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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 second year of the study with the durum wheat planted on Block 1 of the three year rotation (Durum - Sunflower - Flax). The soil is mainly a Williams loam (fine-loamy, mixed typic argiboroll) with a segment of a Bowbells loam (fine-loamy, mixed pachic argiboroll) in one replication. Initial chemical and physical properties of the site are reported in the 1982 annual report. The 1983 growing season air temperature and precipitation data are summarized in Table 24 and 25.

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 these 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.
4. Evaluate the interaction of the management factors studied with wheat diseases.

PROCEDURE AND RESULTS:

The main wheat experiment was set up in a split-split block arrangement with four replications. Individual unit plots were 24 feet x 24 feet (12 x 24 for yield measurements and 12 x 24 for plant soil and disease sampling). The two main split blocks were fertilizer treatment (F_1 , F_2 , F_3) and fungicide spray (S_1 , S_2) with the spray treatments split by varieties (V_1 , V_2). The treatments were as follows:

F_1 = Normal fertilizer rate deep placed based on soil tests and a yield goal of 35 bu/acre.

F_2 = Nitrogen and phosphorus fertilizer rates deep placed 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 K_2O broadcast as KCl was applied.

S_1 = No fungicide applied.

S_2 = Fungicide applied at head emergence and subsequently in 10 days.

V_1 = Cando durum (semidwarf)

V_2 = Vic durum (normal height)

A growth regulator variable was added in 1983. The treatments included:

A = growth regulator applied

B = no growth regulator

The north half of each plot was sprayed with the growth regulator Ethrel. The material was sprayed on June 24 at a rate of .25 lb/acre with 4 lb AI/gal material.

Soil tests of samples collected in the fall of 1982 showed only 28 lb NO₃/acre in 2 feet, P = 25 lb/acre and K = 468 lb/acre. The F₁ treatment received a fall application of 60 lb N/acre placed deep as 28-0-0 liquid with no P or K for the 35 bu/acre yield goal. F₂ and F₃ received 180 lbs N/acre and 30 lbs P₂O₅/acre also placed in a deep band utilizing liquid 28-0-0 and 10-34-0. The F₃ treatment received a spring broadcast application of 50 lb K₂O/acre as KCl. Prior to planting the durum, the flax stubble was cultivated once lightly with a field cultivator to mellow the unusual dry crusty soil surface. This tillage was necessary to insure adequate planting depth for proper root rot evaluations. The durum varieties were planted on May 2 with an 85 lb/acre seeding rate (90% germination) utilizing a Haybuster drill with 6-inch row spacing. The seed of both varieties was treated with Vitavax 200 prior to planting. All plots received 50 lb/acre of 18-46-0 fertilizer with the seed at planting. The plots were sprayed before planting with 1 pt/acre of Roundup (glyphosate) and 2 oz/acre Banvel (dicamba) with x-77 surfactant for early spring perennial weed growth. Broadleaf control was achieved with a post application of 1 pt/acre Bronate (bromoxynil + MCPA).

Fungicide (Dithane M-45 at 2 lb/A with 9 gpa water and 45 psi) was applied on June 24 (boot to early heading stage) and July 4 using a portable sprayer. Plant samples were collected at the soft dough stage on

July 27 for total dry matter production and nutrient analysis. The durum wheat was harvested on August 11 with a small research combine (90 ft² harvested area). Gravimetric soil moisture samples were collected in the spring (April 27) and fall (September 1) for calculating crop moisture use.

The flax area of the rotation (Block 3 - sunflower stubble) was field cultivated twice and planted with the Haybuster drill on May 21 with Culbert flax at a rate of 40 lb/acre for a yield goal of 25 bu/acre. Soil tests (2 feet NO₃ = 26 lb/acre, P = 47 lb/acre and K = 990 lb/acre) indicated 50 lb N/acre fertilizer required for this yield goal. The nitrogen fertilizer was broadcast as urea (46-0-0) prior to field cultivation. The area was sprayed with a post application of 1 pt/acre Bronate for weed control. The flax was harvested on August 25 and a yield of 22.3 bu/acre was obtained.

The sunflower area of the rotation (Block 2 - wheat stubble) was spring plowed. A 1 qt/acre of Treflan (trifluralin) was applied (incorporated with two field cultivations) for weed control. Soil tests produced values of NO₃ = 24 lb/acre in 2 ft, P = 24 lb/acre and K = 490 lb/acre on this block. Seventy-five pounds of nitrogen fertilizer as urea (46-0-0) was broadcast prior to field cultivation as recommended to achieve the 1800 lb/acre yield goal. The hybrid Dalgren 704 XL was planted on May 31 in 30 inch spacing with a Buffalo-Till planter at a population of 18,000 plants/acre. The sunflower heads were harvested on October 12 and threshed for seed yield. Final population was only 14,500 plants/acre. Yields of 1708, 1643 and 1722 lb/acre and oil content of 40.1, 39.6 and 40.0 percent were obtained for the F₁, F₂ and F₃ fertilizer treatment areas, respectively. Seed weights were similar among fertilizer treatment (28 lb/bushel).

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). The growth regulator and no growth regulator data were analyzed separately with the statistical results summarized in Table 22 and 23.

Plant Growth and Yield

Data on plant height, plant dry matter, grain test weight, seed weight, grain yield, seed dry matter and moisture use by Durum wheat as influenced by fertilizer, variety, fungicide spray and growth regulator are summarized in Tables 1 through 7, respectively. Plant height was not significantly affected by fertilizer or fungicide spray. The growth regulator Ethrel decreased plant height in the semi dwarf variety 3 to 4 inches and the normal height variety 5 to 6 inches. Total plant dry matter at the soft dough stage of growth was increased 500 to 600 lb/acre by the two maximum fertilizer treatments (F₂, F₃) when no growth regulator was used. The same trend in increase with additional fertilizer applied was observed when the growth regulator was applied but it was not significant. The growth regulator decreased total plant dry matter 600 lb/acre on the average.

Grain test weight and kernel weight were decreased (although not always significant) by the maximum fertilizer rates. The semi dwarf variety (Cando) had lower test weights and kernel weights than the normal height Vic variety. The fungicide spray treatment did increase kernel weight, especially when no growth regulator was applied. Kernel weights tended to be higher where the growth regulator was applied but was not apparent with test weight measurements. Although grain yields tended to increase with additional fertilizer and the application of

fungicide, the yields advantages were not significant. The growth regulator application depressed yields about 1 to 2 bu/acre. Moisture use was not significantly affected by fertilizer treatment. The Vic variety (normal height) used significantly more moisture (1 inch) than the semi dwarf variety for similar yields. Those plants receiving a growth regulator also used on the average of 1 inch more than when no growth regulator was applied, yet had lower yields.

Foliar and Root Rot Diseases

The leaf spot ratings for tan spot (caused by Pyrenophora trichostoma) on only the no regulator treatment for the two dates are summarized in Table 8. The ratings indicate that Dithana M45 applied on June 24 and July 4 protected both wheats through July 14 but not through July 29. The abundant rain recorded between July 18 and July 20 may have washed off the Dithane M45. It appears the chemical protection did not last long enough as total plant dry matter and yield, although higher with the fungicide application, were not significantly affected by the spray.

