THE EFFECT OF NITROGEN FERTILIZER RATES
ON TWIN SOFT WHITE SPRING WHEAT

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Abstract

Twin soft white spring wheat was planted at the COARC Powell Butte site to determine the effect of nitrogen fertilizer on certain agronomic and quality aspects. The nitrogen fertilizer significantly increased yield, percent protein, height, protein yield and grain N uptake. Test weight and lodging was not significantly affected though there was a trend increase.

Introduction

Soft white wheat is more marketable with lower protein. The export market is demanding more and more a specific protein content of the wheat that is purchased. This trial was set up to look at different rates of nitrogen fertilizer effects on Twin soft white spring yield and quality in the central Oregon area.

Materials and Methods

Twin soft white spring wheat was planted on April 13, 1990 at the rate of 30 seeds/11\(\frac{1}{2}\) (97 lb/ac) with a cone type experimental drill (six 8-inch rows) into plots 5 x 20 feet. The experimental design was randomized block with four replications. The trial was fertilized with 80 lbs/ac N (239 pounds of ammonium nitrate material per acre) and 60 lbs/ac sulfur (400 pounds of gypsum material). The first irrigation occurred on May 5 and the last irrigation occurred on August 4. The plots were sprayed with 2 pints of Bronate on June 5. The plots were harvested with a Hege plot combine on September 6, 1990.

Yield, test weight, percent protein, height, lodging, and grain N uptake were determined. The protein percentage was predicted with near infrared reflectance spectrometry (MRS) at the Oregon State University Crop and Soil Science Department. The data are presented on an "air dry" moisture basis.
Results and Discussion

Yield was significantly increased 18.1 bu/ac with the addition of 40 lb N/ac (Table 1). The next 40 lb N/ac increased yield by 10.1 bu/ac but was not a significant increase (14.1 bu/ac at P=.10 was needed for a significant difference), and the 120 N rate increased 3.4 bu/ac over the 80 lb N rate. Percent protein was increased up to the 120 lb N/ac rate, a rate that would put the protein level at a higher than optimum level for the market. Based on the yield and protein level, the optimum fertilizer rate appears to be 80 lb N/ac in this particular trial. Graph 1 shows the protein yield relationship, with yield increases up to the 90 to 95 bu/ac and 11.0 percent protein. There was no increase in yield, and only increases in protein beyond that yield level. There was high fertility background level for the trial, so the rates had variable increases or even decreases in the replications. Height was increased significantly with higher N rates. Lodging was increased with the higher rates of nitrogen fertilizer, though not significantly. Protein yield and grain N uptake at harvest was significantly increased up to 120 lb N/ac. There is only one year of data for this study and the trial should be run two more years.

Table 1. Agronomic and quality data of Twin soft white wheat as affected by different nitrogen rates on plots established in 1990 at COARC, Powell Butte, OR.

<table>
<thead>
<tr>
<th>N Rate lb/ac</th>
<th>Yield bu/ac</th>
<th>Test Weight lb/bu</th>
<th>Protein %</th>
<th>Height in</th>
<th>Lodging</th>
<th>Protein Yield lb/ac</th>
<th>Grain N Uptake lb/ac</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>61.9</td>
<td>55.0</td>
<td>9.9</td>
<td>36</td>
<td>0</td>
<td>368.7</td>
<td>64.7</td>
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<tr>
<td>40</td>
<td>80.0</td>
<td>55.5</td>
<td>10.3</td>
<td>38</td>
<td>0</td>
<td>496.8</td>
<td>76.9</td>
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<tr>
<td>80</td>
<td>90.1</td>
<td>56.0</td>
<td>10.7</td>
<td>39</td>
<td>6</td>
<td>557.1</td>
<td>101.4</td>
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<tr>
<td>120</td>
<td>93.5</td>
<td>56.0</td>
<td>12.0</td>
<td>40</td>
<td>36</td>
<td>671.0</td>
<td>117.9</td>
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<tr>
<td>Mean</td>
<td>81.4</td>
<td>55.6</td>
<td>10.7</td>
<td>38</td>
<td>11</td>
<td>528.6</td>
<td>92.7</td>
</tr>
</tbody>
</table>

PLSD .10 14.1 NS 0.5 2.0 NS 80.4 14.1
PLSD .05 17.4 NS 0.7 2.4 NS 99.2 17.4
CV% 13.3 1.3 3.8 3.9 204.1 11.7
Graph 1. Protein-yield relationship for the Twin soft white spring wheat nitrogen rate trial established in 1990 at COARC, Powell Butte, OR.