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This report of the Central Crops and Soils Research Station at Highmore, South Dakota is a progress report and, therefore, the results presented are not necessarily complete nor conclusive. Any interpretation given is tentative because additional data from continuation of these experiments may produce conclusions different from those of any one year. The data presented in this report reflect the 1995 growing season.

Commercial companies and trade names are mentioned in this publication solely for the purpose of providing specific information. Mention of a company does not constitute a guarantee or warrantee of its products by the Agricultural Experiment Station or an endorsement over products of other companies not mentioned.

This publication also reports research involving pesticides. It does not contain recommendations for their use, nor does it imply that the uses discussed here have been registered. All uses of pesticides must be registered by appropriate State and Federal agencies before they can be recommended. A complete set of 1995 results from SDSU herbicide demonstrations is available as Extension Circular 678 from your County Agent or SDSU.
## CENTRAL SUBSTATION ADVISORY BOARD

(All advisors appointed to a 4-year term)

<table>
<thead>
<tr>
<th>NAME</th>
<th>POSITION</th>
<th>ADDRESS</th>
<th>PHONE</th>
<th>COUNTY</th>
<th>TERM</th>
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</thead>
<tbody>
<tr>
<td>Greg Yapp</td>
<td>SD St. Office</td>
<td>200 4th St SW, Huron 57350</td>
<td>353-1830</td>
<td>SCS</td>
<td></td>
</tr>
<tr>
<td>Kevin Haber</td>
<td>Extension Agent</td>
<td>Box 36, Huron 57350</td>
<td>352-8559</td>
<td>Beadle</td>
<td></td>
</tr>
<tr>
<td>Scott Ingel</td>
<td></td>
<td>RR 1, Cavour 57324</td>
<td>352-0438</td>
<td>Beadle</td>
<td>1995-1998</td>
</tr>
<tr>
<td>Gerald Syring</td>
<td></td>
<td>Box 589, Faulkton</td>
<td>598-4294</td>
<td>Faulk</td>
<td>1993-1996</td>
</tr>
<tr>
<td>Keith Melius</td>
<td>(alternate)</td>
<td>HC 1 Box 47, Miranda 57438</td>
<td>598-4315</td>
<td>Faulk</td>
<td></td>
</tr>
<tr>
<td>Mike Tyrrell</td>
<td>Extension Agent</td>
<td>Box 169, Courthouse, Miller 57362</td>
<td>853-2738</td>
<td>Hand</td>
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<tr>
<td>Ken Wonnennenberg</td>
<td>Sec., Ext. Agent</td>
<td>Courthouse, Pierre 57501</td>
<td>773-5550</td>
<td>Hughes</td>
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<tr>
<td>Brad Bonhorst</td>
<td>Chairman</td>
<td>30910 SD Hwy 34, Pierre 57501</td>
<td>224-1156</td>
<td>Hughes</td>
<td>1995-1998</td>
</tr>
<tr>
<td>Lyle Stewart</td>
<td>(alternate)</td>
<td>30213 199th St, Blunt 57522</td>
<td>224-5682</td>
<td>Hughes</td>
<td>1992-1995</td>
</tr>
<tr>
<td>Jerry Johnson</td>
<td>Extension Agent</td>
<td>Box 402, Ext. Bldg, Highmore 57345</td>
<td>852-2515</td>
<td>Hyde</td>
<td></td>
</tr>
<tr>
<td>Randy Hague</td>
<td></td>
<td>Highmore 57345</td>
<td>852-2874</td>
<td>Hyde</td>
<td>1993-1996</td>
</tr>
<tr>
<td>Marcia Blecha</td>
<td>Extension Agent</td>
<td>Box 366, Wess. Springs 57382</td>
<td>539-9471</td>
<td>Jerauld</td>
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<tr>
<td>Bruce Eilers</td>
<td></td>
<td>22007 373rd Ave., Wess. Springs 57382</td>
<td>539-1232</td>
<td>Jerauld</td>
<td>1993-1996</td>
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<tr>
<td>Larry Nagel</td>
<td></td>
<td>HCR 3 Box 20, Gettysburg 57442</td>
<td>765-9427</td>
<td>Potter</td>
<td>1993-1996</td>
</tr>
<tr>
<td>Phil Hamburger</td>
<td></td>
<td>HC 78 Box 64A, Seneca 57473</td>
<td>436-6201</td>
<td>Potter</td>
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<tr>
<td>Paul Weeldreyer</td>
<td>Extension Agent</td>
<td>Box 265, Onida 57564</td>
<td>258-2334</td>
<td>Sully</td>
<td>1992-1996</td>
</tr>
<tr>
<td>Todd Yackley</td>
<td></td>
<td>HC 2 Box 614, Onida 57564</td>
<td>264-5465</td>
<td>Sully</td>
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<tr>
<td>Randy Johnson</td>
<td>(alternate)</td>
<td>HCR 1 Box 17, Harrold 57536</td>
<td>973-2419</td>
<td>Sully</td>
<td>1994-1997</td>
</tr>
</tbody>
</table>

| Nilo Reber         | Dist. Conserv.      | Box 484, Highmore 57345              | 852-2221  | SCS     |              |
| Mike Volek         | Central Res. Sta.   | PO Box 91, Highmore 57345            | 852-2829  | SDSU    |              |
| Bob Davis          | Ext. Supervisor     | Ag Hall 136, Brookings 57007         | 688-5132  | SDSU    |              |
| Dale Reeves        | Acting Head, Pisci  | Ag Hall 219, Brookings 57007         | 688-5123  | SDSU    |              |
| Brad Farber        | Cen. Res. Mgr       | Box 2207A, Brookings 57007           | 688-6139  | SDSU    |              |
| Fred Choick        | Dir. Exp. Sta.      | Box 2207 Brookings 57007             | 688-4149  | SDSU    |              |
As the centennial year (1999) of the Central-Crops and Soils Research Station approaches, it is interesting to look back at decades of weather observations recorded at the research farm. A publication by W. Spuhler, W. F. Lytle, and D. Moe summarizing continuous data from 1904 to 1968, notes that, "The annual precipitation averages 17.84 inches of which 14.01 inches, or 79% on the average, falls during the growing season (April–September)". This 64 year period includes more than ten years where average annual rainfall was less than 13.5 inches total. The driest year on record was 1936 with 9.85 inches recorded. Several of the driest years were during the "dirty thirties" with 1931, 1933, and 1934 all receiving less than 13.2 inches of precipitation.

One of the most obvious conclusions that can be drawn from the data is that Highmore (and probably most of South Dakota) is a land of extremes – extremely dry, extremely wet, extremely hot, extremely cold, extremely windy, and the list could go on. When several of these extreme conditions occur at the same time (such as an extremely hot, dry, windy day) the stresses are compounded and raising crops and livestock can become very difficult. Even though we list "averages" and "normal" precipitation and temperature values, there are very few "average" or "normal" years in South Dakota. The 1995 rainfall amount at Highmore is a good example of this. Precipitation at Highmore in 1995 was more than 13 inches greater than the 30 year period from 1961 to 1990 and set a new record of 33.04 inches for the research farm (Table 2). Other high rainfall years include: 1993 (27.21"), 1986 (27.91"), 1957 (28.80") and 1920 (27.31"). The past five years from 1991 to 1995 have averaged 26 inches per year and collectively are the wettest period on record. Combining these five years with the prior 30 year average now gives us a 35 year "annual" precipitation value of 20.57 inches per year. This is nearly 3 inches per year more than the value indicated in the 1968 summary.