In 1983, there was a moderate level of common root rot (caused by Helminthosporium sativum) in the Minot area. The disease ratings were made during the week of July 18-22 and are summarized in Table 9. Thirty individual plants were rated to obtain a mean for individual plots (only the no regulator plots were evaluated). The data show no significant differences due to fertilizer or fungicide treatment. The two wheat cultivars (Cando and Vic) differ in root rot susceptibility and this is reflected in the ratings.

Overall, about 1% of heads and tillers in the plot area were killed in a manner typical of Fusarium root rot. Isolations from symptomatic

plants demonstrated the presence of Fusarium culmorum, a known root rot pathogen. In each plot, the number of killed heads and tillers in a sample of 500 heads were determined. The results in Table 9 are presented as Fusarium root rot incidence. Again, the only difference observed was between the two cultivars with no influence resulting from fungicide spray or fertilizer treatment. Although the levels were significantly different among varieties, the values are so low to be inconsequential.

Plant Nutrient Concentrations and Uptake

Nitrogen, phosphorus and potassium concentration and uptake by plant samples collected at the soft dough stage and grain at harvest are summarized in Tables 10 through 21. Nitrogen concentration and uptake in the plants and grain were not significantly affected by the treatment variables applied. Phosphorus concentration and uptake by the Vic (V₂) plants were significantly lower than the Cando (V₁) plants, but the relationship did not carry over to the durum seed. Potassium concentration and uptake by durum plants and seeds were increased by the high fertilizer applications (F₂ and F₃). The Vic variety consistently had lower potassium levels in the grain than the semidwarf Cando variety. The application of a growth regulator did not appear to greatly effect the concentration or uptake of the three major nutrients.

YIELD LIMITING FACTORS:

Although plant growth during 1983 appeared to be ideal, the yields obtained were much lower than expected. This was partially related to the unusual and extreme climatic conditions. Soil moisture was excellent at the starting of the growing season, but the lack of rainfall for a 30 day period in late May and early June probably affected

yield potential since yield levels are partially determined during this growth period. Cool temperatures occurred early in the season while extremely warm humid conditions were present during July and early August. The extremes definitely affected the wheat plants growth pattern or growing degree days (GDD) as represented in Figure 1. The 1983 crop matured much faster than the 1982 crop thus placing a greater demand on stored soil moisture and adequate precipitation during the early part of the season. Notice the extreme warm periods during flowering and grain filling periods in 1983 that were not present in 1982. Grain yields, on the average, were 5 bu/acre lower in 1983 than obtained in 1982. Leaf disease development was enhanced by the warm humid conditions and although fungicide treated plots were slightly higher, the two fungicide treatments failed to protect the plants adequately as shown by the disease ratings. The low fertility treatment (35 bu/acre yield goal) has yielded exceptionally well, indicating that a large portion of the nitrogen needed for the 50 bu/acre yield was obtained from the soil below the 2-foot soil test level. Subsequently, the high fertility rates produced only an additional 3 to 5 bu/acre. The inclusion of sunflowers into the rotation should eventually remove the deep nitrogen accumulations at this site and responses from the higher rates will be greater in future years.

PLANNED CHANGES FOR NEXT YEAR:

The basic plan for the proposal will remain the same as to fertilizer, variety and fungicide treatments with only some minor modifications for 1984. Since the potassium fertilizer showed some promise in yield and disease incidence, we would like to increase the rate from 50 to 100 lb/acre K_2O to insure an adequate amount. Since the fungicide

did not give the time coverage desired, additional sprays will be considered even though this is not considered economically sound. The growth regular treatment that was added in 1983 will be discontinued since it showed little promise and its main advantage is with lodged grain which rarely occurs at this location with these varieties. Our deep placed N and P treatments have been applied this fall on block #3. Based on soil tests, the rates will be the same as applied in 1983.

DATA CITATION AND ECONOMIC EVALUATION

The data as presented is available for use by PPI/FAR, the project supporter. There are no plans at this time to do an economic evaluation of this year's data since only limited response was obtained by the variables. Economic evaluations may be considered in future years when consistent responses are obtained or after the crop rotation sequences run a number of years.

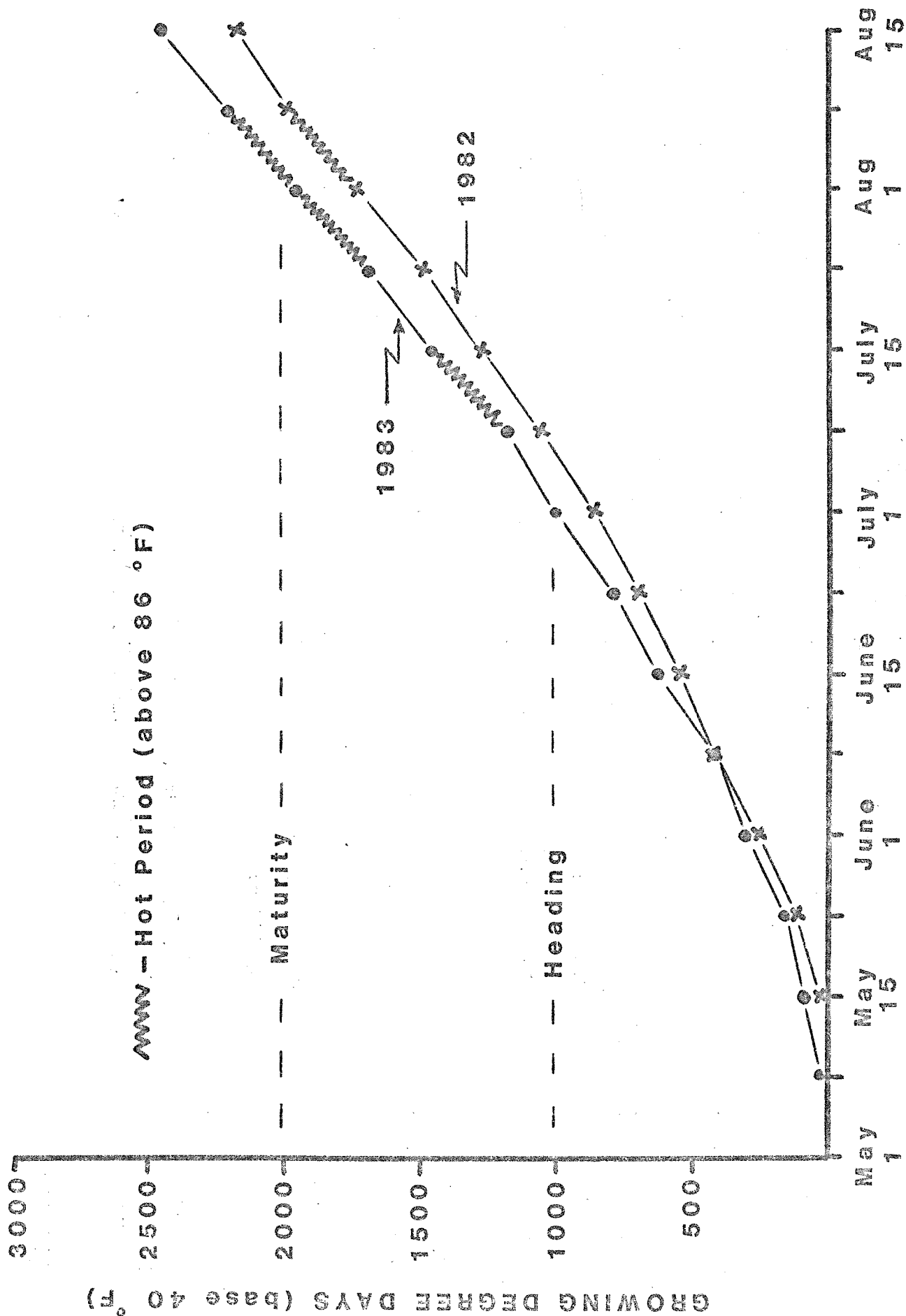


Figure 1. Accumulative Growing Degree Days - Maximum Wheat Yield Trial
 Minot, ND

