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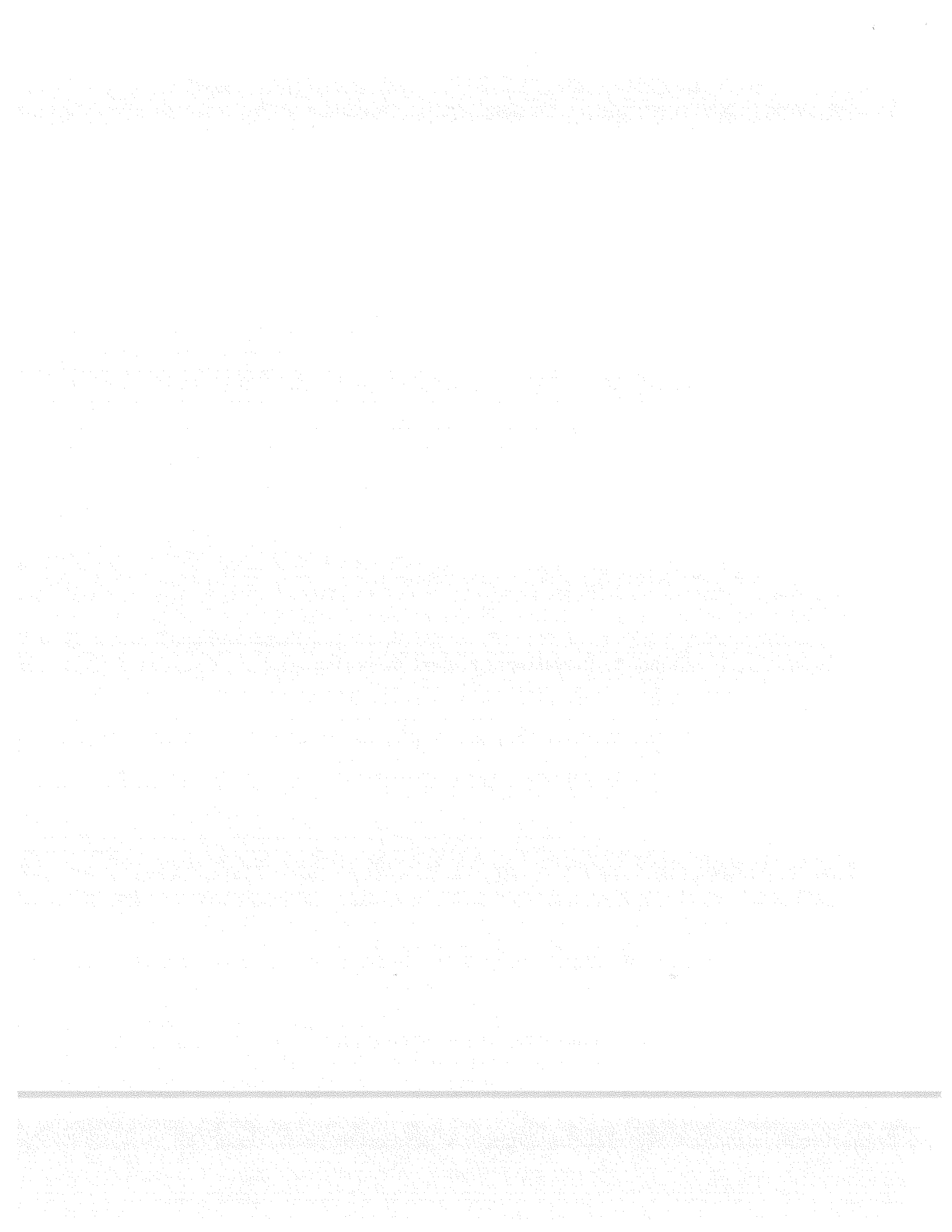
Maximizing Wheat Yields In North Dakota
In A Crop Rotation System

By

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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 fourth year of the study with durum wheat planted for the second time on Block 2 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. Individual plots on Block 2 were soil sampled in the spring of 1985 to a 6-foot depth in 6-inch increments. Samples were dried, ground and analyzed for chemical properties at the NDSU Soil Testing Lab using standard procedures. The soil analysis data is summarized in Tables 1 and 2. The 1985 growing season air temperature and precipitation data are summarized in Tables 3 and 4.

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 main wheat experiment was set up slightly different from previous years (1982, 1983 and 1984) but still in a split-split block arrangement with four replications. Individual unit plots were 12 feet x 48 feet. The two main split blocks were fertilizer treatment (F_1 , F_2 , and F_3 are the same identical plots established in 1982) and foliar nitrogen (S_0 and S_1) with the fertilizer treatments split by varieties (V_1 and V_2). The treatments were as follows:

F_1 = Fertilizer rate based on soil tests (collected in fall of 1984 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.

F₃ = Same as F₂ except a rate of potassium fertilizer applied.

S₀ = No foliar nitrogen applied (a nitrogen fertilizer rate was applied to the soil equal to foliar rate to make total N rates equal).

S₁ = A foliar application of nitrogen fertilizer applied at growth stage 6.

V₁ = Lloyd durum (a semidwarf variety)

V₂ = Vic durum (a normal height variety)

Soil test of samples collected in the fall of 1984 from F₁ plots indicated 45 lb NO₃-N/acre in 2 feet, P = 32 lb/acre and K = 713 lb/acre. The F₁ treatment required 40 lb N/acre and no P or K. A spring application of 20 lb N/acre as 28-0-0 liquid was deep placed (using an experimental applicator with 12 inch spaced shanks) on the F₁ plots for the 35 bu/acre yield goal. F₂ and F₃ received 140 lbs N/acre and 30 lbs P₂O₅/acre with the deep band applicator 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 durum varieties were planted on April 30 with a 90 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 60 lb/acre of 11-52-0 fertilizer with the seed at planting. The plot area was sprayed in the fall with 1 pt Roundup plus surfactant to control fall weed growth, mainly quack grass. The plots were sprayed on May 29 with 1 pt/acre Butril plus 1 qt/acre Hoelon for broadleaf and grass weed control.

The foliar nitrogen was applied in the morning on a cloudy day at plant growth stage 6 (June 13) with a standard field boom sprayer. The nitrogen fertilizer (28-0-0) at a rate of 20 lb/acre was mixed with water in a 2:1 ratio (water:fertilizer) and applied in two passes. Little leaf burn was observed. The durum crop was sprayed with fungicides on June 26 (2 lb/acre Manzate 200) and July 1 (2 lb/acre Manzate 200 plus 1 qt/acre Sevin). Tram lines were used for spraying either herbicides, fertilizer or fungicides. Plant samples were collected at the soft dough stage (July 31) for total dry matter production and nutrient analysis. The durum wheat was harvested in late August with a small research combine. Gravimetric soil moisture samples to 6 feet (6-inch increments) were collected in the spring (April 17) and fall (September 4) for calculating crop water use.