What conclusions can be drawn from this information? Is the central area of South Dakota being affected by global warming as some scientists and journalists would lead us to believe? Or is this 'normal' variation in weather patterns that has been a part of farming and ranching since South Dakota was settled? I am inclined to believe that these are fluctuations in weather patterns that have occurred in past centuries and likely will occur again in the future. However, the collection of long-term climatic data at the research farm while interesting, also may provide a computer database on which future cropping decisions, inputs, potential harvest results, and a myriad of other information could be based.

I would like to take this opportunity to publicly thank Mike Volek for his contributions to the farmers and ranchers of South Dakota during his 25 years of service to South Dakota State University. Mike began working at the Highmore Research Farm on March 1, 1971 as an Ag Research Technician. He has served in this capacity under five different farm managers including Frank Holmes, Harry Geise, Quentin Kingsley, Paul Weeldreyer, and currently Brad Farber.

Mike is a dedicated, hard-working individual who gets a job done no
matter what it takes. The Highmore Research Farm, through Mike's time, effort and leadership, is the best cared for research farm in South Dakota and most likely the region. The USDA Plant Materials Center in Bismarck, ND, annually call their evaluation site at the Highmore Research Farm "the garden spot" of all their 13 testing locations in the north-central region do to the weed-free manner in which it is kept.

Mike manages the day-to-day activities of the research farm, coordinates summer hourly workers, performs all routine maintenance of equipment and farm-site buildings, and has recorded data for the National Weather Service for the past 25 years. He also serves the community of Highmore as an Emergency Medical Technician and volunteer fireman and part-time police officer. Mike and his wife Dixie live at the research farm with their two daughters, Shanda and Sherise.

********************************

Planting at the Highmore Research Farm was severely hampered by the previously discussed 33.04 inches of rain in 1995. Nearly 15 inches of the total amount fell in the months of April and May, preventing planting of small grains, delaying planting of row crops and flooding areas of research plots planted to winter wheat and other crops. Accordingly, the Crop Performance Testing program, Oat Research program, Spring Wheat breeding project and Soybean research project were unable to plant any of their research plots in 1995. Those projects that were able to plant and harvest plots on higher elevations of the farm have submitted reports for inclusion in this publication.

********************************

The annual twilight tour scheduled in late June was also cancelled in 1995 due to the wet conditions, lack of research plots to tour, and small size of crops that eventually were planted.

********************************

The research conducted each year and included in this report involves long hours by staff from many disciplines at SDSU and the Highmore Research Farm. Their efforts in contributing to this publication each year are greatly appreciated. Support and input from area producers, ranchers, Advisory Board members and County Agents is also greatly appreciated.

If anyone has comments or suggestions pertaining to research on the farm or questions and input on any other matter, please write or call.

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Brookings, SD 57007
(605) 688-6139

Special thanks to Nancy Kleinjan for her assistance in preparing this report.
Table 1. Temperatures at the Central Research Farm - 1995.

<table>
<thead>
<tr>
<th>Month</th>
<th>1995 Average Temperatures°F</th>
<th>Departure from Normal°F</th>
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<td></td>
<td>Max.</td>
<td>Min.</td>
</tr>
<tr>
<td>January</td>
<td>24.8</td>
<td>9.1</td>
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<tr>
<td>February</td>
<td>34.8</td>
<td>13.2</td>
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<tr>
<td>March</td>
<td>41.1</td>
<td>21.9</td>
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<tr>
<td>April</td>
<td>47.1</td>
<td>28.5</td>
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<td>May</td>
<td>63.8</td>
<td>43.4</td>
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<tr>
<td>June</td>
<td>76.4</td>
<td>55.6</td>
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<tr>
<td>July</td>
<td>85.7</td>
<td>59.5</td>
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<td>August</td>
<td>87.0</td>
<td>62.4</td>
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<td>September</td>
<td>73.3</td>
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<td>October</td>
<td>57.8</td>
<td>35.4</td>
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<td>November</td>
<td>39.3</td>
<td>19.5</td>
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<tr>
<td>December</td>
<td>29.2</td>
<td>12.6</td>
</tr>
</tbody>
</table>

a Calculated from daily observations.

Table 2. Precipitation at the Central Research Farm - 1995.

<table>
<thead>
<tr>
<th>Month</th>
<th>1995 Precipitation inches</th>
<th>Departure Greatest amount of inches</th>
<th>Date</th>
</tr>
</thead>
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<tr>
<td>January</td>
<td>0.25</td>
<td>-0.08</td>
<td>0.15</td>
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<tr>
<td>February</td>
<td>0.20</td>
<td>-0.29</td>
<td>0.15</td>
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<tr>
<td>March</td>
<td>1.80</td>
<td>+0.55</td>
<td>0.60</td>
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<tr>
<td>April</td>
<td>9.08</td>
<td>+6.76</td>
<td>2.30</td>
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<tr>
<td>May</td>
<td>5.87</td>
<td>+3.10</td>
<td>1.25</td>
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<tr>
<td>June</td>
<td>2.67</td>
<td>-0.52</td>
<td>0.80</td>
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<tr>
<td>July</td>
<td>2.25</td>
<td>-0.76</td>
<td>1.50</td>
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<td>4.23</td>
<td>+1.91</td>
<td>1.88</td>
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<td>0.70</td>
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<td>5.34</td>
<td>+3.99</td>
<td>1.25</td>
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<tr>
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<td>0.60</td>
<td>+0.03</td>
<td>0.30</td>
</tr>
<tr>
<td>December</td>
<td>T</td>
<td>0.42</td>
<td>T</td>
</tr>
</tbody>
</table>

TOTAL 33.04 19.67 13.37

ALFALFA CULTIVAR YIELD TEST

K.D. Kephart, R. Bortnem, S. Selman, and A. Boe

One alfalfa cultivar yield experiment was conducted at the Central station during 1995. This study was planted May 11, 1994 and has 24 entries. Most of the alfalfa cultivars were entered by seed companies, whereas other entries were entered by plant breeders at SDSU other universities. Check entries were also included as a consistent baseline among the alfalfa variety trials in the state. The check entries are >Vernal=, >Riley=, >Baker=, and >Saranac AR=. This test was conducted to determine yield performance of alfalfa cultivars and experimental lines for use in Central South Dakota.

Four harvests were obtained from this study during 1995. Of our five locations, this was the only site where we obtained four harvests. The first harvest was delayed by about 1 week because of cool wet weather during spring of 1995. Average four-cut total yield in 1995 was 6.81 T/A; however, no significant differences were detected among cultivars for all four harvests (Table 1). Average yields for the three harvests in 1995 ranged from 1.07 T/A for the fourth harvest to 2.53 T/A for the first harvest. Yields for the public cultivars Saranac AR, Riley, and Baker ranked near the bottom.