Table 1. Height of Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, Fungicide Spray and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁		Ave.	S ₂		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
inches									
<u>No Growth Regulator</u>									
F ₁	25.9	36.7	<u>31.3</u>	25.3	35.7	<u>30.5</u>	25.6	36.2	<u>30.9</u>
F ₂	25.1	36.1	<u>30.6</u>	26.0	35.0	<u>30.5</u>	25.5	35.6	<u>30.6</u>
F ₃	25.9	35.2	<u>30.6</u>	26.4	34.9	<u>30.6</u>	26.1	35.1	<u>30.6</u>
Ave.	25.6	36.0	<u>30.8</u>	25.8	35.2	<u>30.6</u>	<u>25.8</u>	<u>35.6</u>	<u>30.7</u>
<u>Growth Regulator Applied^{4/}</u>									
F ₁	21.4	28.8	<u>25.1</u>	22.8	28.7	<u>25.8</u>	22.1	28.8	<u>25.5</u>
F ₂	22.9	30.7	<u>26.8</u>	21.6	30.5	<u>26.0</u>	22.2	30.6	<u>26.4</u>
F ₃	22.1	29.6	<u>25.9</u>	22.2	28.3	<u>25.3</u>	22.2	29.0	<u>25.6</u>
Ave.	22.2	29.7	<u>25.9</u>	22.2	29.1	<u>25.7</u>	<u>22.2</u>	<u>29.4</u>	<u>25.8</u>

^{1/}Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

^{2/}Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

^{3/}Variety

V₁ = Cando durum.

V₂ = Vic durum.

^{4/}Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb AI/gal material).

Table 2. Dry Matter of Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, Fungicide Spray and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁		Ave.	S ₂		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
lb/acre									
<u>No Growth Regulator</u>									
F ₁	6548	6596	<u>6572</u>	6380	7364	<u>6872</u>	6464	6980	<u>6722</u>
F ₂	7244	7244	<u>7244</u>	7292	7340	<u>7316</u>	7268	7292	<u>7280</u>
F ₃	7374	7172	<u>7273</u>	7268	7364	<u>7316</u>	7321	7268	<u>7294</u>
Ave.	7055	7004	<u>7030</u>	6980	7356	<u>7168</u>	<u>7018</u>	<u>7180</u>	<u>7099</u>
<u>Growth Regulator Applied^{4/}</u>									
F ₁	5973	5838	<u>5906</u>	5924	6280	<u>6102</u>	5949	6059	<u>6004</u>
F ₂	6553	6596	<u>6575</u>	6444	6093	<u>6368</u>	6599	6344	<u>6472</u>
F ₃	6404	6380	<u>6392</u>	6620	6620	<u>6620</u>	6512	6500	<u>6506</u>
Ave.	6310	6272	<u>6291</u>	6396	6330	<u>6364</u>	<u>6353</u>	<u>6301</u>	<u>6327</u>

^{1/}Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

^{2/}Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

^{3/}Variety

V₁ = Cando durum.

V₂ = Vic durum.

^{4/}Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb AI/gal material).

Table 3. Grain Test Weight of Durum Wheat as Influenced by Fertilizer Treatment, Variety, Fungicide Spray and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁		Ave.	S ₂		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
	lb/bu								
	<u>No Growth Regulator</u>								
F ₁	60.2	61.1	<u>60.7</u>	60.8	61.6	<u>61.2</u>	60.5	61.4	<u>60.9</u>
F ₂	58.6	60.6	<u>59.6</u>	59.2	60.8	<u>60.0</u>	58.9	60.7	<u>59.8</u>
F ₃	59.1	60.5	<u>59.8</u>	59.9	61.0	<u>60.4</u>	59.5	60.8	<u>60.1</u>
Ave.	59.3	60.8	<u>60.0</u>	60.0	61.1	<u>60.5</u>	<u>59.6</u>	<u>60.9</u>	<u>60.3</u>
	<u>Growth Regulator Applied^{4/}</u>								
F ₁	60.0	59.6	<u>59.8</u>	60.5	60.2	<u>60.4</u>	60.2	59.9	<u>60.1</u>
F ₂	59.0	60.0	<u>59.5</u>	59.9	60.0	<u>59.9</u>	59.4	60.0	<u>59.7</u>
F ₃	59.6	59.6	<u>59.6</u>	60.5	60.4	<u>60.4</u>	60.1	60.0	<u>60.0</u>
Ave.	59.5	59.8	<u>59.6</u>	60.3	60.2	<u>60.2</u>	<u>59.9</u>	<u>60.0</u>	<u>59.9</u>

^{1/}Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

^{2/}Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

^{3/}Variety

V₁ = Cando durum.

V₂ = Vic durum.

^{4/}Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb AI/gal material).

Table 4. Kernel Weight of Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, Fungicide Spray and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁		Ave.	S ₂		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
gram/1000									
<u>No Growth Regulator</u>									
F ₁	30.4	38.4	<u>34.4</u>	34.2	39.7	<u>36.9</u>	32.3	39.0	<u>35.7</u>
F ₂	28.7	36.0	<u>32.4</u>	31.1	38.8	<u>34.9</u>	29.9	37.4	<u>33.7</u>
F ₃	30.6	36.6	<u>33.6</u>	30.1	38.9	<u>34.5</u>	30.4	37.8	<u>34.0</u>
Ave.	29.9	37.0	<u>33.5</u>	31.8	39.1	<u>35.4</u>	<u>30.9</u>	<u>38.0</u>	<u>34.5</u>
<u>Growth Regulator Applied^{4/}</u>									
F ₁	32.9	41.0	<u>36.9</u>	34.7	42.2	<u>38.4</u>	33.8	41.6	<u>37.7</u>
F ₂	31.0	38.9	<u>34.9</u>	31.8	39.7	<u>35.9</u>	31.4	39.3	<u>35.4</u>
F ₃	31.5	38.6	<u>35.1</u>	33.0	40.8	<u>36.9</u>	32.3	39.7	<u>36.0</u>
Ave.	31.8	39.5	<u>35.6</u>	33.1	40.9	<u>37.0</u>	<u>32.5</u>	<u>40.2</u>	<u>36.3</u>

^{1/}Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

^{2/}Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

^{3/}Variety

V₁ = Cando durum.