The flax area of the rotation (Block 1 - sunflower stubble) was spring disc plus field cultivated once and planted with the Haybuster drill on May 4 with Flor flax at a rate of 40 lb/acre. No fertilizer was applied to this block area. The flax was sprayed (June 5) with a post application of 1 pt/acre Bronate for weed control. Harvested yields averaged 24.9, 26.9 and 29.7 bu/acre for the F₁, F₂ and F₃ previously established areas, respectively.

The sunflower area of the rotation (Block 3 - Durum stubble) was spring plowed. Prowl at 3 pt/acre was incorporated during field cultivation for weed control. No fertilizer was applied to the block. Interstate 7000 hybrid was planted on May 29. A late frost injured the sunflower crop and required replanting on June 20. The late sunflower crop, again encountered frost damage (September 24 and 25) which affected yield. The sunflower heads were harvested on October 28 for

yield comparisons. Average yields of 475, 384 and 387 lb/acre were obtained for the respective F₁, F₂ and F₃ areas of the block. Oil content for these same areas were low at 20.2, 20.8 and 25.1 percent.

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 26.

Plant Growth and Yield

Data on plant stand counts, plant height, total plant dry matter (soft dough stage), grain test weight, 1000 seed weight, grain yield, total water use and water use efficiency by Durum wheat as influenced by fertilizer treatment, variety and foliar nitrogen are summarized in Tables 5 through 9. Plant stand counts taken were similar among treatments and between varieties. Plant height as expected was significantly higher on the normal height durum (Vic) than the semidwarf variety (Lloyd). The Vic variety height was significantly increased by the two maximum fertilizer treatments but had no effect on the Lloyd variety. Plant dry matter (F₁) at the soft dough stage was significantly increased (1100 lb/acre) by the maximum (F₁ and F₂) fertilizer treatments. This response was a reflection of the large increase in dry matter production associated with the foliar N application. This large increase in growth was not observed with all N applied preplant.

The Lloyd durum had lower test weight and 1000 kernel weight than the Vic variety. Both test weight and kernel weight were significantly reduced when the maximum fertilizer treatments (F₂ and F₃) were applied. Although seed yield was increased 6 to 8 bu/acre by the higher fertilizer rates (additional N, P or K), the increases were not significant

at the .05 level. This is in part due to no response in one replication plus the high residual fertility levels in the soil under F₁, especially the high N levels in the 2 to 4 foot depths as shown in Tables 1 and 2. The semidwarf variety (Lloyd) significantly out yielded the Vic variety by more than 5 bu/acre. Grain yields on both varieties tended to increase with the foliar N application but the increase was not significant. Response to foliar N was greatest with the F₁ and F₂ treatments and averaged over 3 bu/acre.

Many researchers feel that adequate evaluation of water use by the crop requires deep profile measurements since water moves both directions (up-down) in the soil profile during a growing season. Water use in this study was determined using both the 4-foot and 6-foot soil profiles for comparisons as shown in Tables 8 and 9. Total water use and water use efficiency (WUE) values were similar regardless of which profile depth was used indicating that the 4 foot depth evaluates water use effectively. Total water use was not significantly affected by treatments applied and averaged around 16 inches. However WUE was significantly influenced by fertilizer treatment and variety. The Lloyd variety produced on the average about 0.45 bu/acre/inch more than the Vic variety. The F₁ treatment gave 3.8 bu/acre/inch and was increased to 4.4 and 4.6 bu/acre/inch with the F₂ and F₃ treatments that contained additional N, P or K fertilizer.

Plant and Seed Nutrient Concentrations and Uptake

The nitrogen, phosphorus, potassium, sulfur, manganese, iron, copper and zinc concentration and uptake by durum plants and seed are summarized in Tables 10 through 25. The two maximum fertilizer treatments (F₂ and F₃) significantly increased the concentration of nitrogen,

potassium, manganese and zinc in the plant over the F₁ treatment. The total uptake of all nutrients in the plant were significantly increased by the two maximum fertilizer rates. The concentration and uptake of phosphorus, potassium and manganese by Lloyd durum plants were significantly higher than the Vic durum plants.

The concentration and uptake of nitrogen, sulfur and zinc in the seed were significantly increased when the additional N, P or K fertilizer were applied for maximum yield. The concentration of all nutrients in the seed of the Vic variety except potassium were significantly higher than the Lloyd variety. The total uptake of nitrogen and zinc were also significantly higher in the Vic variety with potassium uptake higher in the Lloyd variety.

The foliar application of N had little influence on the concentration or uptake of nutrients in the plant or seed.

YIELD LIMITING FACTORS:

The 1985 growing season was quite ideal for durum production. Stored soil water was adequate at the beginning of the season and 10 inches of precipitation was received during the crop growth period. Precipitation distribution throughout the season was excellent with adequate supplies during most growth stress periods (flowering and grain filling). Air temperatures were above normal in April and May and below normal during June, July and August. The hot dry periods during flowering and grain filling periods experienced in previous years was not evident in 1985. Very few maximum air temperatures exceeded 90 degrees. The cool temperatures and adequate moisture provided conditions for the excellent yields obtained. Other factors such as diseases, insects and weed competition were not a problem and thus were

not yield limiting factors. The residual nutrient status in the soils under past high management levels and an ideal growing season provided conditions for high yields with only minimal responses to the major inputs or treatments. Although conditions appeared ideal for durum production the average yield goal of 80 bu/acre on F₂ and F₃ was not quite achieved, however some individual plots reached 90 bu/acre and one third of plots exceeded 70 bu/acre. Including the low yield levels (58 bu/acre range) of F₂ and F₃ from Rep 4 which appeared to be spot soil related definitely lowered the overall yield levels of these two treatments. A 3 to 4 bu/acre increase in yield would be realized on F₂ and F₃ with only three replications considered.

PLANNED CHANGES FOR NEXT YEAR:

The maximum wheat yield trial will be continued in 1986 and data on the durum crop will be collected on Block 1 that had the fertilizer variables established in 1983. The experiment will be conducted similar to 1985 with the same basic fertilizer plan. The foliar nitrogen application showed some promise and will be continued in 1986. The late crop harvest and wet conditions did not allow time to fall apply the fertilizer treatments but they will be applied in the spring, as in 1985.

DATA CITATION AND ECONOMIC EVALUATION:

The data as reported is available for use by PPI/FAR, the project supporter. No economic evaluation was conducted on the data at this time.

Table 1. Nitrate Nitrogen, Phosphorus and Potassium Levels in the Soil Profile by Fertilizer Treatment from Block Two for the Maximum Wheat Yield Trial in a Crop Rotation System: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Soil Profile Depth (inches)					
	0-12	12-24	24-36	36-48	48-60	60-72
	<u>Nitrate Nitrogen (lb/acre)^{2/}</u>					
F ₁	20	40	55	65	52	37
F ₂	16	42	91	172	58	31
F ₃	20	52	146	124	61	37
	<u>Phosphorus (lb/acre)^{2/}</u>					
F ₁	49	5	4	7	6	6
F ₂	52	8	4	4	6	5
F ₃	47	8	5	6	5	3
	<u>Potassium (lb/acre)^{2/}</u>					
F ₁	1245	502	422	478	517	579
F ₂	1229	593	442	456	544	606
F ₃	1376	685	484	438	493	545

^{1/}Fertilizer treatment: Established in 1982 on Block two.