An important role of the South Dakota Alfalfa Cultivar Yield Test is to evaluate lines that are in experimental stages of breeding programs. Companies and universities often enter promising alfalfa lines to test their suitability to stressful conditions in South Dakota. There are 4 experimental entries in the current experiment at the NE station. Results for experimental lines must be interpreted with caution. Seed for these lines are in early generations of the seed production process and natural inbreeding depression is expected as these lines are advanced to seed production stages. In essence, commercial seed derived from experimental lines may not have the same yield potential that was observed in a state variety trial.

These results are useful in selection of alfalfa cultivars for forage production. Measurements of forage yield taken over several harvests and years are usually more useful than are averages from a single harvest.
Table 1. Forage yield of 24 alfalfa cultivars planted May 11, 1994, at the Central Crops and Soils Research Station, Highmore, SD.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>1995</th>
<th>% of 4-Cut Total</th>
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<tbody>
<tr>
<td></td>
<td>Cut 1 6-Jun</td>
<td>Cut 2 10-Jul</td>
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<tr>
<td>Magnum 620</td>
<td>2.70</td>
<td>1.43</td>
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<tr>
<td>Magnum III-Wet</td>
<td>2.78</td>
<td>1.43</td>
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<tr>
<td>ICI 630</td>
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<td>1.43</td>
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<td>Proof</td>
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<td>Magnum IV</td>
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<td>3452-ML</td>
<td>2.61</td>
<td>1.43</td>
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<td>LegendDairy</td>
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<td>Vernal</td>
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<td>1.42</td>
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<tr>
<td>MS9304 (experimental)</td>
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<tr>
<td>DK 122</td>
<td>2.50</td>
<td>1.32</td>
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<td>MS9301 (experimental)</td>
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<td>1.35</td>
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<td>91-12 (experimental entry)</td>
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<td>1.26</td>
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<td>Flagship 75</td>
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<td>Avalanche</td>
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<td>1.35</td>
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<td>PC431 (experimental entry)</td>
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<td>Defiant</td>
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<td>Baker</td>
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<td>1.27</td>
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<td>Spredor 3</td>
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<tr>
<td>Riley</td>
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<td>1.16</td>
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</table>

Average 2.53 1.35 1.85 1.07 8.81

Maturity* 4.7 39 53 39
CV(%) 10.1 91 107 12.2 8.5
LSD(0.05) NS NS NS NS NS

(a) Data for experimental lines should be used with caution. Commercial seed for these lines may not perform similarly
(b) Kalu and Fick (1983) maturity index, mean stage by count.
(c) Yields among cultivars are not statistically different at the 0.05 level of probability.
SPRING WHEAT BREEDING

Jackie Rudd and Brad Farber

The Highmore station is normally a site for our Advanced Yield Trial. Due to a wet spring we were only able to plant 5 sites in 1995. Highmore and Brentford were just too wet for too long and were not planted. The Advanced Yield Trial is made up of experimental lines that have completed at least 2 years of extensive testing and have all of the characteristics needed to become a new variety. We include the most widely grown varieties (Sharp, Butte 86, 2375, and Prospect) as checks. Averaged across all locations in 1995, the checks were all considerably lower yielding than the experimental lines. A portion of the data is shown in the table at the bottom of this page.

Two new spring wheat varieties from the breeding program will soon be available to producers. ‘Russ’, released in 1995 is a Hessian fly resistant line that is similar to Butte 86 in height and appearance and is 1 or 2 days later maturity. Russ was named in honor of Russel Hansen, a Spink County farmer who was a prominent supporter of SDSU research and grew yield trials for the breeding program until his death in 1993. SD0010 has been approved for 1996 release but is not named yet. It is an early semi-dwarf line that was developed by Pioneer Hi-Bred International. Both of these lines have excellent yield potential and wide adaptation. Russ and SD0010 have both averaged 2 bushels per acre greater grain yield than Butte 86 with a similar test weight and protein content. SD3156 is being increased with the intent to release it in 1997. It is 1 to 2 days earlier than Butte 86 with a better yield and test weight.
# SDSU Spring Wheat Breeding
## 1995 Advanced Yield Trial

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<th>Rank</th>
<th>Name</th>
<th>Yield (bu/a)</th>
<th>Mean</th>
<th>LSD (.05)</th>
<th>C.V. (%)</th>
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<td>Watertown</td>
<td>Selby</td>
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<td>SD8089</td>
<td>59.1</td>
<td>72.0*</td>
<td>60.9*</td>
<td>46.9*</td>
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<tr>
<td>2</td>
<td>SD8108</td>
<td>55.7</td>
<td>70.5*</td>
<td>53.6</td>
<td>42.6</td>
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<td>59.9</td>
<td>50.7*</td>
<td>47.9*</td>
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<td>SD3156</td>
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<td>71.9*</td>
<td>55.7</td>
<td>46.1*</td>
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<td>5</td>
<td>SD3225</td>
<td>62.8*</td>
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<td>56.2</td>
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<td>44.8*</td>
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<td>9</td>
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<td>53.4</td>
<td>66.4</td>
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<td>45.4*</td>
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<tr>
<td>10</td>
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<td>59.9</td>
<td>66.5</td>
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<tr>
<td>11</td>
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<td>52.3*</td>
<td>68.2*</td>
<td>54.3</td>
<td>44.0*</td>
</tr>
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<td>12</td>
<td>SD3186</td>
<td>54.1</td>
<td>65.3</td>
<td>53.2</td>
<td>44.6*</td>
</tr>
<tr>
<td>13</td>
<td>RUSE*</td>
<td>57.2</td>
<td>70.1*</td>
<td>55.2</td>
<td>41.4</td>
</tr>
<tr>
<td>14</td>
<td>BUTTE</td>
<td>49.8</td>
<td>67.3*</td>
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<td>37.2</td>
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<td>15</td>
<td>2375</td>
<td>51.5</td>
<td>54.5</td>
<td>49.9</td>
<td>40.9</td>
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<td>SHARP</td>
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<td>61.7</td>
<td>45.5</td>
<td>34.8</td>
</tr>
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<td>17</td>
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<td>57.7</td>
<td>49.0</td>
<td>35.3</td>
</tr>
<tr>
<td>18</td>
<td>CHRIS</td>
<td>38.3</td>
<td>42.4</td>
<td>38.8</td>
<td>27.8</td>
</tr>
</tbody>
</table>

LSD (0.05) | 2.2  | 5.0 | 3.1 | 4.1 | 5.0 | 1.8 | 
C.V. (%)    | 2.5  | 4.8 | 3.7 | 6.2 | 5.6 | 4.8 |
WINTER WHEAT BREEDING AND GENETICS
Scott D. Haley and Roy A. Schut

The Winter Wheat Breeding and Genetics Program utilizes the Highmore Research Station primarily for testing of early-generation bulk-breeding populations and evaluation of advanced-generation lines developed during the course of the breeding process. The breeding program conducts research at several other sites throughout South Dakota (Brookings, Watertown, Selby, Bison, Ideal, Wall, and the Dakota Lakes Research Station near Pierre), for both early-generation selection and determination of the potential of experimental lines for cultivar release.

