety ^{3/}			
	S ₀		S ₁		S ₂		S ₃		Ave.		V ₁	V ₂	Ave.	
	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	Ave.	
F ₁	42.0	44.2	43.1	41.2	42.2	44.2	40.2	42.2	40.2	39.0	39.6	40.9	42.4	41.7
F ₂	44.5	45.0	44.8	43.5	44.5	45.5	43.8	44.6	43.8	44.2	44.0	43.9	44.8	44.3
F ₃	43.2	44.0	43.6	42.5	43.8	42.8	41.8	42.2	42.0	43.2	42.6	42.4	43.4	42.9
Ave.	43.2	44.4	43.8	42.4	43.5	44.2	41.9	43.0	42.0	42.1	42.1	42.4	43.6	
	Mn Concentration (ppm)													
F ₁	.079	.070	.075	.079	.063	.083	.092	.088	.087	.069	.078	.084	.071	.078
F ₂	.106	.102	.104	.101	.102	.102	.110	.106	.104	.100	.102	.105	.102	.104
F ₃	.095	.089	.092	.099	.098	.100	.096	.098	.103	.100	.102	.098	.097	.098
Ave.	.093	.087	.090	.093	.088	.095	.100	.097	.098	.090	.093	.096	.090	
	Mn Uptake (lb/acre)													
F ₁	.079	.070	.075	.079	.063	.083	.092	.088	.087	.069	.078	.084	.071	.078
F ₂	.106	.102	.104	.101	.102	.102	.110	.106	.104	.100	.102	.105	.102	.104
F ₃	.095	.089	.092	.099	.098	.100	.096	.098	.103	.100	.102	.098	.097	.098
Ave.	.093	.087	.090	.093	.088	.095	.100	.097	.098	.090	.093	.096	.090	

^{1/}Fertilizer treatment: F₁ = Fertilizer rate based on soil tests from F₁ fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F₂ = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;
 Note: All treatments received 61 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Supplemental nitrogen: S₀ = no nitrogen applied; S₁ = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8; S₂ = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S₃ = 20 lb N/acre foliar and 20 lb N/acre soil applied (S₁ + S₂).

^{3/}Variety: V₁ = Lloyed durum (semidwarf variety); V₂ = Vic durum (normal height variety).

Table 19. Iron Concentration and Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}										Variety ^{3/}				
	S0			S1			S2			S3			V1	V2	Ave.
	V1	V2	Ave.	V1	V2	Ave.	V1	V2	Ave.	V1	V2	Ave.	V1	V2	Ave.
F1	43.5	45.2	<u>44.4</u>	42.0	42.8	<u>42.4</u>	41.2	53.2	<u>47.2</u>	40.2	43.0	<u>41.6</u>	41.8	46.0	<u>43.9</u>
F2	43.5	46.0	<u>44.8</u>	42.5	47.5	<u>45.0</u>	43.8	47.2	<u>45.5</u>	42.2	47.2	<u>44.8</u>	43.0	47.0	<u>45.0</u>
F3	44.5	48.2	<u>46.4</u>	41.8	47.8	<u>44.8</u>	43.2	46.8	<u>45.0</u>	42.0	46.8	<u>44.4</u>	42.9	47.4	<u>45.1</u>
Ave.	<u>43.8</u>	<u>46.5</u>	<u>45.2</u>	<u>42.1</u>	<u>46.0</u>	<u>44.0</u>	<u>42.8</u>	<u>49.1</u>	<u>45.9</u>	<u>41.5</u>	<u>45.7</u>	<u>43.6</u>	<u>42.5</u>	<u>46.8</u>	
<u>Fe Concentration (ppm)</u>															
F1	.082	.072	<u>.077</u>	.081	.064	<u>.072</u>	.094	.099	<u>.097</u>	.088	.076	<u>.082</u>	.086	.078	<u>.082</u>
F2	.103	.105	<u>.104</u>	.098	.109	<u>.103</u>	.110	.106	<u>.108</u>	.100	.106	<u>.103</u>	.103	.106	<u>.105</u>
F3	.098	.098	<u>.098</u>	.097	.107	<u>.102</u>	.100	.109	<u>.105</u>	.103	.107	<u>.105</u>	.100	.105	<u>.102</u>
Ave.	<u>.094</u>	<u>.091</u>	<u>.093</u>	<u>.092</u>	<u>.093</u>	<u>.092</u>	<u>.102</u>	<u>.105</u>	<u>.103</u>	<u>.097</u>	<u>.096</u>	<u>.097</u>	<u>.096</u>	<u>.096</u>	
<u>Fe Uptake (lb/acre)</u>															
F1	.082	.072	<u>.077</u>	.081	.064	<u>.072</u>	.094	.099	<u>.097</u>	.088	.076	<u>.082</u>	.086	.078	<u>.082</u>
F2	.103	.105	<u>.104</u>	.098	.109	<u>.103</u>	.110	.106	<u>.108</u>	.100	.106	<u>.103</u>	.103	.106	<u>.105</u>
F3	.098	.098	<u>.098</u>	.097	.107	<u>.102</u>	.100	.109	<u>.105</u>	.103	.107	<u>.105</u>	.100	.105	<u>.102</u>
Ave.	<u>.094</u>	<u>.091</u>	<u>.093</u>	<u>.092</u>	<u>.093</u>	<u>.092</u>	<u>.102</u>	<u>.105</u>	<u>.103</u>	<u>.097</u>	<u>.096</u>	<u>.097</u>	<u>.096</u>	<u>.096</u>	