F₁ = Fertilizer rate based on soil tests and yield goal of 35 bu/acre (none required in 1982).

F₂ = Nitrogen (100 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate deep placed based on F₁ soil tests and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 50 lb/acre K₂O fertilizer applied broadcast as KCl.

Note: In 1983 all treatments received 50 lb/acre 18-46-0 applied with the seed at planting. Block two received 75 lbs N/acre in 1983 for the sunflower crop. No fertilizer was applied in 1984 to Block two for the flax crop.

^{2/}Data presented are the average of four replications.

Table 2. Chemical Properties in the Soil Profile by Fertilizer Treatment from Block Two for the Maximum Wheat Yield Trial in a Crop Rotation System: Minot, ND - 1985.

Soil Property	Soil Profile Depth (inches)			
	0-6	6-12	12-18	18-24
	<u>F₁ Treatment</u> ^{1/}			
NO ₃ -N (lb/acre)	6	14	17	23
Organic Matter (%)	3.4	2.2	1.1	1.0
P (lb/acre)	39	10	3	2
K (lb/acre)	799	446	277	225
SO ₄ -S (ppm)	12	8	7	7
Zn (ppm)	1.1	0.3	0.2	0.1
Fe (ppm)	57	32	11	9
Mn (ppm)	40	21	6	3
Cu (ppm)	0.7	0.7	0.8	0.7
pH (1:1)	6.4	6.6	7.8	8.1
	<u>F₂ Treatment</u>			
NO ₃ -N (lb/acre)	5	11	14	27
Organic Matter (%)	3.2	2.0	1.3	0.9
P (lb/acre)	39	13	4	3
K (lb/acre)	786	442	332	261
SO ₄ -S (ppm)	11	8	7	4
Zn (ppm)	0.6	0.4	0.1	0.1
Fe (ppm)	56	32	16	11
Mn (ppm)	38	20	11	5
Cu (ppm)	0.6	0.7	0.7	0.8
pH (1:1)	6.3	6.4	6.8	7.3
	<u>F₃ Treatment</u>			
NO ₃ -N (lb/acre)	6	14	21	30
Organic Matter (%)	3.4	2.1	1.3	0.8
P (lb/acre)	36	12	4	3
K (lb/acre)	875	501	373	311
SO ₄ -S (ppm)	10	7	6	7
Zn (ppm)	0.5	0.4	0.1	0.1
Fe (ppm)	55	32	16	12
Mn (ppm)	39	19	13	7
Cu (ppm)	0.6	0.6	0.6	0.6
pH (1:1)	6.0	6.5	6.9	7.3

^{1/}Refer to Table 1 for fertilizer treatment description. Data presented are the average of four replications.

Table 3. Daily Growing Season Precipitation Received at the Maximum Wheat Yield Trial: Minot, ND - 1985.

Day	Month						
	April	May	June	July	August	September	October
1			T				
2							
3						.02	.09
4					.82	.24	T
5			.23		.23		.24
6	T*				.01	.01	.01
7	T*					.05	
8	.06*				T	T	.38*
9	T*		T			T	1.39*
10		T					.02*
11		.01				.05	T*
12		.10	.34				
13		1.87	.14		.47		T
14	.35	.04			.15	.38	
15		.04	.02			T	
16					T	.01	T
17			T			T	.01
18	.03*		.06	.17	2.12	.01	
19	T		.03	1.37	.03		
20			.12	.01		.04	
21	.70					.42	
22	T		.02			T	
23	.21		T			.03	
24					.04	T	T
25	.55				T	.08	
26			.40	.05	T		
27			.12		T		
28			.48				
29		.30	.66		T	T*	
30		.01	.24		.13	.01*	
31		.04	T	.02		.06*	
		1.20		.11	.03		
* Snow							
Total (1985)	1.90	3.61	2.86	1.73	4.06	1.41	2.14
Average (1905-1980)	1.53	2.18	3.15	2.19	1.94	1.53	0.89

Table 4. Daily Growing Season Maximum and Minimum Air Temperatures at the Maximum Wheat Yield Trial: Minot, ND - 1985.

Day	April		May		June		July		August		September		October	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	44	21	66	37	71	37	79	54	72	46	75	44	43	24
2	50	26	77	47	56	38	78	55	76	53	75	52	54	25
3	50	31	81	42	61	43	88	58	72	57	61	56	62	37
4	48	26	89	48	62	33	88	54	72	58	80	55	49	41
5	47	27	70	40	62	35	82	57	78	55	72	53	48	32
6	43	27	65	36	69	47	91	60	86	54	77	51	51	34
7	44	23	60	34	78	54	94	59	81	53	65	46	48	31
8	41	17	71	35	85	54	91	55	80	53	55	38	48	25
9	43	25	87	53	73	46	91	58	87	49	61	40	31	8
10	64	30	80	51	71	42	77	58	60	42	61	43	31	9
11	60	31	78	51	70	44	83	55	74	52	59	45	40	21
12	67	38	57	42	55	38	85	55	65	54	64	50	47	31
13	45	30	59	40	68	46	91	58	64	44	61	53	49	34
14	62	38	51	36	66	47	81	55	65	44	64	52	52	36
15	79	36	59	36	75	48	74	49	70	44	73	53	45	30
16	60	31	62	38	80	55	82	51	77	46	81	51	39	24
17	50	24	70	41	70	44	89	57	59	51	76	48	55	30
18	77	36	76	48	58	50	79	57	65	42	71	44	54	37
19	73	42	81	42	70	46	73	49	67	40	61	41	62	35
20	80	42	67	36	75	52	83	52	67	41	43	35	65	40
21	55	36	67	37	85	57	75	51	73	46	53	35	66	39
22	51	34	82	48	70	43	79	55	81	56	63	43	71	38
23	63	31	80	48	80	40	92	59	73	53	52	30	66	40
24	65	34	84	50	73	52	77	52	65	51	45	25	58	34
25	54	31	80	49	74	54	67	51	72	51	49	25	55	34
26	50	26	62	49	65	46	76	48	77	54	51	28	68	32
27	47	29	67	51	65	48	82	54	77	48	66	31	50	32
28	72	43	66	48	54	43	82	58	76	52	42	32	58	34
29	83	51	72	41	52	44	73	47	63	48	45	27	69	26
30	79	37	75	54	64	47	70	49	68	49	43	31	49	26
31			65	46			69	46	78	57			57	32
Mean (1985)	55	32	71	44	69	45	81	54	72	50	62	41	53	31
Mean (1905-1980)	53	28	66	40	75	50	82	55	81	52	70	42	57	32