The winter wheat testing conducted at the Highmore Research Station during 1995 included:

i) The Crops Performance Testing (CPT) Variety Trial, under the overall coordination of Bob Hall (SDSU, Crops Performance Testing Program). The CPT Variety Trial included 35 entries, of which 26 were previously released varieties (including new releases from other states), 5 were elite SDSU experimental lines, and 4 were experimental lines from Nebraska. This nursery was also grown at 13 other sites in South Dakota. Prior to cultivar release, promising elite lines must be grown in the CPT nursery for three years to accurately measure the potential performance across a range of environmental conditions;

ii) Advanced-generation experimental lines in the South Dakota Advanced Yield Trial (AYT). This nursery included 45 entries (33 SDSU experimental lines and 12 checks) and is grown at eight other sites in South Dakota and one site in Nebraska. Superior experimental lines are selected from this nursery for advancement to the CPT Variety Trial;

iii) Early-generation $F_2$-bulk (112 total) and $F_3$-bulk (231 total) breeding populations. $F_2$-bulks are routinely combine-harvested and advanced to the $F_3$ generation with little selection. Undesirable $F_3$ populations are eliminated from the program based largely on visual observations and pedigree; desirable $F_3$ populations are advanced to the $F_4$ head row nursery by selecting approximately 100 heads more or less at random from each $F_3$ population;

iv) A winter wheat phosphorous fertilizer management trial, in cooperation with Ron Gelderman (SDSU Soil Testing Lab) and Jim Gerwing (SDSU Extension Soil Fertility Specialist).

The nursery at Highmore was planted into good moisture on 9/12/94. Fall stand establishment was excellent and, because of
the mild winter experienced during 1994-1995, most of the entries in the nurseries came through the winter with very little winterkill. Excessive spring rains, however, resulted in near-complete flooding of the CPT Variety Trial and loss of all data.

Nurseries in other parts of the field were spared the most severe effects of the flooding (e.g., total immersion). Nevertheless, the combined effects of excessive wet spring weather, retarded crop development because of very cool spring temperatures, and two periods of hot weather (one in mid-June and one in early-July) resulted in an extremely high level of variation within the remaining nurseries (a high coefficient of variability, or CV). Thus, the reliability of yield data presented in the following table should be considered as questionable and interpreted with extreme caution.
Treatment Means for 1995 Advanced Yield (AYT) Trial
Highmore Research Station

<table>
<thead>
<tr>
<th>Entry</th>
<th>Grain Yield</th>
<th>Test Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>bu acre</td>
<td>lb bu</td>
</tr>
<tr>
<td>Dawn</td>
<td>49.4</td>
<td>62.2</td>
</tr>
<tr>
<td>TAM-107</td>
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<td>62.1</td>
</tr>
<tr>
<td>SD91335</td>
<td>44.5</td>
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</tr>
<tr>
<td>SD91338</td>
<td>44.0</td>
<td>62.2</td>
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<td>SD92167</td>
<td>41.0</td>
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</tr>
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<td>SD92168</td>
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</tr>
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<td>Seward</td>
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<td>SD89186</td>
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</tr>
<tr>
<td>SD92203</td>
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</tr>
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</tr>
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</tr>
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<td>Karl92</td>
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</tr>
<tr>
<td>Vista</td>
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<td>62.9</td>
</tr>
<tr>
<td>Roughrider</td>
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<tr>
<td>Rose</td>
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<td>SD92107*</td>
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<td>62.6</td>
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<tr>
<td>Redland</td>
<td>36.9</td>
<td>62.1</td>
</tr>
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<td>SD92132</td>
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<td>63.0</td>
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<td>SD92263</td>
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<td>SD89205*</td>
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<td>SD92227*</td>
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<td>62.5</td>
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<td>Scout66</td>
<td>31.8</td>
<td>63.3</td>
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<tr>
<td>SD92135</td>
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<td>63.0</td>
</tr>
<tr>
<td>Siouxland</td>
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<td>62.6</td>
</tr>
<tr>
<td>SD92222</td>
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<td>SD92174*</td>
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<td>61.9</td>
</tr>
<tr>
<td>Alliance</td>
<td>22.1</td>
<td>62.1</td>
</tr>
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</table>

Mean 35.5  62.4
LSD (0.05) 13.0  1.0
CV (%) 22.6  1.2

* Based on average performance at other sites, this line was selected and advanced for further testing.
EFFECT OF POLLEN SOURCE ON GRAIN YIELD IN HYBRID MAIZE

Zeno W. Wicks, III and Chris T. Mack

An experiment concerning performance of blended hybrids of similar maturities is in progress. Six different 105 day Relative Maturity hybrids were planted in replicated four-row plots. The outer two rows of each plot represent high outcrossing, where two different hybrids stand adjacent to one another. The inner two rows of each plot represent low outcrossing, where different hybrids are separated by a single row. Plots were harvested as single rows, in order to compare yield of hybrids in high vs. low outcrossing situations. The degree of outcrossing which occurs between hybrids is assessed by planting a white hybrid among five yellow hybrids, so that outcross seed can be distinguished from self seed on an ear and percent outcrossing can be calculated.

Comparison of mean yield performance of five yellow hybrids in high vs. low outcrossing situations showed no significant differences overall. Individually, Pioneer Brand hybrids 3732 and 3699 showed significantly higher yields in high vs. low outcrossing situations.

TABLE 1. Mean performance of five hybrids in high vs. low outcrossing environments.

<table>
<thead>
<tr>
<th>Environment</th>
<th>Mean Yield [bw/ac]</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Outcross</td>
<td>97.1</td>
</tr>
<tr>
<td>Low Outcross</td>
<td>96.6</td>
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</table>

TABLE 2. Individual performance of five hybrids in high vs. low outcrossing environments.

<table>
<thead>
<tr>
<th>Hybrid</th>
<th>Environment</th>
<th>Mean Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pioneer Brand 3732</td>
<td>High Outcross</td>
<td>92.6</td>
</tr>
<tr>
<td>Pioneer Brand 3732</td>
<td>Low Outcross</td>
<td>87.8</td>
</tr>
<tr>
<td>Pioneer Brand 3733</td>
<td>High Outcross</td>
<td>90.5</td>
</tr>
<tr>
<td>Pioneer Brand 3733</td>
<td>Low Outcross</td>
<td>90.5</td>
</tr>
<tr>
<td>Pioneer Brand 3702</td>
<td>High Outcross</td>
<td>108.7</td>
</tr>
<tr>
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<td>Low Outcross</td>
<td>111.1</td>
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<td>Pioneer Brand 3699</td>
<td>High Outcross</td>
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</tr>
<tr>
<td>Golden Harvest H2404</td>
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<td>Golden Harvest H2404</td>
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EFFECT OF POPULATION X MATURITY GROUP INTERACTIONS ON THE YIELD OF HYBRID MAIZE

Zeno W. Wicks, III and Troy J. Madetzke

A study concerning Genotype X Environment interactions of hybrid Maize is progressing throughout eastern South Dakota. A total of 8 locations were evaluated in 1995. Following is a brief overview of the experiments design.

