Abstract

A planting method x weed control x seeding rate trial with Twin soft white winter wheat was established at the Central Oregon Agricultural Research Center (COARC), Powell Butte, Oregon. The objective was to test if higher seeding rates and/or different methods of planting could decrease the need for herbicides. Grain yield, test weight, height, lodging, and grain nitrogen uptake were all significantly higher with the drill method of planting compared to broadcast and rotovate. Yield was not affected in any way by either weed control or seeding rate.

Introduction

Lower input agriculture and use of less chemical pesticides are of interest to many producers as society becomes more concerned about our environment and the food we eat. If less pesticides were used without a decrease in production, the producer would benefit economically. This trial was conducted to determine if seeding rate and/or planting method have any affect on weed control, yield, and quality of soft white spring wheat. If by increasing seeding rate and/or narrowing the space between rows, wheat can out-compete the weeds, then producers could obtain good-to-excellent weed control without the application of herbicides.

Materials and Methods

Twin soft white spring wheat was planted on April 13, 1990 at the COARC, Powell Butte, Oregon. The design was a three-factor factorial in a randomized block with four replications, three factors - seeding rates, planting methods, and weed control. Seeding rates were 30, 45, and 60 seeds per square foot (97, 145, and 194 lb/a, respectively), planting methods were planting with a cone-type plot drill with six rows and eight-inch row spacing, and broadcast seeding by hand, followed by rotovating. Weed control was two pints of Bronate and one pint of surfactant per acre applied on June 5 and hand weeding on June 13, or no weed control. The plots were fertilized with 80 lb/a of nitrogen (ammonium nitrate source), and 60 lb/a of sulfur (gypsum source). The first irrigation was on May 5 and the last irrigation occurred on August 4. The plots were 5 feet x 20 feet with an area of 5 feet x 15 feet harvested with a Hege plot combine on September 6. Yield, test weight, height, lodging, and grain N uptake data were collected or calculated. The percent protein was analyzed with near infra-red reflectance spectroscopy (NIRS) by the OSU Crop and Soil Science Department at Corvallis. Data are presented on an air dry moisture basis.
Results and Discussion

Yield, test weight, height, lodging and grain N uptake were increased by 21.8 bu/a, 0.3 lb/bu, 2 inches, 10 percent, and 22 lb/a, respectively, by drilling compared to broadcasting and rotovating (Table 1.).

Table 1. Planting method effect on the yield, test weight, protein, height, lodging, and grain nitrogen uptake on Twin soft white spring wheat planted at the COARC, Powell Butte, Oregon in 1990.

<table>
<thead>
<tr>
<th>Planting Method</th>
<th>Yield bu/a</th>
<th>Test Weight lb/bu</th>
<th>Protein %</th>
<th>Height In.</th>
<th>Lodging %</th>
<th>Grain N Uptake Lb/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drilled</td>
<td>83.7</td>
<td>55.6</td>
<td>10.6</td>
<td>39</td>
<td>14</td>
<td>93.3</td>
</tr>
<tr>
<td>Broadcast</td>
<td>61.9</td>
<td>55.3</td>
<td>10.9</td>
<td>37</td>
<td>4</td>
<td>71.3</td>
</tr>
<tr>
<td>Mean</td>
<td>72.8</td>
<td>55.5</td>
<td>10.8</td>
<td>38</td>
<td>9</td>
<td>82.3</td>
</tr>
<tr>
<td>PLSD .10 S</td>
<td>S</td>
<td>S</td>
<td>NS</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>PLSD .05 S</td>
<td>S</td>
<td>S</td>
<td>NS</td>
<td>S</td>
<td>NS</td>
<td>S</td>
</tr>
<tr>
<td>CV%</td>
<td>13.2</td>
<td>0.9</td>
<td>7.4</td>
<td>5.1</td>
<td>219.7</td>
<td>15.5</td>
</tr>
</tbody>
</table>

There was no advantage to higher seeding rates, or weed control, as individual treatments, on yield, height, and grain N uptake (Table 2). Test weight was increased by utilizing weed control (55.6 lb/bu vs. 55.3 lb/bu, Probability = .03), but seeding rate did not affect it.

Protein content and lodging were affected by a seeding rate and weed control interaction (Table 2). Without weed control, the 60 seeds per square foot seeding rate protein content was significantly lower than the 30 and 45 seeds per square foot seeding rate. The high seeding rate, with weed control, had a significantly higher protein content than the same seeding rate, with no weed control.

There was a trend for increased lodging as the seeding rate increased, when weed control was used, the reverse trend was seen when weed control was not used. There was a trend for higher protein content as lodging increased. The CV's for lodging were very high and reveal a lot of variability in the treatment plots.