V₂ = Vic durum.

^{4/}Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb AI/gal material).

Table 5. Grain Yield of Durum Wheat as Influenced by Fertilizer Treatment, Variety, Fungicide Spray, and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁		Ave.	S ₂		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
bu/acre									
<u>No Growth Regulator</u>									
F ₁	50.8	50.6	<u>50.7</u>	52.6	49.7	<u>51.1</u>	51.7	50.1	<u>50.9</u>
F ₂	54.2	56.4	<u>55.3</u>	55.6	55.3	<u>55.4</u>	54.9	55.8	<u>55.4</u>
F ₃	54.3	55.3	<u>54.8</u>	56.7	57.2	<u>57.0</u>	55.5	56.3	<u>55.9</u>
Ave.	53.1	54.1	<u>53.6</u>	54.9	54.1	<u>54.5</u>	<u>54.0</u>	<u>54.1</u>	<u>54.0</u>
<u>Growth Regulator Applied^{4/}</u>									
F ₁	51.0	50.7	<u>50.8</u>	52.0	50.1	<u>51.0</u>	51.5	50.4	<u>50.9</u>
F ₂	53.4	50.9	<u>52.2</u>	55.4	53.2	<u>54.3</u>	54.4	52.0	<u>53.2</u>
F ₃	53.4	52.9	<u>53.1</u>	57.2	56.4	<u>56.8</u>	55.3	54.6	<u>55.0</u>
Ave.	52.6	51.5	<u>52.0</u>	54.9	53.2	<u>54.0</u>	<u>53.7</u>	<u>52.3</u>	<u>53.0</u>

1/Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

2/Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

3/Variety

V₁ = Cando durum.

V₂ = Vic durum.

4/Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb AI/gal material).

Table 6. Dry Matter of Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, Fungicide Spray and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁		Ave.	S ₂		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
lb/acre									
<u>No Growth Regulator</u>									
F ₁	2668	2654	<u>2661</u>	2759	2609	<u>2684</u>	2714	2632	<u>2673</u>
F ₂	2844	2960	<u>2902</u>	2916	2903	<u>2910</u>	2880	2931	<u>2906</u>
F ₃	2853	2903	<u>2878</u>	2978	3006	<u>2992</u>	2915	2954	<u>2935</u>
Ave.	2788	2839	<u>2837</u>	2884	2839	<u>2862</u>	<u>2836</u>	<u>2839</u>	<u>2838</u>
<u>Growth Regulator Applied^{4/}</u>									
F ₁	2675	2662	<u>2668</u>	2730	2629	<u>2679</u>	2702	2645	<u>2674</u>
F ₂	2802	2674	<u>2737</u>	2910	2790	<u>2850</u>	2856	2731	<u>2794</u>
F ₃	2801	2776	<u>2788</u>	3004	2958	<u>2981</u>	2903	2867	<u>2885</u>
Ave.	2759	2704	<u>2732</u>	2881	2793	<u>2813</u>	<u>2820</u>	<u>2748</u>	<u>2784</u>

^{1/}Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

^{2/}Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

^{3/}Variety

V₁ = Cando durum.

V₂ = Vic durum.

^{4/}Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb AI/gal material).

Table 7. Moisture Use by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, Fungicide Spray and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁		Ave.	S ₂		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
inches									
<u>No Growth Regulator</u>									
F ₁	13.4	14.5	<u>14.0</u>	13.3	14.3	<u>13.8</u>	13.4	14.4	<u>13.9</u>
F ₂	13.6	14.5	<u>14.0</u>	13.2	14.7	<u>13.9</u>	13.4	14.6	<u>14.0</u>
F ₃	13.0	14.9	<u>14.0</u>	14.3	13.2	<u>13.8</u>	13.7	14.1	<u>13.9</u>
Ave.	13.3	14.6	<u>14.0</u>	13.6	14.1	<u>13.8</u>	<u>13.4</u>	<u>14.4</u>	<u>13.9</u>
<u>Growth Regulator Applied^{4/}</u>									
F ₁	14.8	16.0	<u>15.4</u>	14.0	14.4	<u>14.2</u>	14.4	15.2	<u>14.8</u>
F ₂	16.1	16.4	<u>16.3</u>	14.6	15.1	<u>14.8</u>	15.4	15.8	<u>15.6</u>
F ₃	14.8	16.1	<u>15.4</u>	14.8	14.8	<u>14.8</u>	14.8	15.4	<u>15.1</u>
Ave.	15.2	16.2	<u>15.7</u>	14.4	14.8	<u>14.6</u>	<u>14.8</u>	<u>15.5</u>	<u>15.2</u>

1/Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

2/Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

3/Variety

V₁ = Cando durum.

V₂ = Vic durum.

4/Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb AI/gal material).

Table 8. Leaf Spot Disease Ratings of Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety and Fungicide Spray: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁		Ave.	S ₂		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
numerical rating									
July 14 Rating ^{4/}									
F ₁	2.75	2.75	<u>2.75</u>	1.00	1.00	<u>1.00</u>	1.88	1.88	<u>1.88</u>
F ₂	3.00	3.00	<u>3.00</u>	1.00	1.00	<u>1.00</u>	2.00	2.00	<u>2.00</u>
F ₃	2.25	3.25	<u>2.75</u>	1.00	1.00	<u>1.00</u>	1.62	2.12	<u>1.88</u>
Ave.	2.67	3.00	<u>2.83</u>	1.00	1.00	<u>1.00</u>	<u>1.83</u>	<u>2.00</u>	
July 29 Rating									
F ₁	9.00	9.00	<u>9.00</u>	9.00	8.75	<u>8.88</u>	9.00	8.88	<u>8.94</u>
F ₂	9.00	9.00	<u>9.00</u>	9.00	9.00	<u>9.00</u>	9.00	9.00	<u>9.00</u>
F ₃	9.00	9.00	<u>9.00</u>	9.00	9.00	<u>9.00</u>	9.00	9.00	<u>9.00</u>
Ave.	9.00	9.00	<u>9.00</u>	9.00	8.92	<u>8.96</u>	<u>9.00</u>	<u>8.96</u>	

^{1/}Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

^{2/}Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

^{3/}Variety

V₁ = Cando durum.

V₂ = Vic durum.

^{4/}Rating 0-9 (0 = no spotting, 9 = severe spotting including the flag leaf). First rating when wheat at 2/3 berry and second rating at late milk stage.