Nine commercial corn hybrids representing three maturity groups (early: 89-92DRM, mid: 97-100DRM, and late: 112-116DRM) are planted at four different populations. The populations are: 15, 22, 29, and 36,000 plants per acre. Each variety is planted in 4-row plots, and each row is 27.5 ft. long. Only the center two rows of each plot is harvested for data. This ensures a more precise estimate of actual field conditions. Data is then calculated up to a yield per acre basis.

The experiment at the Highmore, SD was planted on May 24, 1995. Table (2) contains the harvest data from the plots in Highmore. The early maturity groups are represented by a 1, the mid-season groups by a 2, and the late season groups by a 3.

<table>
<thead>
<tr>
<th>Maturity Group</th>
<th>Final Population</th>
<th>Mean Yield (Bu/Ac)</th>
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<tbody>
<tr>
<td>1</td>
<td>15000</td>
<td>81.8</td>
</tr>
<tr>
<td>1</td>
<td>22000</td>
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<td>1</td>
<td>29000</td>
<td>110.2</td>
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<tr>
<td>1</td>
<td>36000</td>
<td>116.8</td>
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<tr>
<td>2</td>
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<td>104.8</td>
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<tr>
<td>3</td>
<td>36000</td>
<td>89.4</td>
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CORRELATION OF PHOSPHORUS SOIL TESTS FOR WINTER WHEAT

R. Gelderman, J. Gerwing, C. Stymiest, and S. Haley

INTRODUCTION

The correlation of phosphorus soil tests for spring wheat in South Dakota has been previously determined. This data shows very little yield response after soil P tests (Bray 1) reach 18-20 ppm. The data for winter wheat (Figure 1) looks similar to spring wheat. However, there is a lack of data above 15 ppm P. The purpose of this study is to obtain data to complete this correlation for the Bray 1 and Olsen soil tests for winter wheat.

PROCEDURE

A number of sites with medium to high soil P test levels were needed to complete the correlation. Thirteen studies were established at the winter wheat variety testing program sites located primarily in central and western South Dakota (Figure 2). One site was not harvested because of cheatgrass competition. Another site's data was not used because of high variability due to winter kill.

Site characteristics are listed in Table 1. Soil test P levels are given in Table 2. There were 9 and 8 sites listed as high or very high for the Bray and Olsen tests, respectively. The range of soil tests was from 7-41 and 4-23 ppm for Bray and Olsen, respectively.

Phosphorus treatments consisted of 0, 25, 50, 75, and 100 lb/acre of P₂O₅ (as 0-46-0). The material was applied with the seed at planting. The treatments were arranged in a randomized complete block design with four replications.

Nitrogen was applied to be sufficient for a 50-60 bushel yield goal. All other nutrients were judged to be adequate. Grain harvest was completed with a small plot combine. The area harvested for each site is given in Table 1.

RESULTS

Estimated grain yields for each site is given in Table 2. In general, yields were above average for most sites. Site yield means ranged from 25 bu/acre at Hayes to 93 bu/acre at Selby.

Response to added phosphorus was seen at Watertown, Martin and Selby (Pr > F is less than 0.15). The soil P tests at Watertown were low; therefore, a yield response was expected. At Selby and
Martin, soil tests are considered high or very high and grain yield response would not normally be expected. At each site, a 10% yield increase is seen from added P. However, yields were exceptionally high at both sites and phosphorus demand was probably high. A yield response to added P was expected at Ideal. However, dry weather limited yields at this site, probably reducing plant P needs. In addition, mineralization of organic P may have been higher than normal at this site because it was no-tilled into standing alfalfa.

When the relative yields (check/maximum yields x 100) are plotted against soil tests, the 1995 data fits nicely with previous studies (Figures 3 and 4).

A casual observation of this data would indicate a critical Bray P soil test of 15-20 ppm and a critical Olsen test of 12-15 ppm. This value represents the test where additional fertilizer phosphorus will no longer give an economical yield increase. These critical soil tests agree very well with critical values for other crops. Another year of data will be added to this correlation to determine the critical level more precisely for each soil test.

Figure 1. Correlation of Bray P soil test with relative yield of winter wheat in South Dakota, 1986 - 1994.
Figure 2. Location of winter wheat - phosphorus studies, South Dakota, 1995.
Table 1. Selected characteristics of winter wheat phosphorus correlation sites, 1995.

<table>
<thead>
<tr>
<th>Site</th>
<th>County</th>
<th>Tillage</th>
<th>Soil</th>
<th>Parameter</th>
<th>Previous Crop</th>
<th>Row Width</th>
<th>Planting Date</th>
<th>Harvest Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highmore</td>
<td>Hyde</td>
<td>No-till</td>
<td>Stickney</td>
<td>Fallow</td>
<td>7</td>
<td></td>
<td>9/12/94</td>
<td>4.1&quot;x15'</td>
</tr>
<tr>
<td>Selby</td>
<td>Walworth</td>
<td>No-till</td>
<td>Highmore</td>
<td>Flax</td>
<td>7</td>
<td></td>
<td>9/14/95</td>
<td>&quot;</td>
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<tr>
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<td>Tripp</td>
<td>No-till</td>
<td>Millboro</td>
<td>Alfalfa</td>
<td>7</td>
<td></td>
<td>9/13/94</td>
<td>&quot;</td>
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<td>Brookings</td>
<td>No-till</td>
<td>Brandt</td>
<td>Fallow</td>
<td>7</td>
<td></td>
<td>9/19/94</td>
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<td>Chisel</td>
<td>Brookings</td>
<td>Fallow</td>
<td>7</td>
<td></td>
<td>9/20/95</td>
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<tr>
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<td>Surface tillage</td>
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<td>Promise</td>
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<td>Bennett</td>
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<td>Wartman</td>
<td>Fallow</td>
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Table 2. Winter wheat grain yields due to P treatment, 1995.

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<th>Selby</th>
<th>Ideal</th>
<th>Aurora</th>
<th>Water</th>
<th>Bear</th>
<th>Town</th>
<th>Butte</th>
<th>Bison</th>
<th>Hayes</th>
<th>Martin</th>
<th>Ralph</th>
<th>Wall</th>
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<td>66</td>
<td>65</td>
<td>26</td>
<td>72</td>
<td>36</td>
<td>53</td>
<td></td>
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<tr>
<td>100</td>
<td>56</td>
<td>97</td>
<td>32</td>
<td>59</td>
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<td>65</td>
<td>64</td>
<td>24</td>
<td>70</td>
<td>34</td>
<td>52</td>
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<td>93</td>
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<td>65</td>
<td>65</td>
<td>25</td>
<td>70</td>
<td>35</td>
<td>51</td>
<td></td>
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</tr>
<tr>
<td>C.V.1%</td>
<td>21</td>
<td>5</td>
<td>17</td>
<td>8</td>
<td>12</td>
<td>7</td>
<td>7</td>
<td>9</td>
<td>4</td>
<td>6</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pr&gt;F$^2$</td>
<td>0.56</td>
<td>0.15</td>
<td>0.95</td>
<td>0.57</td>
<td>0.01</td>
<td>0.97</td>
<td>0.60</td>
<td>0.75</td>
<td>0.02</td>
<td>0.56</td>
<td>0.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bray P ppm</td>
<td>27.5</td>
<td>20.5</td>
<td>7.0</td>
<td>19.0</td>
<td>10.0</td>
<td>38</td>
<td>21</td>
<td>26</td>
<td>23</td>
<td>21</td>
<td>41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Olsen P ppm</td>
<td>12.5</td>
<td>12.0</td>
<td>4.5</td>
<td>7.0</td>
<td>5.0</td>
<td>26</td>
<td>12</td>
<td>15</td>
<td>11</td>
<td>15</td>
<td>22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1Coefficient of variation.
2Probability of greater F.
Figure 3. Correlation of Bray P soil test with relative yield of winter wheat in South Dakota, 1986-1995.