Table 5. Total Dry Matter and Height of Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀		Ave.	S ₁		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
<u>Total Plant Dry Matter (lb/acre)</u>									
F ₁	7906	7940	<u>7922</u>	7676	7848	<u>7762</u>	7791	7894	<u>7842</u>
F ₂	7824	8371	<u>8098</u>	9978	9667	<u>9823</u>	8901	9019	<u>8960</u>
F ₃	8717	8371	<u>8544</u>	9077	9897	<u>9487</u>	8897	9134	<u>9015</u>
Ave.	<u>8149</u>	<u>8227</u>	<u>8188</u>	<u>8910</u>	<u>9137</u>	<u>9023</u>	<u>8530</u>	<u>8682</u>	
<u>Plant Height (inches)</u>									
F ₁	26.2	36.8	<u>31.5</u>	26.7	37.7	<u>32.2</u>	26.4	37.2	<u>31.8</u>
F ₂	27.6	40.5	<u>34.1</u>	27.5	40.8	<u>34.2</u>	27.6	40.7	<u>34.1</u>
F ₃	27.6	37.9	<u>32.8</u>	27.1	39.5	<u>33.3</u>	27.3	38.7	<u>33.0</u>
Ave.	<u>27.1</u>	<u>38.4</u>	<u>32.8</u>	<u>27.1</u>	<u>39.4</u>	<u>33.2</u>	<u>27.1</u>	<u>38.9</u>	

1/Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

2/Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

3/Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 6. Yield and Test Weight of Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀		Ave.	S ₁		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
<u>Seed Yield (bu/acre)</u>									
F ₁	62.8	60.2	<u>61.4</u>	66.8	63.2	<u>65.0</u>	64.8	61.7	<u>63.2</u>
F ₂	69.4	62.7	<u>66.0</u>	75.8	68.4	<u>72.1</u>	72.6	65.6	<u>69.1</u>
F ₃	73.9	67.8	<u>70.8</u>	75.8	68.1	<u>72.0</u>	74.9	68.0	<u>71.4</u>
Ave.	<u>68.7</u>	<u>63.6</u>	<u>66.1</u>	<u>72.8</u>	<u>66.6</u>	<u>69.7</u>	<u>70.7</u>	<u>65.1</u>	
<u>Seed Test Weight (lb/bu)</u>									
F ₁	60.7	61.9	<u>61.3</u>	60.1	61.6	<u>60.8</u>	60.4	61.8	<u>61.1</u>
F ₂	59.2	61.1	<u>60.1</u>	58.5	61.3	<u>59.9</u>	58.8	61.2	<u>60.0</u>
F ₃	59.2	61.2	<u>60.2</u>	59.5	61.3	<u>60.4</u>	59.4	61.2	<u>60.3</u>
Ave.	<u>59.7</u>	<u>61.4</u>	<u>60.6</u>	<u>59.4</u>	<u>61.4</u>	<u>60.4</u>	<u>59.5</u>	<u>61.4</u>	

^{1/}Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

^{3/}Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 7. Plant Stand and Kernel Weight of Durum Wheat as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀		Ave.	S ₁		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
<u>Plant Stand (plants/3 foot row)</u>									
F ₁	23.6	23.4	<u>23.5</u>	23.5	23.1	<u>23.3</u>	23.6	23.2	<u>23.4</u>
F ₂	25.9	22.6	<u>24.2</u>	25.0	21.5	<u>23.2</u>	25.4	22.1	<u>23.7</u>
F ₃	21.1	26.9	<u>24.0</u>	25.7	23.0	<u>24.4</u>	23.4	24.9	<u>24.1</u>
Ave.	<u>23.5</u>	<u>24.3</u>	<u>23.9</u>	<u>24.8</u>	<u>22.5</u>	<u>23.6</u>	<u>24.1</u>	<u>23.4</u>	
<u>Kernel Weight (gram/1000)</u>									
F ₁	47.8	47.8	<u>47.8</u>	49.8	48.7	<u>49.2</u>	48.8	48.2	<u>48.5</u>
F ₂	41.6	44.4	<u>43.0</u>	41.3	45.2	<u>43.2</u>	41.4	44.8	<u>43.1</u>
F ₃	44.9	46.7	<u>45.8</u>	43.3	46.7	<u>45.0</u>	44.1	46.7	<u>45.4</u>
Ave.	<u>44.8</u>	<u>46.3</u>	<u>45.5</u>	<u>44.8</u>	<u>46.8</u>	<u>45.8</u>	<u>44.8</u>	<u>46.6</u>	

^{1/}Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

^{3/}Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 8. Total Water Use by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀		Ave.	S ₁		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
<u>0 to 48 Inch Soil Profile (inches)</u>									
F ₁	16.9	17.5	<u>17.1</u>	16.4	16.9	<u>16.6</u>	16.6	17.2	<u>16.9</u>
F ₂	14.8	15.6	<u>15.2</u>	16.2	16.2	<u>16.2</u>	15.5	15.9	<u>15.7</u>
F ₃	15.5	15.3	<u>15.4</u>	15.9	15.9	<u>15.9</u>	15.7	15.6	<u>15.7</u>
Ave.	<u>15.7</u>	<u>16.1</u>	<u>15.9</u>	<u>16.1</u>	<u>16.3</u>	<u>16.2</u>	<u>15.9</u>	<u>16.2</u>	
<u>0 to 72 Inch Soil Profile (inches)</u>									
F ₁	16.4	17.7	<u>17.1</u>	16.1	16.3	<u>16.2</u>	16.3	17.0	<u>16.6</u>
F ₂	14.2	15.4	<u>14.8</u>	16.5	16.6	<u>16.5</u>	15.3	16.0	<u>15.7</u>
F ₃	15.7	14.5	<u>15.1</u>	15.6	15.7	<u>15.7</u>	15.7	15.1	<u>15.4</u>
Ave.	<u>15.4</u>	<u>15.9</u>	<u>15.7</u>	<u>16.1</u>	<u>16.2</u>	<u>16.1</u>	<u>15.8</u>	<u>16.0</u>	

^{1/}Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

^{3/}Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 9. Water Use Efficiency of Durum Wheat as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀			S ₁			V ₁	V ₂	Ave.
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.			
<u>0 to 48 Inch Soil Profile (bu/acre/inch)</u>									
F ₁	3.76	3.45	<u>3.60</u>	4.15	3.76	<u>3.96</u>	3.96	3.61	<u>3.78</u>
F ₂	4.72	4.04	<u>4.38</u>	4.72	4.24	<u>4.48</u>	4.72	4.14	<u>4.43</u>
F ₃	4.81	4.47	<u>4.64</u>	4.78	4.27	<u>4.53</u>	4.79	4.37	<u>4.58</u>
Ave.	<u>4.43</u>	<u>3.39</u>	<u>4.21</u>	<u>4.55</u>	<u>4.09</u>	<u>4.32</u>	<u>4.49</u>	<u>4.04</u>	
<u>0 to 72 Inch Soil Profile (bu/acre/inch)</u>									
F ₁	3.86	3.43	<u>3.64</u>	4.31	3.90	<u>4.10</u>	4.08	3.66	<u>3.87</u>
F ₂	4.94	4.09	<u>4.51</u>	4.65	4.17	<u>4.41</u>	4.79	4.13	<u>4.46</u>
F ₃	4.78	4.71	<u>4.75</u>	4.84	4.36	<u>4.60</u>	4.81	4.53	<u>4.67</u>
Ave.	<u>4.52</u>	<u>4.08</u>	<u>4.30</u>	<u>4.60</u>	<u>4.14</u>	<u>4.37</u>	<u>4.56</u>	<u>4.11</u>	

