Title: Effect of seeding rate and nitrogen on yield and quality of spring wheat and durum.

Year: 2000.

Location: Western Triangle Agricultural Research Center, Conrad, MT 59425.

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Introduction and Objectives: Low and high seeding rates can adversely affect durum quality and kernel characteristics. Low rates result in green kernels and poor color in the harvested grain. High rates can reduce kernel size below industry requirements and possibly influence test weight. Nitrogen fertilizer is essential for durum to achieve adequate hard vitreous amber color, and may interact with seed rate to affect kernel characteristics. The objectives were to determine the optimum range of seed rates in durum, to determine N requirements for desired protein and vitreous levels, and to compare the responses between durum and spring wheat. Year 2000 is the second year of this study.

Procedures: Plots were planted with a four-row planter with one-foot spacing. Phosphorus fertilizer was applied with the seed and N and potassium (K) fertilizers were broadcast during planting.

Results and Discussion: Agronomic and kernel characteristic data are presented in Table X. The low seeding rate (15 seeds/ft^2) increased percent green kernels to unacceptable levels in 1999, and approached unacceptable levels in year 2000. Seeding rate did not significantly affect yield and test weight under the conditions of this test. The data from both years suggest that dryland seeding rates up to 30 seeds/ ft^2 do not adversely affect test weight. However, since all test weights were below acceptable levels due to drought, kernel sizes were not measured in year 2000. The data also indicate that 15 seeds/ft^2 is to low, resulting in high risk for green-kernel dockage. Since yield and test weights were favorable in the 20 to 30 seeds/ft^2 range, it is suggested that a rate of 23 seeds/ft^2 be used, which equals 1 million seeds per acre. The 1 million seed per acre rate facilitates calculations for the grower in determining quantities of seed to purchase. These data should be interpreted with caution due to the drought, and a hail storm that occurred June 15. Both durum and spring wheat responded negatively to N. In general the highest grain yields were attained without N fertilizer. This years optimum grain yield and protein content would have been obtained with about 40 to 50 lbs of additional N/a.

Future Plans: Continue this test in 2001 in order to sample a variety of growing season conditions.

Table X. Effect of seeding rate and N on spring wheat and durum yield and quality. The experiment was located at Western Triangle Ag. Research Center, Conrad, MT. 2000.

Crop	Fertilizer N (lbs./a)	Seeding Rate (seed/ft^2)	Grain Yield (bu/a)	Test Weight (lbs./bu)	Protein (%)	Protein Yield (lbs./a)	DHV[1] (%)
SW	150	20	47.27	56.70	16.73	456.2	
SW	150	25	46.65	56.78	16.47	460.7	
SW	0	30	46.18	58.85	13.08	360.0	
SW	75	20	45.08	56.93	15.57	420.6	
SW	0	25	44.78	58.33	13.25	356.1	
SW	75	15	44.70	56.97	15.67	419.2	
SW	0	20	44.63	58.28	13.45	361.7	
SW	75	25	43.85	56.75	15.95	418.6	
SW	0	15	43.60	58.12	13.17	346.6	
DU	225	25	43.33	55.00	16.65	431.1	100.0
DU	0	30	43.30	58.85	12.63	328.2	95.5
DU	0	20	43.22	58.55	12.65	329.0	93.3
DU	0	15	43.08	57.85	13.13	338.1	94.3
DU	0	25	43.00	58.35	12.63	326.8	95.3
DU	225	30	42.55	55.15	16.68	424.5	99.8
SW	150	30	41.90	57.35	17.10	427.8	
SW	225	15	41.35	55.63	17.10	423.0	
SW	225	25	41.30	55.47	17.65	436.2	
SW	225	20	41.07	55.83	17.40	427.3	
DU	75	25	41.02	55.45	15.55	380.4	99.8
SW	75	20	40.97	56.20	16.20	396.3	
SW	225	30	40.73	55.25	17.80	433.7	
DU	75	25	40.30	55.35	15.43	371.8	99.0
DU	75	15	38.35	55.08	15.38	351.8	99.3
DU	225	15	37.92	53.85	17.00	386.2	100.0
DU	150	30	37.72	54.40	17.00	384.5	100.0
DU	75	30	37.50	55.70	15.68	351.5	99.3
DU	150	25	36.85	54.13	17.35	362.6	100.0
DU	150	15	36.43	53.88	16.73	365.2	100.0
DU	225	20	36.13	53.20	17.22	372.8	100.0
SW	150	15	35.64	56.47	17.45	360.5	
DU	150	20	33.78	53.97	17.08	345.8	99.5

[1] Dark Hard Vitreous

LSD for DHV = 1.42. The 0 lbs N/a was statistically different from plots that received N.

Summary Statistics

	Grain Yield (Bu/a)	Test Weight (lbs./bu)	Protein (%)	Protein Yield (lbs./a)
Experimental Means	41.47	56.21	15.71	386.1
Error Mean Square	23.34	1.102	0.4270	1788
P-Value	0.0072	0.0000	0.0000	0.0000
Standard Error of the Mean	2.416	0.5250	0.3267	21.14
C.V. 1: (s/mean)*100	11.68	1.868	4.159	10.95
LSD (0.05)	6.787	1.474	0.9176	59.38

Variety Summary

Utopia	39.75	55.55	15.53	367.5
McNeal	43.08	56.84	15.86	407.5
LSD (0.05)	1.40	0.32	0.20	11.97

Seeding Rate Summary

15	40.27	55.94	15.67	375.9
20	40.74	55.99	15.76	382.5
25	42.80	56.29	15.66	400.3
30	41.87	56.56	15.69	391.3
LSD (0.05)	1.98	0.45	NS	17.00

Nitrogen Summary

0	43.97	58.40	13.00	343.3
75	41.47	56.05	15.68	388.8
150	39.68	55.40	16.92	401.1
225	40.55	54.92	17.19	416.8
LSD (0.05)	2.00	0.46	0.29	17.19
Interaction P-value	0.6521	0.9546	0.9268	0.4940

Notes:
Varieties: Durum = Utopia Spring Wheat = McNeal
Seeding Date: 4/24/00 Harvest Date: 8/14/00
Growing Season ppt: 3.46" Previous Crop: Fallow
Fertilizer: N applied as urea (broadcast) while planting. Thirty lbs. P_2O_5 applied with the seed as mono-ammonium phosphate while planting. 30 lbs K/ac as KCl was applied, (broadcast), while planting.
Herbicide: Achieve @ 0.25 lbs. ai/ac and Bronate @ 1 2 pt/ac applied on 6/8/00.

Soil Test Summary[1]:

Depth (ft)	NO_3-N (lbs/a)
0 - 1	35.4
1 - 2	15.6
2 - 3	11.0
3 - 4	7.7

[1]The soil was sampled during autumn of 1999.