Table 9. Common Root Rot Ratings and Fusarium Root Rot Incidence of Durum Wheat as Influenced by Fertilizer Treatment, Variety, and Fungicide Spray: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁		Ave.	S ₂		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
numerical rating									
Common Root Rot Ratings ^{4/}									
F ₁	2.05	1.60	<u>1.83</u>	2.03	1.66	<u>1.84</u>	2.04	1.63	<u>1.83</u>
F ₂	2.20	1.68	<u>1.94</u>	2.12	1.72	<u>1.92</u>	2.16	1.70	<u>1.93</u>
F ₃	1.97	1.75	<u>1.86</u>	2.09	1.72	<u>1.90</u>	2.03	1.73	<u>1.88</u>
Ave.	2.07	1.68	<u>1.88</u>	2.08	1.70	<u>1.89</u>	<u>2.08</u>	<u>1.69</u>	
Fusarium Root Rot Incidence ^{5/}									
F ₁	1.25	0.45	<u>0.85</u>	0.75	0.95	<u>0.85</u>	1.00	0.70	<u>0.85</u>
F ₂	1.65	0.60	<u>1.12</u>	1.50	0.85	<u>1.18</u>	1.58	0.72	<u>1.15</u>
F ₃	1.25	0.40	<u>0.82</u>	1.40	0.75	<u>1.08</u>	1.32	0.58	<u>0.95</u>
Ave.	1.38	0.48	<u>0.93</u>	1.22	0.85	<u>1.03</u>	<u>1.30</u>	<u>0.67</u>	

^{1/}Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

^{2/}Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

^{3/}Variety

V₁ = Cando durum.

V₂ = Vic durum.

^{4/}Ratings: 1 = Clean to 4 = Severe.

^{5/}Incidence = Percent of heads showing typical white head symptom of F. culmorum.

Table 10. Nitrogen Concentration of Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, Fungicide Spray and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁		Ave.	S ₂		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
%									
<u>No Growth Regulator</u>									
F ₁	1.14	1.02	<u>1.08</u>	1.24	1.21	<u>1.22</u>	1.19	1.12	<u>1.15</u>
F ₂	1.34	1.44	<u>1.42</u>	1.33	1.18	<u>1.26</u>	1.36	1.31	<u>1.33</u>
F ₃	1.40	1.34	<u>1.37</u>	1.37	1.24	<u>1.30</u>	1.38	1.29	<u>1.34</u>
Ave.	1.31	1.26	<u>1.29</u>	1.31	1.21	<u>1.26</u>	<u>1.31</u>	<u>1.24</u>	<u>1.27</u>
<u>Growth Regulator Applied^{4/}</u>									
F ₁	1.32	1.45	<u>1.38</u>	1.41	1.35	<u>1.38</u>	1.36	1.40	<u>1.38</u>
F ₂	1.53	1.35	<u>1.44</u>	1.48	1.34	<u>1.41</u>	1.51	1.34	<u>1.42</u>
F ₃	1.19	1.40	<u>1.29</u>	1.32	1.24	<u>1.28</u>	1.26	1.32	<u>1.29</u>
Ave.	1.35	1.40	<u>1.37</u>	1.40	1.31	<u>1.36</u>	<u>1.38</u>	<u>1.36</u>	<u>1.36</u>

^{1/}Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

^{2/}Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

^{3/}Variety

V₁ = Cando durum.

V₂ = Vic durum.

^{4/}Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb AI/gal material).

Table 11. Nitrogen Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, Fungicide Spray, and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁		Ave.	S ₂		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
lb/acre									
<u>No Growth Regulator</u>									
F ₁	74.8	67.9	<u>7.13</u>	78.7	90.6	<u>84.7</u>	76.7	79.3	<u>78.0</u>
F ₂	101.3	104.0	<u>102.6</u>	97.0	86.4	<u>91.7</u>	99.1	95.2	<u>97.1</u>
F ₃	102.2	95.3	<u>98.8</u>	98.9	90.9	<u>94.9</u>	100.6	93.1	<u>96.8</u>
Ave.	92.8	89.0	<u>90.9</u>	91.5	89.3	<u>90.4</u>	<u>92.2</u>	<u>89.2</u>	<u>90.7</u>
<u>Growth Regulator Applied^{4/}</u>									
F ₁	79.3	84.7	<u>82.0</u>	83.4	84.7	<u>84.1</u>	81.4	84.7	<u>83.0</u>
F ₂	99.8	89.2	<u>94.5</u>	97.7	81.5	<u>89.6</u>	98.8	85.3	<u>92.1</u>
F ₃	76.2	88.7	<u>82.5</u>	87.7	82.0	<u>84.9</u>	82.0	85.4	<u>83.7</u>
Ave.	85.1	87.6	<u>86.3</u>	89.6	82.7	<u>86.1</u>	<u>87.4</u>	<u>85.1</u>	<u>86.3</u>

^{1/}Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

^{2/}Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

^{3/}Variety

V₁ = Cando durum.

V₂ = Vic durum.

^{4/}Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb AI/gal material).

Table 12. Phosphorus Concentration of Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, Fungicide Spray, and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁			S ₂			V ₁	V ₂	Ave.
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.			
				%					
	<u>No Growth Regulator</u>								
F ₁	.252	.180	<u>.216</u>	.245	.182	<u>.214</u>	.249	.181	<u>.215</u>
F ₂	.228	.235	<u>.231</u>	.238	.185	<u>.211</u>	.232	.210	<u>.221</u>
F ₃	.242	.238	<u>.240</u>	.235	.200	<u>.218</u>	.239	.219	<u>.229</u>
Ave.	.240	.217	<u>.229</u>	.239	.189	<u>.214</u>	<u>.240</u>	<u>.203</u>	<u>.222</u>
	<u>Growth Regulator Applied^{4/}</u>								
F ₁	.228	.252	<u>.240</u>	.232	.218	<u>.225</u>	.230	.235	<u>.232</u>
F ₂	.255	.190	<u>.222</u>	.225	.195	<u>.210</u>	.240	.192	<u>.216</u>
F ₃	.188	.230	<u>.209</u>	.208	.195	<u>.201</u>	.198	.212	<u>.205</u>
Ave.	.223	.224	<u>.224</u>	.222	.202	<u>.212</u>	<u>.222</u>	<u>.213</u>	<u>.218</u>

^{1/}Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

^{2/}Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

^{3/}Variety

V₁ = Cando durum.

V₂ = Vic durum.

^{4/}Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb AI/gal material).

Table 13. Phosphorus Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, Fungicide Spray and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁		Ave.	S ₂		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
lb/acre									
<u>No Growth Regulator</u>									
F ₁	16.4	11.9	<u>14.2</u>	15.5	13.4	<u>14.4</u>	16.0	12.6	<u>14.3</u>
F ₂	16.4	17.0	<u>16.7</u>	17.3	13.4	<u>15.3</u>	16.9	15.2	<u>16.0</u>
F ₃	17.9	17.0	<u>17.4</u>	17.0	14.7	<u>15.9</u>	17.4	15.9	<u>16.6</u>
Ave.	16.9	15.3	<u>16.1</u>	16.6	13.8	<u>15.2</u>	<u>16.8</u>	<u>14.6</u>	<u>15.7</u>
<u>Growth Regulator Applied^{4/}</u>									
F ₁	13.6	14.7	<u>14.2</u>	13.7	13.8	<u>13.8</u>	13.7	14.2	<u>14.0</u>
F ₂	16.6	12.5	<u>14.6</u>	14.9	11.9	<u>13.4</u>	15.8	12.2	<u>14.0</u>
F ₃	12.0	14.6	<u>13.3</u>	13.8	12.9	<u>13.3</u>	12.9	13.7	<u>13.3</u>
Ave.	14.1	14.0	<u>14.0</u>	14.2	12.8	<u>13.5</u>	<u>14.1</u>	<u>13.4</u>	<u>13.8</u>

1/Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

2/Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

3/Variety

V₁ = Cando durum.