Figure 4. Correlation of Olsen P soil test with relative yield of winter wheat in South Dakota, 1986-1995.
SPOKE INJECTION OF FERTILIZER PHOSPHORUS FOR GRASSES

R.H. Gelderman, J.R. Gerwing, and E.K. Twidwell

Fertilization of forage grasses with phosphorus has shown limited forage increases in South Dakota, even with low soil tests. Lack of response to added phosphorus may partially be due to fertilizer placement on established grass stands. Traditionally broadcasting fertilizer has been the only placement method available. Since P moves very little in the soil, root feeding from the added P must occur very close to the soil surface. A dry soil surface could limit P uptake by grasses, limiting any yield response to the added nutrient.

Innovation in fertilizer placement equipment in the past few years include the spoke injector. Such equipment has been studied on limited till situations but research on permanent sod has been limited. The applicator does little disturbance of the sod and can apply liquid fertilizer from 1 to 4 inches below the soil surface. This placement may increase phosphorus use efficiency on established grass.

The objective of the following study was to determine if subsurface applied P is more effective than surface applied P in established grass.

METHODS AND MATERIALS

A field study utilizing nine site-years containing primarily cool-season grasses was used to evaluate placement method. Phosphorus tests at the sites were all interpreted as low or very low in South Dakota. Four of the sites had treatments applied for multiple years.

Treatment design consisted of a split-plot replicated four times. The whole plot was rate of phosphorus (0 or 60 lb P$_2$O$_5$/acre) and the placement (broadcast or spoke applied) was the split. The equipment was run empty through the spoke check. Phosphorus material used was 10-34-0. The broadcast treatment was sprayed over the surface. The subsurface treatment was injected at a 3-inch depth applied with the spoke injector at 12 inch spacings. All treatments were balanced with respect to nitrogen by broadcasting ammonium nitrate over the surface at the rate of 100 lb N/acre.

Harvests were completed by cutting and weighing forage from an area of 3 feet x 20 feet or 1.4 feet x 20 feet for the sites. A subsample of the forage was taken for dry weight and plant P analysis.
RESULTS AND DISCUSSION

Forage yields at the sites ranged from poor because of drought to excellent with over 3 tons of dry forage per acre (Table 1). Phosphorus application influenced yield at only four site-years (where \( pr > F \) was less than 0.10). At these sites, placement of phosphorus had no influence on dry matter produced. These results indicate that a spoke subsurface placement has no advantage over broadcast applied phosphorus for grass forage production.

Table 1. Dry matter grass yields as influenced by phosphorus and P placement.

<table>
<thead>
<tr>
<th>SITE</th>
<th>YEAR</th>
<th>Rate (lb/acre)</th>
<th>---0---</th>
<th>---60---</th>
<th>Pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Rate x Pl</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highmore-1</td>
<td>93</td>
<td>4636</td>
<td>4535</td>
<td>4662</td>
<td>4079</td>
</tr>
<tr>
<td>Hughes</td>
<td>93</td>
<td>3158</td>
<td>2989</td>
<td>2838</td>
<td>2836</td>
</tr>
<tr>
<td>Brookings</td>
<td>93</td>
<td>3551</td>
<td>4109</td>
<td>5569</td>
<td>4083</td>
</tr>
<tr>
<td>Brookings</td>
<td>94</td>
<td>2456</td>
<td>3063</td>
<td>4245</td>
<td>3656</td>
</tr>
<tr>
<td>Highmore-2</td>
<td>94</td>
<td>2658</td>
<td>2641</td>
<td>3137</td>
<td>3011</td>
</tr>
<tr>
<td>Brown</td>
<td>94</td>
<td>1378</td>
<td>1788</td>
<td>1937</td>
<td>1727</td>
</tr>
<tr>
<td>Brookings</td>
<td>95</td>
<td>2664</td>
<td>2656</td>
<td>3993</td>
<td>3879</td>
</tr>
<tr>
<td>Highmore-2</td>
<td>95</td>
<td>5663</td>
<td>5786</td>
<td>6089</td>
<td>6022</td>
</tr>
<tr>
<td>Brown</td>
<td>95</td>
<td>3520</td>
<td>3550</td>
<td>4672</td>
<td>4526</td>
</tr>
</tbody>
</table>

1Pr > F = probability that tabular F ratio exceeds F ratio calculated by analysis of variance.
2Bct. = broadcast.
3Pl = placement.

Plant P concentrations of the grass forage is given in Table 2. Phosphorus application increased forage P concentration at all but one of the site-years. Increases in forage P concentration due to P application ranged from 0.02 to 0.11 percent P. Of the eight responsive sites, placement of P influenced forage P concentration at five locations. The effect of placing the P below the soil surface compared to a broadcast application was negative at every site. It would appear that phosphorus availability to the plant is lessened with P fertilizer placed in this manner. Perhaps the placement of P in a small discrete area of the soil limits root contact and uptake of P.
Since yield and forage P concentration were not increased with subsurface placement, spoke injection of phosphorus for grass is not a recommended practice in South Dakota.

Table 2. Phosphorus concentration of grass forage as influenced by phosphorus rate and placement.

<table>
<thead>
<tr>
<th>SITE</th>
<th>YEAR</th>
<th>BCT² SPOKE</th>
<th>BCT. SPOKE</th>
<th>RATE</th>
<th>PL³ × PL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highmore-1</td>
<td>93</td>
<td>0.113</td>
<td>0.176</td>
<td>0.01</td>
<td>0.007</td>
</tr>
<tr>
<td>Hughes</td>
<td>93</td>
<td>0.205</td>
<td>0.210</td>
<td>0.63</td>
<td>0.88</td>
</tr>
<tr>
<td>Brookings</td>
<td>93</td>
<td>0.095</td>
<td>0.121</td>
<td>0.003</td>
<td>0.82</td>
</tr>
<tr>
<td>Brookings</td>
<td>94</td>
<td>0.095</td>
<td>0.137</td>
<td>0.005</td>
<td>0.016</td>
</tr>
<tr>
<td>Highmore-2</td>
<td>94</td>
<td>0.106</td>
<td>0.187</td>
<td>0.008</td>
<td>0.007</td>
</tr>
<tr>
<td>Brown</td>
<td>94</td>
<td>0.102</td>
<td>0.170</td>
<td>0.0001</td>
<td>0.041</td>
</tr>
<tr>
<td>Brookings</td>
<td>95</td>
<td>0.122</td>
<td>0.168</td>
<td>0.13</td>
<td>0.59</td>
</tr>
<tr>
<td>Highmore-2</td>
<td>95</td>
<td>0.089</td>
<td>0.200</td>
<td>0.0001</td>
<td>0.08</td>
</tr>
<tr>
<td>Brown</td>
<td>95</td>
<td>0.080</td>
<td>0.167</td>
<td>0.0005</td>
<td>0.8</td>
</tr>
</tbody>
</table>

¹Pr > F = probability that tabular F ratio exceeds F ratio calculated by analysis of variance.
²Bct. = broadcast.
³PL = placement.
EFFECT OF ADDED CHLORIDE TO WINTER WHEAT

Ron Gelderman, Jim Gerwing, Clair Stymiest, and Scott Haley

INTRODUCTION

A number of studies in South Dakota on spring wheat and barley have shown a yield response to added chloride. Work in Montana and Kansas have shown winter wheat responses to added chloride as well. The objective of these studies was to determine if yield responses from added chloride are found on winter wheat in South Dakota.