1/Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

2/Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

3/Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 10. Nitrogen Concentration and Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀			S ₁			V ₁	V ₂	Ave.
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.			
<u>N Concentration (%)</u>									
F ₁	1.21	1.13	<u>1.17</u>	1.16	1.01	<u>1.08</u>	1.18	1.07	<u>1.13</u>
F ₂	1.73	1.64	<u>1.68</u>	1.68	1.45	<u>1.56</u>	1.70	1.54	<u>1.62</u>
F ₃	1.48	1.52	<u>1.50</u>	1.55	1.38	<u>1.47</u>	1.52	1.45	<u>1.48</u>
Ave.	<u>1.48</u>	<u>1.43</u>	<u>1.45</u>	<u>1.46</u>	<u>1.28</u>	<u>1.37</u>	<u>1.47</u>	<u>1.36</u>	
<u>N Uptake (lb/acre)</u>									
F ₁	96	90	<u>93</u>	90	80	<u>85</u>	93	86	<u>89</u>
F ₂	136	137	<u>136</u>	168	138	<u>153</u>	153	137	<u>145</u>
F ₃	129	125	<u>127</u>	141	138	<u>139</u>	135	131	<u>133</u>
Ave.	<u>121</u>	<u>117</u>	<u>119</u>	<u>133</u>	<u>119</u>	<u>126</u>	<u>127</u>	<u>118</u>	

^{1/}Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Foliar nitrogen treatment.

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

^{3/}Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 11. Phosphorus Concentration and Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀		Ave.	S ₁		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
<u>P Concentration (%)</u>									
F ₁	.195	.162	<u>.179</u>	.198	.162	<u>.180</u>	.196	.162	<u>.179</u>
F ₂	.218	.185	<u>.201</u>	.225	.175	<u>.200</u>	.221	.180	<u>.201</u>
F ₃	.175	.180	<u>.178</u>	.185	.172	<u>.179</u>	.180	.176	<u>.178</u>
Ave.	<u>.196</u>	<u>.176</u>	<u>.186</u>	<u>.202</u>	<u>.170</u>	<u>.186</u>	<u>.199</u>	<u>.173</u>	
<u>P Uptake (lb/acre)</u>									
F ₁	15.4	13.0	<u>14.2</u>	15.2	12.7	<u>14.0</u>	15.3	12.9	<u>14.1</u>
F ₂	17.2	15.5	<u>16.3</u>	22.7	16.8	<u>19.7</u>	20.0	16.1	<u>18.0</u>
F ₃	15.2	14.8	<u>15.0</u>	16.9	17.2	<u>17.0</u>	16.0	16.0	<u>16.0</u>
Ave.	<u>15.9</u>	<u>14.4</u>	<u>15.2</u>	<u>18.3</u>	<u>15.5</u>	<u>16.9</u>	<u>17.1</u>	<u>15.0</u>	

^{1/}Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

^{3/}Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 12. Potassium Concentration and Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀		Ave.	S ₁		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
<u>K Concentration (%)</u>									
F ₁	0.90	0.75	<u>0.82</u>	0.73	0.70	<u>0.71</u>	0.81	0.72	<u>0.77</u>
F ₂	1.21	1.13	<u>1.17</u>	1.27	1.18	<u>1.23</u>	1.24	1.16	<u>1.20</u>
F ₃	1.58	1.20	<u>1.39</u>	1.61	1.31	<u>1.46</u>	1.59	1.26	<u>1.42</u>
Ave.	<u>1.23</u>	<u>1.02</u>	<u>1.13</u>	<u>1.20</u>	<u>1.06</u>	<u>1.13</u>	<u>1.22</u>	<u>1.04</u>	
<u>K Uptake (lb/acre)</u>									
F ₁	71	60	<u>66</u>	56	55	<u>56</u>	64	57	<u>61</u>
F ₂	92	94	<u>93</u>	125	116	<u>120</u>	109	105	<u>107</u>
F ₃	138	101	<u>120</u>	147	130	<u>139</u>	143	115	<u>129</u>
Ave.	<u>101</u>	<u>85</u>	<u>93</u>	<u>110</u>	<u>100</u>	<u>105</u>	<u>105</u>	<u>92</u>	

^{1/}Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

^{3/}Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 13. Sulfur Concentration and Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀			S ₁			V ₁	V ₂	Ave.
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.			
<u>S Concentration (%)</u>									
F ₁	.121	.110	<u>.116</u>	.110	.094	<u>.102</u>	.116	.102	<u>.109</u>
F ₂	.159	.151	<u>.155</u>	.162	.140	<u>.151</u>	.160	.145	<u>.153</u>
F ₃	.145	.135	<u>.140</u>	.132	.139	<u>.136</u>	.138	.137	<u>.138</u>
Ave.	<u>.142</u>	<u>.132</u>	<u>.137</u>	<u>.134</u>	<u>.124</u>	<u>.129</u>	<u>.138</u>	<u>.128</u>	
<u>S Uptake (lb/acre)</u>									
F ₁	9.7	8.8	<u>9.2</u>	8.7	7.5	<u>8.1</u>	9.2	8.1	<u>8.7</u>
F ₂	12.5	12.6	<u>12.5</u>	16.1	13.5	<u>14.8</u>	14.3	13.1	<u>13.7</u>
F ₃	12.8	11.2	<u>12.0</u>	11.9	13.8	<u>12.8</u>	12.4	12.5	<u>12.4</u>
Ave.	<u>11.7</u>	<u>10.9</u>	<u>11.3</u>	<u>12.2</u>	<u>11.6</u>	<u>11.9</u>	<u>11.9</u>	<u>11.2</u>	