^{1/}Fertilizer treatment: F1 = Fertilizer rate based on soil tests from F1 fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F2 = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F3 = Same as F2 except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;

Note: All treatments received 61 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Supplemental nitrogen: S0 = no nitrogen applied; S1 = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8; S2 = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S3 = 20 lb N/acre foliar and 20 lb N/acre soil applied (S1 + S2).

^{3/}Variety: V1 = Lloyd durum (semidwarf variety); V2 = Vic durum (normal height variety).

Table 20. Copper Concentration and Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}										Variety ^{3/}				
	S0		S1		S2		S3		Ave.		V1	V2	Ave.		
	V1	V2	V1	V2	V1	V2	V1	V2	V1	V2	V1	V2	Ave.		
F1	6.50	9.00	7.75	7.25	6.25	7.25	6.50	7.75	7.12	6.25	6.75	6.50	6.38	7.69	7.03
F2	6.75	7.00	6.88	7.25	6.50	7.25	6.75	7.00	6.88	6.50	7.00	6.75	6.62	7.06	6.84
F3	6.25	6.75	6.50	7.50	6.25	7.50	6.25	7.00	6.62	6.25	8.50	7.38	6.25	7.44	6.84
Ave.	6.50	7.58	7.04	7.33	6.33	7.33	6.50	7.25	6.88	6.33	7.42	6.88	6.42	7.40	
	Cu Concentration (ppm)														
F1	0.012	0.015	0.013	0.011	0.012	0.011	0.015	0.014	0.015	0.014	0.012	0.013	0.013	0.013	0.013
F2	0.016	0.016	0.016	0.017	0.015	0.017	0.017	0.016	0.016	0.015	0.016	0.016	0.016	0.016	0.016
F3	0.014	0.014	0.014	0.017	0.015	0.017	0.015	0.017	0.016	0.016	0.019	0.017	0.015	0.017	0.016
Ave.	0.014	0.015	0.014	0.015	0.014	0.015	0.016	0.016	0.016	0.015	0.015	0.015	0.015	0.015	0.015
	Cu Uptake (lb/acre)														
F1	0.012	0.015	0.013	0.011	0.012	0.011	0.015	0.014	0.015	0.014	0.012	0.013	0.013	0.013	0.013
F2	0.016	0.016	0.016	0.017	0.015	0.017	0.017	0.016	0.016	0.015	0.016	0.016	0.016	0.016	0.016
F3	0.014	0.014	0.014	0.017	0.015	0.017	0.015	0.017	0.016	0.016	0.019	0.017	0.015	0.017	0.016
Ave.	0.014	0.015	0.014	0.015	0.014	0.015	0.016	0.016	0.016	0.015	0.015	0.015	0.015	0.015	0.015

^{1/}Fertilizer treatment: F1 = Fertilizer rate based on soil tests from F1 fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F2 = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F3 = Same as F2 except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;

^{2/}Supplemental nitrogen: S0 = no nitrogen applied; S1 = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8; S2 = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S3 = 20 lb N/acre foliar and 20 lb N/acre soil applied (S1 + S2).

^{3/}Variety: V1 = Lloyd durum (semidwarf variety); V2 = Vic durum (normal height variety).

Table 21. Zinc Concentration and Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Supplemental Nitrogen: Minot, ND - 1986.

Fertilizer Treatment ^{1/}	Supplemental Nitrogen Treatment ^{2/}										Variety ^{3/}				
	S ₀		S ₁		S ₂		S ₃		Ave.		V ₁	V ₂	Ave.		
	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	V ₁	V ₂	Ave.		
	Zn Concentration (ppm)														
F ₁	36.2	42.8	39.5	40.5	36.5	40.5	34.5	41.2	37.9	35.2	40.2	37.8	35.6	41.2	38.4
F ₂	39.2	42.0	40.6	41.2	38.8	41.2	38.8	45.2	42.0	40.2	43.2	41.8	39.2	42.9	41.1
F ₃	37.0	43.0	40.0	46.0	38.8	46.0	33.8	40.2	37.0	35.2	42.2	38.8	36.2	42.9	39.5
Ave.	37.5	42.6	40.0	42.6	38.0	42.6	35.7	42.2	39.0	36.9	41.9	39.4	37.0	42.3	
	Zn Uptake (lb/acre)														
F ₁	.067	.069	.068	.060	.070	.060	.078	.078	.078	.075	.071	.073	.073	.069	.071
F ₂	.093	.095	.094	.094	.089	.094	.098	.101	.100	.097	.097	.097	.094	.097	.096
F ₃	.082	.087	.084	.103	.091	.103	.077	.092	.084	.086	.095	.091	.084	.094	.089
Ave.	.081	.084	.082	.086	.083	.086	.084	.090	.087	.086	.088	.087	.084	.087	.087