PROCEDURE

There were two studies to answer the above objective.

*New Underwood Study*

This study was located in Pennington County near New Underwood, SD. This site is in western South Dakota on the heavy clay residual soils. This site had winter wheat (variety: Arapahoe) recropped after winter wheat under minimum till. Therefore, the potential for leaf disease was high. The soil tests at this site are given in Table 1. All nutrients are considered adequate with the exception of phosphorus which is considered low. The cooperator applied a phosphorus starter at seeding. This site had a moderate level of residual soil chloride. The chances of a grain yield response from spring wheat to added chloride is about 70% at chloride levels below 30 lb/A for a 2 foot depth. The level at this rate is 38 and 53 lb/acre for the 2 and 4 foot depths, respectively.
Table 1. Soil Tests for chloride winter wheat studies.

<table>
<thead>
<tr>
<th>Site</th>
<th>NO₃-N 0-2' lb/A</th>
<th>Cl 0-3' ppm</th>
<th>Olsen 0-2'</th>
<th>K 0-3'</th>
<th>pH</th>
<th>O.M. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Underwood</td>
<td>108 144</td>
<td>38 53</td>
<td>6.0 681</td>
<td>6.9</td>
<td>3.2</td>
<td></td>
</tr>
<tr>
<td>Ideal</td>
<td>122</td>
<td>22</td>
<td>4.5 620</td>
<td>7.3</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>Selby</td>
<td>90</td>
<td>17</td>
<td>12.0 557</td>
<td>6.3</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>Highmore</td>
<td>96</td>
<td>22</td>
<td>12.5 748</td>
<td>6.4</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>123</td>
<td>29</td>
<td>10.0 435</td>
<td>6.4</td>
<td>1.6</td>
<td></td>
</tr>
</tbody>
</table>

'New Underwood site sampled on April 4, 1995; other sites sampled in November of 1994.

Fertilizer and fungicide treatments applied at the New Underwood study are given in Table 2. All fertilizer treatments (KCl) were broadcast over the growing wheat on April 5, 1995. The wheat was beginning to break dormancy at this time. The foliar fungicide application was made at early flag leaf with a plot sprayer.

The experimental design was a randomized complete design with four replications. Plot size was 15' x 40'. Grain harvest was completed on July 17, 1995 with a small plot combine cutting a 5' x 40' area.

RESULTS

Heavy cheatgrass competition prevented harvest of one replication. Leaf spot diseases either tan spot and/or septorial were present. This was expected because of the heavy residue and relatively moist conditions. No visual difference could be detected between treatments. Grain yields for this study are presented in Table 2.
Table 2. Influence of chloride and tilt fungicide on winter wheat grain yields and test weight, New Underwood, SD, 1995.

<table>
<thead>
<tr>
<th>Chloride Rate (lb/A)</th>
<th>Yield (bu/A)</th>
<th>Test Weight (lb/bu)</th>
<th>Tilt Response</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ +</td>
</tr>
<tr>
<td>0</td>
<td>44.7</td>
<td>62.9</td>
<td>64.0</td>
</tr>
<tr>
<td>50</td>
<td>46.9</td>
<td>63.1</td>
<td>62.3</td>
</tr>
<tr>
<td>100</td>
<td>47.8</td>
<td>61.4</td>
<td>63.2</td>
</tr>
<tr>
<td>Response</td>
<td>+ 3.1</td>
<td>+ 3.8</td>
<td></td>
</tr>
</tbody>
</table>

Statistics: **Yield**: C.V.% = 9.3; Pr > F; Cl rate = 0.45; Tilt = 0.003; Rate x Tilt = 0.99. **Test Weight**: C.V.% = 1.7; Pr > F; Cl rate = 0.22; Tilt = 0.18; Rate x Tilt = 0.15.

Yields were fair considering this was a recropped field and weed pressure was heavy. The application of tilt produced a significant yield increase of about 5 bu/A at all chloride levels. The effect of chloride was not significant. The trend for chloride was to increase yield from 2 to 4 bushels per acre, regardless of tilt treatment. These data indicate that a fungicide treatment where high disease potential exists is profitable. The application of chloride, although not significant, produced a consistent yield increase irregardless of tilt treatment.

Grain test weights were not influenced by fungicide or chloride treatments.

**Other Chloride Studies**

Four other chloride studies were established at the sites listed in Table 1. Residual chloride levels were below 30 lb/A for all sites. These sites would all be considered responsive to added...
chloride using SDSU's guidelines for spring wheat. The treatments consisted of a check and a 60 lb/A chloride treatment replicated five times. The chloride treatment (KCl) was broadcast over the wheat in early spring. No other nutrients were applied to these plots. Plot size was 4' x 15' and the entire plot was harvested to estimate grain yield. The variety used was TAM 107 at all sites.

Table 3. Grain yields of winter wheat for chloride studies, 1995.

<table>
<thead>
<tr>
<th>Cl Treatment(^1)</th>
<th>Ideal</th>
<th>Selby</th>
<th>Highmore Wall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cl-</td>
<td>60</td>
<td>58</td>
<td>53</td>
</tr>
<tr>
<td>Cl+</td>
<td>60</td>
<td>58</td>
<td>52</td>
</tr>
<tr>
<td>C.V.%</td>
<td>5</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>Pr &gt; F</td>
<td>0.99</td>
<td>0.94</td>
<td>0.87</td>
</tr>
</tbody>
</table>

\(^1\)Cl- = check; Cl+ = 60 lb chloride per acre.

The results indicate no yield response to added chloride. Possible reasons include lack of disease pressure, deep profile chloride or a non-responsive variety. Spring wheat and barley studies have indicated some varieties do not respond to added chloride. Studies in Montana and Kansas have also indicated that the varietal component may be important for winter wheat as well. Additional studies will be conducted in 1996 to determine if chloride response may be variety specific.
WEED CONTROL

Leon J. Wrage, Paul O. Johnson, David A. Vos, and Scott A. Wagner

The experiment station provides a strategic location for several weed control field evaluation and demonstration trials. The plots provide data used in the statewide weed control extension program. They are also used for field tours.

The station location has been the primary site for evaluating downy brome (cheatgrass) control in winter wheat. A block is devoted to maintaining the weed infestation and provides the winter wheat crop for comparing herbicides, including experimental products. Data are reported as part of the following tables.

