Spring Wheat and Durum Yield Response to Rates of Nitrogen

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This study was established with objectives to evaluate wheat and durum yield response to five levels of N (0, 50, 100, 150, and 200 lbs N/ac) applied as urea, and to attain a goal of realizing different levels of residual N under these rates. Durum and hard red spring wheat (HRSW) were seeded on May 24. Yields were recorded at harvest on August 27; grains were analyzed for protein content (table 1) and the response to N rates for wheat (figure 1) and durum (figure 2) determined.

Results

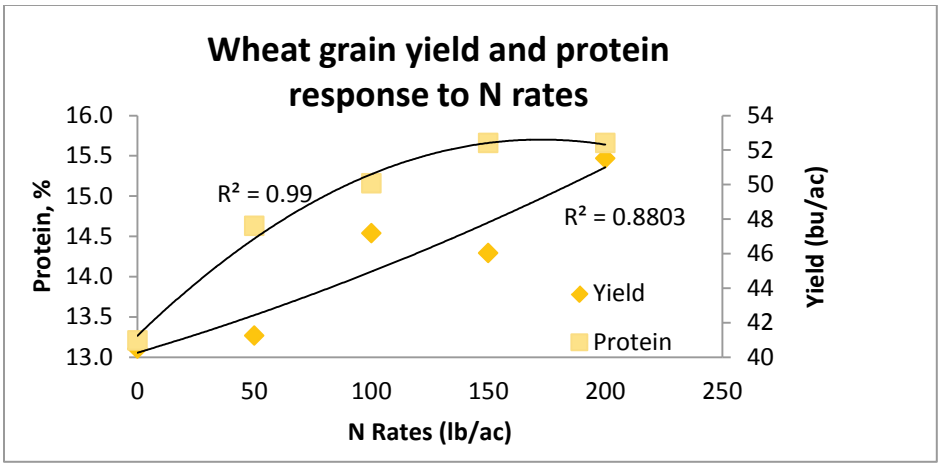
Nitrogen rates significantly (*p <0.05*) increased grain yield and protein content for wheat and durum. Contrary to the protein quadratic response to N rates (figure 1), grain yields showed a stronger linear relationship ($p < 0.0137$), implying that the highest fertilizer rate (200 lbs N) was not enough to maximize yields. However, caution must be taken when interpreting the data because yields were not significantly different between the 100 and 200 lb N rates, thus suggesting optimum yields were produced close to the 100 lb N rate. At this N rate, optimum grain protein was also produced. Durum also optimized yield and protein close to 100 lbs N (figure 2). Soil test results showed a strong correlation between N rates and residual N for wheat ($R^2 = 0.75$) and durum ($R^2 = 0.72$).

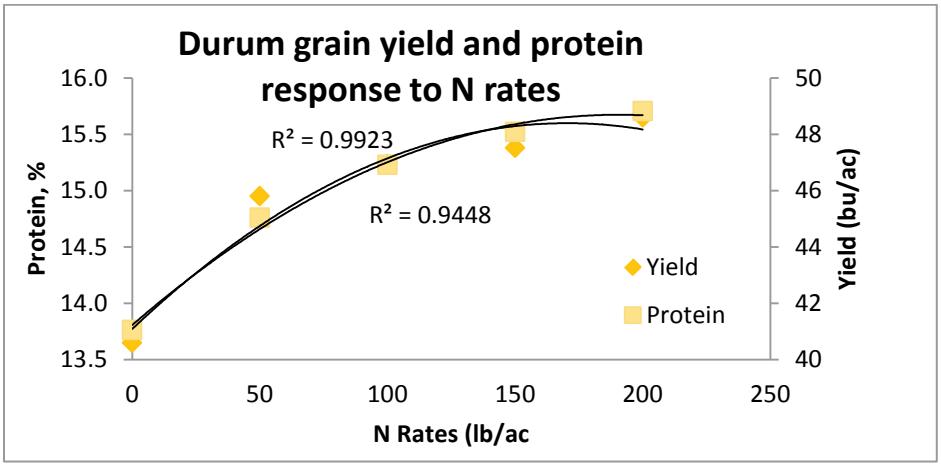
Table 1. Nitrogen fertilizer treatment effect on the grain yield and quality of spring wheat and durum.

Trt	Nitrogen Rates (lb N /ac)	Crop	Yield (bu/ac)	Protein (%)	Test Weight (lb/bu)
1	0	HRSW	40 b	13.21 b	58 a
2	50	HRSW	41 b	14.63 ab	58 a
3	100	HRSW	47 ab	15.16 a	58 a
4	150	HRSW	46 ab	15.66 a	58 a
5	200	HRSW	52 a	15.66 a	58 a
Means			46	14.922	58
Tukey-Kramer's MSD			8.807	1.441	1.704
Treatment differences, P>F2			0.0013	<.0001	0.8426
C.V.			10.918	5.318	1.669
1	0	Durum	41 b	13.76 c	59 a
2	50	Durum	46 ab	14.76 b	59 a
3	100	Durum	47 a	15.26 ab	60 a
4	150	Durum	48 a	15.52 ab	59 a
5	200	Durum	49a	15.71 a	59 a
Means			46	14.979	59
Tukey-Kramer's MSD			5.37	0.811	4.24
Treatment differences, P>F[2]			0.0018	<.0001	0.6026
C.V.			8.76	4.028	5.332

[1] Probability of observing an F-statistic > the observed; Indicates significance of treatment differences at $\alpha = 0.05$

[2] Mean values followed by the same letter in each column are not significantly different from each other


Wheat grain yield and protein response to N rates
16.0
15.5
15.0
14.5
14.0
13.5
13.0
Protein, %
54
52
50
48
46
44
42
40
Yield (bu/ac)
R² = 0.99
R² = 0.8803
Yield
Protein
0
50
100
150
200
250
N Rates (lb/ac)


Durum grain yield and protein response to N rates
16.0
15.5
15.0
14.5
14.0
13.5
Protein, %
50
48
46
44
42
40
Yield (bu/ac)
R² = 0.9923
R² = 0.9448
Yield
Protein
0
50
100
150
200
250
N Rates (lb/ac