^{1/}Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

^{3/}Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 14. Manganese Concentration and Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀			S ₁			V ₁	V ₂	Ave.
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.			
<u>Mn Concentration (ppm)</u>									
F ₁	52.5	52.2	<u>52.4</u>	52.5	57.2	<u>54.9</u>	52.5	54.8	<u>53.6</u>
F ₂	70.0	64.8	<u>67.4</u>	77.0	62.0	<u>69.5</u>	73.5	63.4	<u>68.4</u>
F ₃	76.0	62.2	<u>69.1</u>	78.8	64.2	<u>71.5</u>	77.4	63.2	<u>70.3</u>
Ave.	<u>66.2</u>	<u>59.8</u>	<u>63.0</u>	<u>69.4</u>	<u>61.2</u>	<u>65.3</u>	<u>67.8</u>	<u>60.4</u>	
<u>Mn Uptake (lb/acre)</u>									
F ₁	.417	.412	<u>.415</u>	.404	.445	<u>.425</u>	.411	.428	<u>.420</u>
F ₂	.555	.540	<u>.548</u>	.769	.596	<u>.683</u>	.662	.568	<u>.615</u>
F ₃	.664	.521	<u>.593</u>	.704	.633	<u>.669</u>	.684	.577	<u>.630</u>
Ave.	<u>.545</u>	<u>.491</u>	<u>.518</u>	<u>.626</u>	<u>.558</u>	<u>.592</u>	<u>.586</u>	<u>.524</u>	

^{1/}Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

^{3/}Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 15. Iron Concentration and Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀		Ave.	S ₁		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
<u>Fe Concentration (ppm)</u>									
F ₁	59.2	54.2	<u>56.8</u>	53.5	54.5	<u>54.0</u>	56.4	54.4	<u>55.4</u>
F ₂	65.5	59.0	<u>62.2</u>	64.0	59.2	<u>61.6</u>	64.8	59.1	<u>61.9</u>
F ₃	67.8	59.8	<u>63.8</u>	73.8	63.0	<u>68.4</u>	70.8	61.4	<u>66.1</u>
Ave.	<u>64.2</u>	<u>57.7</u>	<u>60.9</u>	<u>63.8</u>	<u>58.9</u>	<u>61.3</u>	<u>64.0</u>	<u>58.3</u>	
<u>Fe Uptake (lb/acre)</u>									
F ₁	.467	.424	<u>.446</u>	.413	.430	<u>.421</u>	.440	.427	<u>.433</u>
F ₂	.498	.491	<u>.494</u>	.627	.572	<u>.600</u>	.562	.532	<u>.547</u>
F ₃	.591	.499	<u>.545</u>	.659	.624	<u>.642</u>	.625	.562	<u>.593</u>
Ave.	<u>.519</u>	<u>.472</u>	<u>.495</u>	<u>.566</u>	<u>.542</u>	<u>.554</u>	<u>.542</u>	<u>.507</u>	

^{1/}Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

^{3/}Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 16. Copper Concentration and Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀		Ave.	S ₁		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
<u>Cu Concentration (ppm)</u>									
F ₁	3.00	2.75	<u>2.88</u>	3.00	3.00	<u>3.00</u>	3.00	2.88	<u>2.94</u>
F ₂	3.00	3.25	<u>3.12</u>	3.00	3.00	<u>3.00</u>	3.00	3.12	<u>3.06</u>
F ₃	2.75	3.00	<u>2.88</u>	3.00	2.75	<u>2.88</u>	2.88	2.88	<u>2.88</u>
Ave.	<u>2.92</u>	<u>3.00</u>	<u>2.96</u>	<u>3.00</u>	<u>2.92</u>	<u>2.96</u>	<u>2.96</u>	<u>2.96</u>	
<u>Cu Uptake (lb/acre)</u>									
F ₁	.024	.022	<u>.023</u>	.024	.023	<u>.024</u>	.024	.023	<u>.023</u>
F ₂	.023	.028	<u>.026</u>	.030	.029	<u>.029</u>	.027	.028	<u>.027</u>
F ₃	.024	.025	<u>.025</u>	.027	.027	<u>.027</u>	.026	.026	<u>.026</u>
Ave.	<u>.024</u>	<u>.025</u>	<u>.024</u>	<u>.027</u>	<u>.026</u>	<u>.027</u>	<u>.025</u>	<u>.026</u>	

^{1/}Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

^{3/}Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 17. Zinc Concentration and Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀			S ₁			V ₁	V ₂	Ave.
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.			
<u>Zn Concentration (ppm)</u>									
F ₁	15.0	13.5	<u>14.2</u>	14.5	13.0	<u>13.8</u>	14.8	13.2	<u>14.0</u>
F ₂	21.2	22.2	<u>21.8</u>	20.5	17.2	<u>18.9</u>	20.9	19.8	<u>20.3</u>
F ₃	21.0	21.8	<u>21.4</u>	17.8	18.2	<u>18.0</u>	19.4	20.0	<u>19.7</u>
Ave.	<u>19.1</u>	<u>19.2</u>	<u>19.1</u>	<u>17.6</u>	<u>16.2</u>	<u>16.9</u>	<u>18.3</u>	<u>17.7</u>	
<u>Zn Uptake (lb/acre)</u>									
F ₁	.118	.108	<u>.113</u>	.110	.101	<u>.105</u>	.114	.105	<u>.109</u>
F ₂	.166	.184	<u>.175</u>	.207	.166	<u>.187</u>	.187	.176	<u>.181</u>
F ₃	.184	.180	<u>.182</u>	.164	.181	<u>.172</u>	.174	.180	<u>.177</u>
Ave.	<u>.156</u>	<u>.158</u>	<u>.157</u>	<u>.160</u>	<u>.150</u>	<u>.155</u>	<u>.158</u>	<u>.154</u>	

^{1/}Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

^{3/}Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 18. Nitrogen Concentration and Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀			S ₁			V ₁	V ₂	Ave.
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.			
<u>N Concentration (%)</u>									
F ₁	2.10	2.46	<u>2.28</u>	1.97	2.26	<u>2.12</u>	2.04	2.36	<u>2.20</u>
F ₂	2.60	2.94	<u>2.77</u>	2.51	2.84	<u>2.67</u>	2.56	2.89	<u>2.72</u>
F ₃	2.52	2.93	<u>2.73</u>	2.57	2.88	<u>2.73</u>	2.55	2.91	<u>2.73</u>
Ave.	<u>2.41</u>	<u>2.78</u>	<u>2.59</u>	<u>2.35</u>	<u>2.66</u>	<u>2.50</u>	<u>2.38</u>	<u>2.72</u>	
<u>N Uptake (lb/acre)</u>									
F ₁	69	78	<u>73</u>	69	75	<u>72</u>	69	77	<u>73</u>
F ₂	94	96	<u>95</u>	99	102	<u>100</u>	97	99	<u>98</u>
F ₃	98	104	<u>101</u>	101	103	<u>102</u>	99	103	<u>101</u>
Ave.	<u>87</u>	<u>93</u>	<u>90</u>	<u>90</u>	<u>93</u>	<u>92</u>	<u>88</u>	<u>93</u>	