V₂ = Vic durum.

4/Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb AI/gal material).

Table 14. Potassium Concentration of Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, Fungicide Spray and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁			S ₂			V ₁	V ₂	Ave.
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.			
%									
<u>No Growth Regulator</u>									
F ₁	1.60	1.97	<u>1.78</u>	1.90	1.90	<u>1.90</u>	1.75	1.93	<u>1.84</u>
F ₂	2.00	2.04	<u>2.02</u>	2.01	1.89	<u>1.95</u>	2.01	1.97	<u>1.99</u>
F ₃	2.08	1.79	<u>1.94</u>	2.04	1.98	<u>2.01</u>	2.06	1.88	<u>1.97</u>
Ave.	1.90	1.94	<u>1.92</u>	1.98	1.92	<u>1.95</u>	<u>1.94</u>	<u>1.93</u>	<u>1.93</u>
<u>Growth Regulator Applied^{4/}</u>									
F ₁	1.63	2.16	<u>1.89</u>	2.20	2.04	<u>2.12</u>	1.92	2.10	<u>2.01</u>
F ₂	2.13	1.90	<u>2.01</u>	2.27	2.02	<u>2.14</u>	2.20	1.96	<u>2.08</u>
F ₃	1.97	1.84	<u>1.91</u>	1.86	1.86	<u>1.86</u>	1.91	1.85	<u>1.88</u>
Ave.	1.91	1.96	<u>1.94</u>	2.11	1.97	<u>2.04</u>	<u>2.01</u>	<u>1.97</u>	<u>1.99</u>

^{1/}Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

^{2/}Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

^{3/}Variety

V₁ = Cando durum.

V₂ = Vic durum.

^{4/}Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb AI/gal material).

Table 15. Potassium Uptake by Durum Wheat Plants as Influenced by Fertilizer Treatment, Variety, Fungicide Spray and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁			S ₂			V ₁	V ₂	Ave.
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.			
lb/acre									
<u>No Growth Regulator</u>									
F ₁	103.9	130.0	<u>116.9</u>	120.6	139.2	<u>129.9</u>	112.2	134.6	<u>123.4</u>
F ₂	144.7	148.1	<u>146.4</u>	146.2	139.4	<u>142.8</u>	145.4	143.7	<u>144.6</u>
F ₃	153.6	128.5	<u>141.1</u>	149.1	146.3	<u>147.8</u>	151.4	137.4	<u>144.4</u>
Ave.	134.1	135.5	<u>134.8</u>	138.6	141.6	<u>140.1</u>	<u>136.3</u>	<u>138.6</u>	<u>137.5</u>
<u>Growth Regulator Applied^{4/}</u>									
F ₁	96.2	125.6	<u>110.9</u>	130.0	127.1	<u>128.6</u>	113.1	126.3	<u>119.7</u>
F ₂	139.3	124.9	<u>132.1</u>	151.7	123.4	<u>137.5</u>	145.5	124.2	<u>134.8</u>
F ₃	125.9	117.8	<u>121.8</u>	122.8	124.4	<u>123.6</u>	124.3	121.1	<u>122.7</u>
Ave.	120.5	122.8	<u>121.6</u>	134.8	125.0	<u>129.9</u>	<u>127.6</u>	<u>123.9</u>	<u>125.7</u>

1/Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

2/Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

3/Variety

V₁ = Cando durum.

V₂ = Vic durum.

4/Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb Al/gal material).

Table 16. Nitrogen Concentration of Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, Fungicide Spray and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁		Ave.	S ₂		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
%									
<u>No Growth Regulator</u>									
F ₁	2.16	2.24	<u>2.20</u>	2.30	2.32	<u>2.31</u>	2.23	2.28	<u>2.25</u>
F ₂	2.69	2.65	<u>2.67</u>	2.66	2.81	<u>2.73</u>	2.68	2.73	<u>2.70</u>
F ₃	2.42	2.63	<u>2.53</u>	2.66	2.52	<u>2.59</u>	2.54	2.58	<u>2.56</u>
Ave.	2.42	2.51	<u>2.47</u>	2.54	2.55	<u>2.54</u>	<u>2.48</u>	<u>2.53</u>	<u>2.51</u>
<u>Growth Regulator Applied^{4/}</u>									
F ₁	2.24	2.33	<u>2.29</u>	2.32	2.52	<u>2.42</u>	2.28	2.43	<u>2.35</u>
F ₂	2.61	2.61	<u>2.61</u>	2.67	2.86	<u>2.76</u>	2.64	2.73	<u>2.68</u>
F ₃	2.39	2.75	<u>2.57</u>	2.43	2.63	<u>2.53</u>	2.41	2.69	<u>2.55</u>
Ave.	2.41	2.56	<u>2.49</u>	2.47	2.67	<u>2.57</u>	<u>2.44</u>	<u>2.62</u>	<u>2.53</u>

^{1/}Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

^{2/}Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

^{3/}Variety

V₁ = Cando durum.

V₂ = Vic durum.

^{4/}Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb AI/gal material).

Table 17. Nitrogen Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, Fungicide Spray and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁		Ave.	S ₂		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
lb/acre									
<u>No Growth Regulator</u>									
F ₁	57.6	60.0	<u>58.8</u>	63.6	61.1	<u>62.4</u>	60.6	60.6	<u>60.6</u>
F ₂	77.7	78.6	<u>78.2</u>	77.4	81.4	<u>79.4</u>	77.6	80.0	<u>78.8</u>
F ₃	69.4	76.6	<u>73.0</u>	79.3	75.7	<u>77.5</u>	74.3	76.2	<u>75.3</u>
Ave.	68.2	71.7	<u>70.0</u>	73.4	72.8	<u>73.1</u>	<u>70.8</u>	<u>72.2</u>	<u>71.6</u>
<u>Growth Regulator Applied^{4/}</u>									
F ₁	60.2	62.3	<u>61.3</u>	63.3	66.2	<u>64.8</u>	61.8	64.3	<u>63.0</u>
F ₂	73.6	69.7	<u>71.6</u>	77.7	79.7	<u>78.7</u>	75.7	74.7	<u>75.2</u>
F ₃	67.0	76.8	<u>71.9</u>	72.8	77.9	<u>75.4</u>	69.9	77.4	<u>73.6</u>
Ave.	66.9	69.6	<u>68.3</u>	71.3	74.6	<u>73.0</u>	<u>69.1</u>	<u>72.1</u>	<u>70.6</u>

1/Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

2/Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

3/Variety

V₁ = Cando durum.

V₂ = Vic durum.

4/Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb AI/gal material).