^{1/}Fertilizer treatment: F₁ = Fertilizer rate based on soil tests from F₁ fertilizer plot and yield goal of 35 bu/acre (none required in 1986); F₂ = Nitrogen (120 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep band placed in the spring; F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring;

Note: All treatments received 61 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Supplemental nitrogen: S₀ = no nitrogen applied; S₁ = 20 lb/acre of N foliar applied as 28-0-0 at growth stage 8; S₂ = 20 lb/acre of N applied surface band (dribble) preplant as 28-0-0; S₃ = 20 lb N/acre foliar and 20 lb N/acre soil applied (S₁ + S₂).

^{3/}Variety: V₁ = Lloyd durum (semidwarf variety); V₂ = Vic durum (normal height variety).

Table 22. Tests of Significance for Variables Measured in the Maximum Durum Wheat Yield Study as Influenced by Fertilizer Treatment, Variety, Supplemental Nitrogen and Subsequent Interactions Minot, ND - 1986.

Variable	Source							
	Fertilizer		Supplemental N		Variety		x	
	Fertilizer	Supplemental N	Fertilizer	Supplemental N	Fertilizer	Supplemental N	Fertilizer	Supplemental N
Plant Height	NS	0.68	***	NS	NS	NS	NS	NS
Plant Dry Matter	NS	628	NS	NS	NS	NS	662	NS
Plant Nutrients								
Concentration								
N	.12	.05	NS	NS	NS	NS	NS	NS
P	.011	NS	NS	NS	NS	NS	NS	NS
K	.06	NS	***	NS	NS	NS	NS	NS
S	.014	NS	NS	NS	NS	NS	.009	NS
Mn	5.2	NS	NS	NS	NS	NS	NS	NS
Fe	NS	NS	NS	NS	NS	NS	NS	NS
Cu	NS	NS	NS	NS	NS	NS	NS	NS
Zn	NS	NS	NS	NS	NS	NS	NS	NS
Uptake								
N	NS	10.8	NS	NS	NS	NS	12.3	NS
P	NS	NS	NS	NS	NS	NS	NS	NS
K	NS	NS	*	NS	NS	NS	NS	NS
S	NS	0.95	NS	NS	NS	NS	1.06	NS
Mn	.065	NS	NS	NS	NS	NS	.042	NS
Fe	NS	NS	NS	NS	NS	NS	NS	NS
Cu	NS	NS	NS	NS	NS	NS	NS	NS
Zn	.022	NS	NS	NS	NS	NS	.002	NS

Table 22. Continued.

Variable	Source							
	Fertilizer		Supplemental		Variety		Variety x Supplemental	
	N		N		N		N	
Seed Yield	NS		2.54	***	NS		NS	
Test Weight	NS		NS	NS	NS		NS	2.6
Seed Weight	1.05		NS	**	NS		NS	0.26
Seed Nutrients								2.17
Concentration								
N	.070		.046	***	NS		NS	.056
P	.007		.006	***	NS		NS	NS
K	NS		NS	***	NS		NS	.015
S	NS		.004	NS	NS		NS	NS
Mn	NS		1.36	NS	NS		NS	NS
Fe	NS		NS	***	NS		NS	NS
Cu	NS		NS	***	NS		NS	NS
Zn	NS		NS	***	NS		NS	NS
Uptake								
N	12.6		3.48	NS	NS		NS	3.6
P	NS		0.63	**	NS		NS	0.57
K	NS		0.76	*	NS		NS	NS
S	NS		0.26	**	NS		NS	NS
Mn	.012		NS	**	NS		NS	.007
Fe	NS		.007	NS	NS		NS	NS
Cu	NS		NS	NS	NS		NS	NS
Zn	NS		NS	NS	NS		NS	.006

Statistical analysis run on the computer using SAS procedures. Tests of significance were determined by Waller-Duncan K-Ratio T Test (Bayes LSD) at the .05 level of significance. NS = non significant, * = comparing only two means with significance at .05 level (** = .01 level and *** = .001 level), Number value = unit of difference required to be significant at the .05 level according to Bayes LSD.

