Continued Evaluation of N Stabilizing Products on Protein and Yields of Desert Durum Wheat

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Summary

Studies were conducted during the 2011-2012 growing season to follow up on research conducted in 2010-2011 evaluating N stabilizing products on yield and protein content of Durum wheat. The products evaluated included soil biological products reported to enhance N uptake. In 2011-2012 we used more economical rates of the biological products than we used in 2010-2011. There was a positive response to N fertilization in yield and grain protein levels but none of the products evaluated showed positive results under the rates used. Perhaps future studies could compare the biological products at rates higher than those used in 2011-2012 but lower than those used in 2010-2011 where we did get positive results but the rates used were not economical.

Introduction

The term "Desert Durum®" has been coined to refer to most of the durum wheat grain produced in the low deserts of Arizona and Southern California since about 1989. The common denominator of the durum wheat cultivars that are considered to qualify as Desert Durum® is their capability to produce durum grain of exceedingly desirable traits for the milling and pasta industries. These traits include large uniform kernels of very low moisture content resulting in very high rates of semolina flour extraction, yellow semolina/pasta color that is highly desired in many markets, and characteristically strong gluten (a protein) properties that allow the manufacture of pasta of high cooking tolerance that will retain a firm bite after lengthy cooking.

Protein contents of grain are exceedingly important and wheat growers are docked for grain protein level below established threshold values. Because desert durum is flood irrigated multiple times during the growing season, management of N remains challenging. Many durum producers apply large amounts of N fertilizer (sometimes exceeding 300 lbs N/A) to evade these dockages. Many producers monitor the N nutritional status using the stem nitrate-N test and apply water run UN32 based on recommendations developed by the University of Arizona. However, in many cases these monitoring programs called for continual water run N applications resulting in cumulative total seasonal rates of 300 lbs N/A in addition to the residual N remaining from a previous produce crop. These high rates of applied N relative to amounts accumulated by the above-ground plant suggest that much of the applied N may be lost by leaching below the crop root zone and, perhaps, denitrification. A number of growers declined to produce wheat in 2009-2010 because they felt the costs of nitrogen required to produce grain of acceptable quality eliminated any potential profit margin from the crop.

The potential to manage N more efficiently using N conserving products has not been evaluated for desert durum. Potential N conserving products include urease inhibitors that delay the hydrolysis of urea to ammonium, nitrification inhibitors that delay the biochemical oxidation of ammonium to nitrate, and controlled release N (CRN) fertilizers that aim to provide N release rates from coated fertilizer granules to coincide with N uptake patterns. All of these technologies may result in preserving N in the crop root zone by reducing N volatilization losses, leaching losses, and losses to denitrification.

During 2010-2011 we evaluated a number of N stabilizing products. We have collected yield and the observed that differences are minimal. Although all grain protein levels for all treatments were above the threshold of 12%, some treatments produced grain protein levels appreciably greater. For example, the Agrinos biological packages of HYT AB and HYT ABC applied with 200 kg N/ha produced grain protein levels greater than 16%.

Our objective in 2011-2012 is to continue these experiments with the most promising products identified in 2010-2011.

Materials and Methods

A study was conducted with Durum wheat (cv. Havasu) to evaluate the effects of HYT biological treatments on yield and grain protein. The treatments were as follows:

1. No Water Run N Fertilizer
2. No Water Run N fertilizer with HYT program
3. 50% Water Run N program
4. 50% Water Run N Program with HYT program
5. 100% Water Run N Program (GSP)

The wheat was planted November 14, 2011 using a plot planter. The experiment was randomized complete block designs with four replications.

The 50% water run program was 150 kg N/ha as UAN32 and the 100% water run program was 300 kg N/ha as UAN32. The water runs were applied with a calibrated float box on six irrigations. Wheat seedlings were collected at the early-tillering stage (January 12, 2012) for dry matter production. Wheat yields were collected with a plot harvester on May 11, 2012.

Results

Wheat yields and grain protein increased to the first increment of N fertilizer (Table 1). Interestingly, the 50% N program (150 kg N/ha)) was superior to the grower standard practice (300 kg N/ha) in this experiment. Grain protein levels were all adequate after the first increment of N fertilizer. The HYT program did not significantly increase yield or grain protein in this experiment. It should be noted that we did get a significant increase in grain protein levels in a previous study conducted in 2010-2011 but the rates used were not economical. Perhaps future studies could compare the biological products at rates higher than those used in 2011-2012 but lower than those used in 2010-2011.

Table 1. Response of wheat to N practice and HYT program.

N Programs	**Biological**	**Seedling weight (g/30 cm row)**	**Yield (MT/ha)**	**Grain Protein (%)**
No Nitrogen	None	16.0	3.7	9.5
No Nitrogen	HYT Program	16.5	3.5	9.3
50% N	None	15.5	7.9	15.2
50% N	HYT Program	16.4	8.1	14.4
100% N (GSP)	None	13.2	6.3	16.1
Statistics		NS	2.5	1.7

Least Significant difference at the 5% level. NS=not significant.