Table 18. Phosphorus Concentration of Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, Fungicide Spray and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁		Ave.	S ₂		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
%									
<u>No Growth Regulator</u>									
F ₁	.410	.400	<u>.405</u>	.400	.398	<u>.399</u>	.405	.399	<u>.402</u>
F ₂	.415	.402	<u>.409</u>	.412	.402	<u>.407</u>	.414	.402	<u>.408</u>
F ₃	.408	.402	<u>.405</u>	.422	.405	<u>.414</u>	.415	.404	<u>.409</u>
Ave.	.411	.402	<u>.406</u>	.412	.402	<u>.407</u>	<u>.411</u>	<u>.402</u>	<u>.406</u>
<u>Growth Regulator Applied^{4/}</u>									
F ₁	.408	.402	<u>.405</u>	.392	.398	<u>.395</u>	.400	.400	<u>.400</u>
F ₂	.425	.392	<u>.409</u>	.405	.392	<u>.399</u>	.415	.392	<u>.404</u>
F ₃	.402	.405	<u>.404</u>	.430	.412	<u>.421</u>	.416	.409	<u>.412</u>
Ave.	.412	.400	<u>.406</u>	.409	.401	<u>.405</u>	<u>.410</u>	<u>.400</u>	<u>.405</u>

1/Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

2/Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

3/Variety

V₁ = Cando durum.

V₂ = Vic durum.

4/Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb AI/gal material).

Table 19. Phosphorus Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, Fungicide Spray and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁			S ₂			V ₁	V ₂	Ave.
	V ₁	V ₂	Ave.	V ₁	V ₂	Ave.			
lb/acre									
<u>No Growth Regulator</u>									
F ₁	11.0	10.6	<u>10.8</u>	11.0	10.4	<u>10.7</u>	11.0	10.5	<u>10.7</u>
F ₂	11.7	11.9	<u>11.8</u>	12.0	11.6	<u>11.8</u>	11.8	11.8	<u>11.8</u>
F ₃	11.6	11.7	<u>11.8</u>	12.6	12.3	<u>12.4</u>	12.1	11.9	<u>12.0</u>
Ave.	11.4	11.4	<u>11.4</u>	11.9	11.4	<u>11.6</u>	<u>11.6</u>	<u>11.4</u>	<u>11.5</u>
<u>Growth Regulator Applied^{4/}</u>									
F ₁	10.9	10.8	<u>10.8</u>	10.7	10.5	<u>10.6</u>	10.8	10.6	<u>10.7</u>
F ₂	11.8	10.5	<u>11.1</u>	11.8	10.9	<u>11.4</u>	11.8	10.7	<u>11.2</u>
F ₃	11.3	11.3	<u>11.3</u>	12.9	12.2	<u>12.6</u>	12.1	11.7	<u>11.9</u>
Ave.	11.3	10.8	<u>11.1</u>	11.8	11.2	<u>11.5</u>	<u>11.6</u>	<u>11.0</u>	<u>11.3</u>

1/Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

2/Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

3/Variety

V₁ = Cando durum.

V₂ = Vic durum.

4/Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb AI/gal material).

Table 20. Potassium Concentration of Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, Fungicide Spray and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁		Ave.	S ₂		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				
				%					
	<u>No Growth Regulator</u>								
F ₁	.565	.498	<u>.531</u>	.538	.475	<u>.506</u>	.551	.486	<u>.519</u>
F ₂	.602	.565	<u>.584</u>	.618	.512	<u>.565</u>	.610	.539	<u>.574</u>
F ₃	.610	.540	<u>.575</u>	.578	.532	<u>.555</u>	.594	.536	<u>.565</u>
Ave.	.592	.534	<u>.563</u>	.578	.507	<u>.542</u>	<u>.585</u>	<u>.520</u>	<u>.553</u>
	<u>Growth Regulator Applied^{4/}</u>								
F ₁	.562	.508	<u>.535</u>	.515	.470	<u>.492</u>	.539	.489	<u>.514</u>
F ₂	.622	.538	<u>.580</u>	.585	.505	<u>.545</u>	.604	.521	<u>.562</u>
F ₃	.590	.540	<u>.565</u>	.578	.538	<u>.558</u>	.584	.539	<u>.561</u>
Ave.	.592	.528	<u>.560</u>	.559	.504	<u>.532</u>	<u>.575</u>	<u>.516</u>	<u>.546</u>

1/Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

2/Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

3/Variety

V₁ = Cando durum.

V₂ = Vic durum.

4/Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb AI/gal material).

Table 21. Potassium Uptake by Durum Wheat Seed as Influenced by Fertilizer Treatment, Variety, Fungicide Spray and Growth Regulator: Minot, ND - 1983.

Fertilizer Treatment ^{1/}	Fungicide Spray Treatment ^{2/}						Variety ^{3/}		
	S ₁		Ave.	S ₂		Ave.	V ₁	V ₂	Ave.
	V ₁	V ₂		V ₁	V ₂				

lb/acre

No Growth Regulator

F ₁	15.0	13.2	<u>14.1</u>	14.8	12.4	<u>13.6</u>	14.9	12.8	<u>13.8</u>
F ₂	17.0	16.7	<u>16.9</u>	18.0	14.8	<u>16.4</u>	17.5	15.8	<u>16.6</u>
F ₃	17.4	15.7	<u>16.5</u>	17.2	16.0	<u>16.6</u>	17.3	15.8	<u>16.6</u>
Ave.	16.5	15.2	<u>15.8</u>	16.7	14.4	<u>15.5</u>	<u>16.6</u>	<u>14.8</u>	<u>15.7</u>

Growth Regulator Applied^{4/}

F ₁	15.0	13.6	<u>14.3</u>	14.1	12.3	<u>13.2</u>	14.6	13.0	<u>13.8</u>
F ₂	17.3	14.4	<u>15.8</u>	17.0	14.0	<u>15.5</u>	17.2	14.2	<u>15.7</u>
F ₃	16.5	15.0	<u>15.8</u>	17.4	15.9	<u>16.6</u>	16.9	15.5	<u>16.2</u>
Ave.	16.3	14.3	<u>15.3</u>	16.2	14.1	<u>15.1</u>	<u>16.2</u>	<u>14.2</u>	<u>15.2</u>

1/Fertilizer treatment

F₁ = Normal fertilizer rate based on soil tests and yield goal of 35 bu/acre (60 lb N/acre deep placed in the fall).

F₂ = Nitrogen (180 lb N/acre) and phosphorus (30 lb P₂O₅/acre) fertilizer rate fall 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 as KCl applied broadcast in the spring.

Note: All treatments received 50 lb/acre 18-46-0 applied with the seed at planting.

2/Fungicide spray treatment

S₁ = No fungicide applied.

S₂ = Fungicide applied in two applications at recommended rates of Dithane M-45 (2 lb/acre). (First applied June 24 and second on July 4 with 9 gpa water at 45 psi).

3/Variety

V₁ = Cando durum.

V₂ = Vic durum.

4/Growth regulator applied on June 24 (Ethrel applied at .25 lb/acre with 4 lb AI/gal material).

Table 22. Tests of Significance for Variables Measured in the Maximum Durum Wheat Yield Study as Influenced by Fertilizer Treatment, Variety, Fungicide Spray and Subsequent Interactions - No Growth Regulator: Minot, ND - 1983.