^{1/}Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

^{3/}Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 19. Phosphorus Concentration and Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀			S ₁			V ₁	V ₂	Ave.
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.			
<u>P Concentration (%)</u>									
F ₁	.375	.412	<u>.394</u>	.402	.445	<u>.424</u>	.389	.429	<u>.409</u>
F ₂	.398	.442	<u>.420</u>	.410	.425	<u>.418</u>	.404	.434	<u>.419</u>
F ₃	.395	.422	<u>.409</u>	.398	.432	<u>.415</u>	.396	.428	<u>.411</u>
Ave.	<u>.389</u>	<u>.426</u>	<u>.408</u>	<u>.403</u>	<u>.434</u>	<u>.419</u>	<u>.396</u>	<u>.430</u>	
<u>P Uptake (lb/acre)</u>									
F ₁	12.3	13.0	<u>12.7</u>	14.1	14.8	<u>14.4</u>	13.2	13.9	<u>13.6</u>
F ₂	14.5	14.6	<u>14.5</u>	16.3	15.3	<u>15.8</u>	15.4	14.9	<u>15.2</u>
F ₃	15.3	15.1	<u>15.2</u>	15.8	15.5	<u>15.6</u>	15.5	15.3	<u>15.4</u>
Ave.	<u>14.0</u>	<u>14.2</u>	<u>14.1</u>	<u>15.4</u>	<u>15.2</u>	<u>15.3</u>	<u>14.7</u>	<u>14.7</u>	

^{1/}Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

^{3/}Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 20. Potassium Concentration and Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀			S ₁			V ₁	V ₂	Ave.
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.			
<u>K Concentration (%)</u>									
F ₁	.438	.392	<u>.415</u>	.450	.415	<u>.432</u>	.444	.404	<u>.424</u>
F ₂	.462	.400	<u>.431</u>	.475	.398	<u>.436</u>	.469	.399	<u>.434</u>
F ₃	.465	.395	<u>.430</u>	.455	.408	<u>.431</u>	.460	.401	<u>.431</u>
Ave.	<u>.455</u>	<u>.396</u>	<u>.425</u>	<u>.460</u>	<u>.407</u>	<u>.433</u>	<u>.458</u>	<u>.401</u>	
<u>K Uptake (lb/acre)</u>									
F ₁	14.4	12.4	<u>13.4</u>	15.8	13.8	<u>14.8</u>	15.1	13.1	<u>14.1</u>
F ₂	16.9	13.2	<u>15.0</u>	18.9	14.3	<u>16.6</u>	17.9	13.7	<u>15.8</u>
F ₃	18.0	14.1	<u>16.1</u>	18.1	14.6	<u>16.4</u>	18.1	14.3	<u>16.2</u>
Ave.	<u>16.4</u>	<u>13.2</u>	<u>14.8</u>	<u>17.6</u>	<u>14.2</u>	<u>15.9</u>	<u>17.0</u>	<u>13.7</u>	

^{1/}Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

^{3/}Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 21. Sulfur Concentration and Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀			S ₁			V ₁	V ₂	Ave.
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.			
<u>S Concentration (%)</u>									
F ₁	.146	.163	<u>.155</u>	.136	.145	<u>.140</u>	.141	.154	<u>.148</u>
F ₂	.189	.199	<u>.194</u>	.176	.189	<u>.182</u>	.183	.194	<u>.188</u>
F ₃	.174	.189	<u>.181</u>	.177	.187	<u>.182</u>	.176	.188	<u>.182</u>
Ave.	<u>.170</u>	<u>.184</u>	<u>.177</u>	<u>.163</u>	<u>.174</u>	<u>.168</u>	<u>.166</u>	<u>.179</u>	
<u>S Uptake (lb/acre)</u>									
F ₁	4.8	5.2	<u>5.0</u>	4.8	4.8	<u>4.8</u>	4.8	5.0	<u>4.9</u>
F ₂	6.9	6.6	<u>6.7</u>	6.9	6.8	<u>6.9</u>	6.9	6.7	<u>6.8</u>
F ₃	6.7	6.7	<u>6.7</u>	7.0	6.7	<u>6.8</u>	6.8	6.7	<u>6.8</u>
Ave.	<u>6.1</u>	<u>6.1</u>	<u>6.1</u>	<u>6.2</u>	<u>6.1</u>	<u>6.2</u>	<u>6.2</u>	<u>6.1</u>	

1/Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

2/Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

3/Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 22. Manganese Concentration and Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀		Ave.	S ₁		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
<u>Mn Concentration (ppm)</u>									
F ₁	42.2	43.8	<u>43.0</u>	43.0	47.0	<u>45.0</u>	42.6	45.4	<u>44.0</u>
F ₂	46.5	48.2	<u>47.4</u>	48.2	48.0	<u>48.1</u>	47.4	48.1	<u>47.8</u>
F ₃	44.2	47.8	<u>46.0</u>	46.2	48.5	<u>47.4</u>	45.2	48.1	<u>46.7</u>
Ave.	<u>44.3</u>	<u>46.6</u>	<u>45.4</u>	<u>45.8</u>	<u>47.8</u>	<u>46.8</u>	<u>45.1</u>	<u>47.2</u>	
<u>Mn Uptake (lb/acre)</u>									
F ₁	.139	.138	<u>.139</u>	.151	.155	<u>.153</u>	.145	.147	<u>.146</u>
F ₂	.170	.159	<u>.164</u>	.191	.172	<u>.182</u>	.181	.165	<u>.173</u>
F ₃	.172	.170	<u>.171</u>	.184	.172	<u>.178</u>	.178	.171	<u>.175</u>
Ave.	<u>.160</u>	<u>.156</u>	<u>.158</u>	<u>.175</u>	<u>.167</u>	<u>.171</u>	<u>.168</u>	<u>.161</u>	

^{1/}Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

^{3/}Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 23. Iron Concentration and Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀			S ₁			V ₁	V ₂	Ave.
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.			
<u>Fe Concentration (ppm)</u>									
F ₁	35.8	40.0	<u>37.9</u>	36.2	39.8	<u>38.0</u>	36.0	39.9	<u>37.9</u>
F ₂	38.8	42.0	<u>40.4</u>	39.5	41.8	<u>40.6</u>	39.1	41.9	<u>40.5</u>
F ₃	40.5	42.0	<u>41.2</u>	39.2	42.0	<u>40.6</u>	39.9	42.0	<u>40.9</u>
Ave.	<u>38.3</u>	<u>41.3</u>	<u>39.8</u>	<u>38.3</u>	<u>41.2</u>	<u>39.8</u>	<u>38.3</u>	<u>41.2</u>	
<u>Fe Uptake (lb/acre)</u>									
F ₁	.118	.127	<u>.122</u>	.128	.132	<u>.130</u>	.123	.130	<u>.126</u>
F ₂	.141	.138	<u>.140</u>	.157	.150	<u>.153</u>	.149	.144	<u>.146</u>
F ₃	.156	.148	<u>.152</u>	.157	.151	<u>.154</u>	.157	.150	<u>.153</u>
Ave.	<u>.138</u>	<u>.138</u>	<u>.138</u>	<u>.147</u>	<u>.144</u>	<u>.146</u>	<u>.143</u>	<u>.141</u>	