Individual treatment means and statistical data are presented in Table 3.
Table 2. Weed control (WC) x seeding rate (SR) effect on the percent protein and percent lodging of Twin soft white spring wheat planted at the COARC, Powell Butte, Oregon in 1990.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Protein</th>
<th>Lodging</th>
</tr>
</thead>
<tbody>
<tr>
<td>WC SR</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>+ 30</td>
<td>10.8</td>
<td>4</td>
</tr>
<tr>
<td>+ 45</td>
<td>10.4</td>
<td>0</td>
</tr>
<tr>
<td>+ 60</td>
<td>11.0</td>
<td>16</td>
</tr>
<tr>
<td>- 30</td>
<td>11.2</td>
<td>22</td>
</tr>
<tr>
<td>- 45</td>
<td>10.9</td>
<td>10</td>
</tr>
<tr>
<td>- 60</td>
<td>10.2</td>
<td>1</td>
</tr>
<tr>
<td>Mean</td>
<td>10.7</td>
<td>9</td>
</tr>
<tr>
<td>PLSD.10</td>
<td>0.7</td>
<td>16.3</td>
</tr>
<tr>
<td>PLSD.05</td>
<td>0.8</td>
<td>19.6</td>
</tr>
<tr>
<td>CV%</td>
<td>7.4</td>
<td>219.7</td>
</tr>
</tbody>
</table>

WC: + = weed control, - = no weed control; SR = 30, 45, and 60 seeds per square foot
Table 3. Planting method (PM) x weed control (WC) x seeding rate (SR) effects on the grain yield, test weight, protein, height, lodging and grain N uptake of Twin soft white spring wheat planted at the COARC, Powell Butte, Oregon in 1990.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Grain Yield bu/a</th>
<th>Test Weight lb/bu</th>
<th>Protein %</th>
<th>Height in.</th>
<th>Lodging %</th>
<th>Grain N Uptake lb/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>D + 30</td>
<td>88.6</td>
<td>56.0</td>
<td>10.7</td>
<td>39.3</td>
<td>6</td>
<td>99.7</td>
</tr>
<tr>
<td>D + 45</td>
<td>83.5</td>
<td>55.9</td>
<td>10.0</td>
<td>39.0</td>
<td>0</td>
<td>87.7</td>
</tr>
<tr>
<td>D + 60</td>
<td>83.4</td>
<td>55.8</td>
<td>10.8</td>
<td>39.5</td>
<td>19</td>
<td>94.1</td>
</tr>
<tr>
<td>D - 30</td>
<td>77.3</td>
<td>55.1</td>
<td>11.0</td>
<td>38.5</td>
<td>34</td>
<td>89.7</td>
</tr>
<tr>
<td>D - 45</td>
<td>87.4</td>
<td>55.4</td>
<td>10.8</td>
<td>40.3</td>
<td>21</td>
<td>98.6</td>
</tr>
<tr>
<td>D - 60</td>
<td>81.9</td>
<td>55.7</td>
<td>10.4</td>
<td>37.5</td>
<td>1</td>
<td>89.9</td>
</tr>
<tr>
<td>B + 30</td>
<td>58.7</td>
<td>55.4</td>
<td>11.0</td>
<td>36.8</td>
<td>1</td>
<td>68.5</td>
</tr>
<tr>
<td>B + 45</td>
<td>58.3</td>
<td>55.3</td>
<td>10.8</td>
<td>37.8</td>
<td>0</td>
<td>66.2</td>
</tr>
<tr>
<td>B + 60</td>
<td>65.9</td>
<td>55.4</td>
<td>11.2</td>
<td>37.8</td>
<td>13</td>
<td>78.3</td>
</tr>
<tr>
<td>B - 30</td>
<td>60.5</td>
<td>55.1</td>
<td>11.5</td>
<td>37.3</td>
<td>10</td>
<td>73.5</td>
</tr>
<tr>
<td>B - 45</td>
<td>63.9</td>
<td>55.4</td>
<td>11.0</td>
<td>37.0</td>
<td>0</td>
<td>74.1</td>
</tr>
<tr>
<td>B - 60</td>
<td>64.1</td>
<td>55.0</td>
<td>10.0</td>
<td>38.3</td>
<td>0</td>
<td>67.4</td>
</tr>
<tr>
<td>Mean</td>
<td>72.8</td>
<td>55.5</td>
<td>10.7</td>
<td>38.3</td>
<td>9</td>
<td>82.3</td>
</tr>
</tbody>
</table>

Probability

<table>
<thead>
<tr>
<th></th>
<th>Grain Yield</th>
<th>Test Weight</th>
<th>Protein</th>
<th>Height</th>
<th>Lodging</th>
<th>Grain N Uptake</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM</td>
<td>.001</td>
<td>.011</td>
<td>NS</td>
<td>.009</td>
<td>.093</td>
<td>.001</td>
</tr>
<tr>
<td>WC</td>
<td>NS</td>
<td>.030</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>PM x WC</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>SR</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>PM x SR</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>WC x SR</td>
<td>NS</td>
<td>NS</td>
<td>.048</td>
<td>NS</td>
<td>.050</td>
<td>NS</td>
</tr>
<tr>
<td>PM x WC x SR</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>CV%</td>
<td>13.2</td>
<td>0.9</td>
<td>7.4</td>
<td>5.1</td>
<td>219.7</td>
<td>15.5</td>
</tr>
</tbody>
</table>

D = drill, B = broadcast and rotovate; + = weed control applied, - = no weed control; SR = 30, 45, and 60 seeds per square foot. NS = not significant.