Variable	Source					
	Fertilizer	Spray	Variety	Variety x Spray	Fertilizer x Spray	Fertilizer x Variety
Grain Yield (bu/acre)	NS	NS	NS	NS	NS	NS
Grain Test Weight (lb/bu)	.612	NS	***	NS	NS	NS
Plant Height (inches)	NS	NS	***	NS	NS	.76
Leaf Spot Disease (July 14)	NS	***	NS	NS	NS	NS
(July 29)	NS	NS	NS	NS	NS	NS
Common Root Rot	NS	NS	***	NS	NS	NS
Fusarium Root Rot	NS	NS	**	NS	NS	NS
Plant Dry Matter (lb/acre)	538	NS	NS	NS	NS	NS
Plant Nutrients						
Concentration (%)						
N	NS	NS	NS	NS	NS	NS
P	NS	NS	*	NS	NS	NS
K	NS	NS	NS	NS	NS	NS
Uptake (lb/acre)						
N	NS	NS	NS	NS	NS	NS
P	NS	NS	*	NS	NS	NS
K	14.7	NS	NS	NS	NS	19.7
Seed Dry Matter (lb/acre)	NS	NS	NS	NS	NS	NS
Seed Nutrients						
Concentration (%)						
N	NS	NS	NS	NS	NS	NS
P	NS	NS	NS	NS	NS	NS
K	.024	NS	***	NS	NS	NS
Uptake (lb/acre)						
N	NS	NS	NS	NS	NS	NS
P	1.10	NS	NS	NS	NS	NS
K	1.90	NS	***	NS	NS	NS
Kernel Weight (gm/1000)	NS	**	***	NS	NS	NS
Moisture Use (inches)	NS	NS	**	NS	NS	NS

1/ 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.

Table 23. Tests of Significance for Variables Measured in the Maximum Durum Wheat Yield Study as Influenced by Fertilizer Treatment, Variety, Fungicide Spray and Subsequent Interactions - Growth Regulator: Minot, ND - 1983.

Variable	Source					
	Fertilizer	Spray	Variety	Fertilizer x Spray	Fertilizer x Variety	Fertilizer x Spray x Variety
Grain Yield (bu/acre)	NS	NS	NS	NS	NS	NS
Grain Test Weight (lb/bu)	NS	NS	NS	NS	NS	NS
Plant Height (inches)	NS	NS	***	NS	NS	NS
Plant Dry Matter (lb/acre)	NS	NS	NS	NS	NS	NS
Plant Nutrients						
Concentration						
N (%)	NS	NS	NS	NS	NS	NS
P (%)	NS	NS	NS	NS	.036	NS
K (%)	NS	NS	NS	NS	NS	NS
Uptake (lb/acre)						
N	NS	NS	NS	NS	12.1	NS
P	NS	NS	NS	NS	2.18	NS
K	NS	NS	NS	NS	22.2	NS
Seed Dry Matter (lb/acre)	NS	NS	NS	NS	NS	NS
Seed Nutrients						
Concentration (%)						
N	NS	NS	**	NS	NS	NS
P	NS	NS	*	NS	NS	NS
K	.021	NS	***	NS	NS	NS
Uptake (lb/acre)						
N	NS	NS	NS	NS	NS	NS
P	NS	NS	NS	NS	NS	NS
K	1.67	NS	***	NS	NS	NS
Kernel Weight (gm/1000)	.677	NS	***	NS	NS	NS
Moisture Use (inches)	NS	NS	NS	NS	NS	NS

1/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.

Table 24. Daily Growing Season Precipitation Received at the Maximum Wheat Yield Trial: Minot, ND - 1983.

Day	Month						
	April	May	June	July	August	September	October
	inches						
1	.09*			.19		.06	.48
2			.02	.71	.06		.10
3			.02	.35			.35
4			T	T			T
5				.03		T	
6							
7							
8			.03				
9		.03		T		.33	
10			.01		T	T	
11						.08	
12	.33*	.90*				.36	T
13	.09*	.66	T			.27	
14		T				T	
15		T			.14	1.28	
16	T			.05	.54	.16	T
17	.10*				.06	T	
18	T			.71			
19		.31	.19	.33			
20		.04	T	.65	.01		T
21		T	.02		.07		
22		.09	1.57				
23		T			.62		
24		.04			.02		.23
25	T	.03	.10		.14		
26		T	.10		T		
27							
28	.05*				T	.07	
29			.20				
30			.60	.05		.48	
31							
* Snow							
Total (1983)	.66	2.15	2.86	3.07	1.66	3.09	1.19
Average (1905-1980)	1.53	2.18	3.15	2.19	1.94	1.53	0.89

Table 25. Daily Growing Season Maximum and Minimum Air Temperatures at the Maximum Wheat Yield Trial: Minot, ND - 1983.

Day	April		May		June		July		August		September		October	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	37	28	61	28	67	40	75	53	83	54	(94)	65	41	34
2	40	21	63	32	71	46	77	54	(89)	61	(96)	67	48	40
3	36	23	65	32	71	41	76	55	(94)	65	(89)	55	49	40
4	43	25	57	33	70	44	70	57	(99)	65	81	55	55	39
5	40	21	66	35	62	42	74	48	(99)	66	82	56	63	38
6	44	23	70	37	65	40	80	50	(92)	65	71	51	55	32
7	45	24	63	27	75	40	87	65	(98)	67	68	45	56	33
8	50	30	64	27	81	44	(93)	62	(98)	55	85	50	55	34
9	53	32	73	49	78	46	(88)	63	84	54	64	50	60	38
10	52	27	72	42	81	56	(93)	71	84	57	77	47	65	40
11	55	29	71	29	(91)	59	84	53	85	53	62	41	67	27
12	43	24	35	26	(90)	60	79	55	87	53	50	45	39	25
13	27	12	36	29	69	53	(90)	60	(91)	58	49	33	45	25
14	33	12	45	26	77	44	(92)	62	85	52	61	33	53	25
15	39	19	57	27	74	45	(98)	63	(93)	56	54	42	54	27
16	45	20	45	25	65	38	77	52	(87)	60	54	42	44	33
17	37	25	56	26	74	41	78	51	77	57	62	48	48	26
18	45	27	71	44	78	56	83	62	(94)	57	62	38	46	25
19	53	29	72	44	75	59	84	63	(91)	51	56	35	46	25
20	61	36	60	35	77	55	86	68	76	50	46	35	44	32
21	64	36	65	37	83	57	86	68	78	54	45	27	49	41
22	65	30	67	37	76	54	83	58	81	57	45	25	58	38
23	65	35	69	44	76	54	86	54	72	56	56	25	56	34
24	64	40	75	44	83	57	83	54	79	57	68	37	59	37
25	69	46	61	38	(94)	65	82	54	81	57	78	48	51	32
26	69	39	72	40	83	52	(87)	54	(89)	61	74	46	63	35
27	43	29	87	50	78	49	(87)	67	(89)	61	84	53	65	38
28	48	21	82	49	73	51	(88)	63	(91)	62	85	45	76	31
29	38	23	73	39	76	55	(88)	55	(92)	58	55	38	50	30
30	52	26	62	41	67	55	(89)	66	84	59	39	34	59	35
31			56	36			84	54	(90)	61			68	42
Mean (1983)	48	27	64	36	76	50	84	58	88	58	66	44	54	33
Mean (1905-1980)	53	28	66	40	75	50	82	55	81	52	70	42	57	32