^{1/}Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

^{3/}Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 24. Copper Concentration and Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀		Ave.	S ₁		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
<u>Cu Concentration (ppm)</u>									
F ₁	4.25	4.50	<u>4.38</u>	4.25	4.75	<u>4.50</u>	4.25	4.62	<u>4.44</u>
F ₂	3.75	4.25	<u>4.00</u>	4.25	4.75	<u>4.50</u>	4.00	4.50	<u>4.25</u>
F ₃	4.00	4.50	<u>4.25</u>	4.25	4.50	<u>4.38</u>	4.12	4.50	<u>4.31</u>
Ave.	<u>4.00</u>	<u>4.42</u>	<u>4.21</u>	<u>4.25</u>	<u>4.67</u>	<u>4.46</u>	<u>4.12</u>	<u>4.54</u>	
<u>Cu Uptake (lb/acre)</u>									
F ₁	.014	.014	<u>.014</u>	.015	.016	<u>.015</u>	.014	.015	<u>.015</u>
F ₂	.014	.014	<u>.014</u>	.017	.017	<u>.017</u>	.015	.016	<u>.015</u>
F ₃	.015	.016	<u>.016</u>	.016	.016	<u>.016</u>	.016	.016	<u>.016</u>
Ave.	<u>.014</u>	<u>.015</u>	<u>.015</u>	<u>.016</u>	<u>.016</u>	<u>.016</u>	<u>.015</u>	<u>.016</u>	

^{1/}Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

^{3/}Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 25. Zinc Concentration and Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, and Foliar Nitrogen: Minot, ND - 1985.

Fertilizer Treatment ^{1/}	Foliar Nitrogen Treatment ^{2/}						Variety ^{3/}		
	S ₀			S ₁			V ₁	V ₂	Ave.
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.			
<u>Zn Concentration (ppm)</u>									
F ₁	21.5	25.2	<u>23.4</u>	21.0	24.0	<u>22.5</u>	21.2	24.6	<u>22.9</u>
F ₂	29.2	35.8	<u>32.5</u>	28.0	32.2	<u>30.1</u>	28.6	34.0	<u>31.3</u>
F ₃	29.8	34.0	<u>31.9</u>	28.5	32.8	<u>30.6</u>	29.1	33.4	<u>31.2</u>
Ave.	<u>26.8</u>	<u>31.7</u>	<u>29.2</u>	<u>25.8</u>	<u>29.7</u>	<u>27.8</u>	<u>26.3</u>	<u>30.7</u>	
<u>Zn Uptake (lb/acre)</u>									
F ₁	.070	.080	<u>.075</u>	.074	.079	<u>.076</u>	.072	.080	<u>.076</u>
F ₂	.106	.118	<u>.112</u>	.110	.116	<u>.113</u>	.108	.117	<u>.113</u>
F ₃	.114	.121	<u>.118</u>	.112	.117	<u>.115</u>	.113	.119	<u>.116</u>
Ave.	<u>.097</u>	<u>.106</u>	<u>.101</u>	<u>.099</u>	<u>.104</u>	<u>.101</u>	<u>.098</u>	<u>.105</u>	

^{1/}Fertilizer treatment

F₁ = Fertilizer rate based on soil tests from the F₁ fertilizer treatment plot and yield goal of 35 bu/acre (20 lb N/acre deep placed in the spring).

F₂ = Nitrogen (140 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer deep placed in the spring based on F₁ soil test and maximum yield goal of 80 bu/acre.

F₃ = Same as F₂ except 100 lb/acre K₂O fertilizer as KCl applied broadcast in the spring.

Note: All treatments received 60 lb/acre 11-52-0 applied with the seed at planting.

^{2/}Foliar nitrogen treatment

S₀ = No foliar N applied (20 lb/acre of additional N was applied to the soil preplant as a dribble application to make the total N rates equal to the foliar rate).

S₁ = 20 lb/acre of additional N as 28-0-0 was applied as a foliar application at growth stage 6.

^{3/}Variety

V₁ = Lloyd durum (semidwarf variety).

V₂ = Vic durum (normal height variety).

Table 26. Tests of Significance for Variables Measured in the Maximum Durum Wheat Yield Study as Influenced by Fertilizer Treatment, Variety, Foliar Nitrogen Spray and Subsequent Interactions Minot, ND - 1985.

Variable	Source							
	Fertilizer	Spray	Variety	Variety	Fertilizer	Fertilizer	Fertilizer	Fertilizer
			Spray	Spray	Spray	Variety	Variety	Spray
						Variety	Variety	Variety
Plant Stand	NS	NS	NS	NS	NS	NS	NS	NS
Plant Height	NS	NS	***	NS	NS	NS	1.4	NS
Plant Dry Matter	763	NS	NS	NS	1049	NS	NS	NS
Plant Nutrients								
Concentration N	0.25	NS	NS	NS	NS	NS	NS	NS
P	NS	NS	*	NS	NS	NS	NS	NS
K	0.18	NS	*	NS	NS	NS	NS	NS
S	NS	NS	NS	NS	NS	NS	NS	NS
Mn	5.4	*	**	NS	NS	NS	NS	NS
Fe	NS	NS	NS	NS	NS	NS	NS	NS
Cu	NS	NS	NS	NS	NS	NS	NS	NS
Zn	3.1	NS	NS	NS	NS	NS	NS	NS
Uptake N	18.8	NS	NS	NS	NS	NS	NS	NS
P	2.9	NS	*	NS	NS	NS	NS	NS
K	19.4	NS	*	NS	11.6	NS	NS	NS
S	2.0	NS	NS	NS	NS	NS	NS	NS
Mn	.060	NS	*	NS	NS	NS	NS	NS
Fe	.067	NS	NS	NS	0.07	NS	NS	NS
Cu	.002	NS	NS	NS	NS	NS	NS	NS
Zn	.042	NS	NS	NS	NS	NS	NS	NS
Total Water Use - 120 cm	NS	NS	NS	NS	NS	NS	NS	NS
Total Water Use - 180 cm	NS	NS	NS	NS	1.13	NS	NS	NS

Table 26. Continued.

Variable	Source			
	Fertilizer Spray	Variety	Fertilizer Spray	Fertilizer Spray
Grain Yield	NS	***	NS	NS
Grain Test Weight	0.7	***	NS	NS
Kernel Weight	2.3	***	1.17	1.4
WUE - 120 cm	0.53	**	NS	NS
WUE - 180 cm	0.52	**	NS	NS
Seed Nutrients				
Concentration N	0.36	***	NS	NS
P	NS	***	NS	NS
K	NS	***	NS	.012
S	0.02	***	.006	NS
Mn	NS	**	NS	NS
Fe	NS	**	NS	NS
Cu	NS	*	NS	NS
Zn	2.8	***	NS	NS
Uptake N	8.3	**	NS	NS
P	NS	NS	NS	NS
K	NS	***	NS	NS
S	0.55	NS	NS	0.25
Mn	NS	NS	NS	NS
Fe	.021	NS	NS	.007
Cu	NS	NS	NS	NS
Zn	.010	**	NS	NS

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.