Additional no-till evaluations were established in 1995. The tests provide comparative performance data for herbicides in corn, sorghum, and sunflower. Data are reported in the following tables.

The location is also used to evaluate herbicide carryover from experimental herbicides. These data are an important part of the evaluation program for potential commercial products and become a part of the data base and to define label restrictions.

The contribution of station personnel in plot area preparation and maintenance is acknowledged.

Table 1. Evaluation of Cheatgrass Control in Winter Wheat
2. No-Till Sunflower Evaluation
3. No-Till Corn Evaluation
4. No-Till Sorghum Evaluation
Table 1. Evaluation of Cheatgrass Control in Winter Wheat

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Varietal A/ft²</th>
<th>% VCRR 5/11/95</th>
<th>% DoB 6/11/95</th>
<th>% DoB 7/2/95</th>
<th>Yield bu/ft²</th>
<th>2-Yr Avg. % DoB</th>
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</thead>
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<tr>
<td><strong>PREPLANT INCORPORATED</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hoelon</td>
<td>2.67 pt</td>
<td>7</td>
<td>88</td>
<td>88</td>
<td>27</td>
<td>73</td>
</tr>
<tr>
<td>Treflan 10G</td>
<td>7.5 lbs</td>
<td>43</td>
<td>57</td>
<td>48</td>
<td>19</td>
<td>48</td>
</tr>
<tr>
<td>Fer-go 10G</td>
<td>1.5 lbs</td>
<td>0</td>
<td>70</td>
<td>68</td>
<td>25</td>
<td>42</td>
</tr>
<tr>
<td>Sen/Lex 75DF</td>
<td>.67 lbs</td>
<td>17</td>
<td>82</td>
<td>79</td>
<td>25</td>
<td>–</td>
</tr>
<tr>
<td><strong>SHALLOW PREPLANT INCORPORATED</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Treflan</td>
<td>1.5 pt</td>
<td>53</td>
<td>53</td>
<td>35</td>
<td>20</td>
<td>38</td>
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<tr>
<td>Amber</td>
<td>.3 oz</td>
<td>0</td>
<td>58</td>
<td>60</td>
<td>25</td>
<td>52</td>
</tr>
<tr>
<td>Amber</td>
<td>.6 oz</td>
<td>0</td>
<td>68</td>
<td>74</td>
<td>27</td>
<td>67</td>
</tr>
<tr>
<td>Amber+Sen/Lex 75DF</td>
<td>.6 oz+2 oz</td>
<td>3</td>
<td>73</td>
<td>74</td>
<td>23</td>
<td>–</td>
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<td>25</td>
<td>80</td>
<td>55</td>
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<td>46</td>
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<td><strong>PREEMERGENCE</strong></td>
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<td></td>
</tr>
<tr>
<td>Amber</td>
<td>.3 oz</td>
<td>0</td>
<td>43</td>
<td>48</td>
<td>24</td>
<td>42</td>
</tr>
<tr>
<td>Amber</td>
<td>.6 oz</td>
<td>0</td>
<td>43</td>
<td>37</td>
<td>27</td>
<td>41</td>
</tr>
<tr>
<td>Amber+Sen/Lex 75DF</td>
<td>.6 oz+2 oz</td>
<td>0</td>
<td>47</td>
<td>50</td>
<td>25</td>
<td>–</td>
</tr>
<tr>
<td>Finesse</td>
<td>.3 oz</td>
<td>0</td>
<td>47</td>
<td>52</td>
<td>24</td>
<td>–</td>
</tr>
<tr>
<td>Finesse</td>
<td>.4 oz</td>
<td>0</td>
<td>57</td>
<td>53</td>
<td>24</td>
<td>–</td>
</tr>
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<td><strong>FALL POSTEMERGENCE</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finesse</td>
<td>.3 oz</td>
<td>0</td>
<td>57</td>
<td>53</td>
<td>26</td>
<td>–</td>
</tr>
<tr>
<td>Sen/Lex 75DF</td>
<td>.33 lbs</td>
<td>3</td>
<td>80</td>
<td>82</td>
<td>25</td>
<td>–</td>
</tr>
<tr>
<td>Sen/Lex 75DF</td>
<td>.67 lbs</td>
<td>13</td>
<td>92</td>
<td>94</td>
<td>28</td>
<td>86</td>
</tr>
<tr>
<td>Amber+X-77</td>
<td>.6 oz+25%</td>
<td>0</td>
<td>58</td>
<td>30</td>
<td>25</td>
<td>43</td>
</tr>
<tr>
<td>Amber+Sen/Lex 75DF+X-77</td>
<td>.6 oz+.33 lbs+</td>
<td>10</td>
<td>80</td>
<td>87</td>
<td>28</td>
<td>84</td>
</tr>
<tr>
<td>Amber+Sen/Lex 75DF+X-77</td>
<td>.6 oz+1/8 lbs+</td>
<td>.25%</td>
<td>3</td>
<td>70</td>
<td>72</td>
<td>28</td>
</tr>
<tr>
<td>Finesse+Sen/Lex 75DF+X-77</td>
<td>.4 oz+.33 lbs+</td>
<td>13</td>
<td>91</td>
<td>92</td>
<td>29</td>
<td>–</td>
</tr>
<tr>
<td>Finesse+Sen/Lex 75DF+X-77</td>
<td>.4 oz+1/8 lbs+</td>
<td>.25%</td>
<td>8</td>
<td>87</td>
<td>89</td>
<td>29</td>
</tr>
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</table>
Table 2. No-Till Sunflower Evaluation

RCB; 3 reps
Variety: AgriPro ST317
Planting Date: 5/23/95
PRE: 5/23/95
POST: 6/20/95
POST: 6/20/96
Soil: Clay loam; 2.4% O.M.; 7.2 pH
PRECIPITATION:
- Grft = Green foxtail
- Rpw = Redroot pigweed

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Product/A</th>
<th>% VCRR 6/29/95</th>
<th>% Grft 6/29/95</th>
<th>% Rpw 6/29/95</th>
<th>Yield lb/acre</th>
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<tr>
<td>Check</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>596</td>
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<td><strong>PREEMERGENCE</strong></td>
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<td></td>
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<tr>
<td>Gramoxone Extra + X-77</td>
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<td>0</td>
<td>7</td>
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<td>966</td>
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<tr>
<td>Prowl + Gramoxone Extra + X-77</td>
<td>3 pt+ 1.5 pt+.5%</td>
<td>0 88</td>
<td>96</td>
<td>1535</td>
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</tr>
<tr>
<td>Prowl + Roundup + X-77</td>
<td>3 pt+ 1 pt+.375+.5%</td>
<td>0 84</td>
<td>82</td>
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<td>Prowl</td>
<td>3 pt</td>
<td>0</td>
<td>81</td>
<td>74</td>
<td>1247</td>
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<td>Treflan + Gramoxone Extra + X-77</td>
<td>1 qt+ 1.5 pt+.5%</td>
<td>0 81</td>
<td>96</td>
<td>1598</td>
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</tr>
<tr>
<td>Frontier 7.5L +</td>
<td>1.6 pt+</td>
<td>8</td>
<td>98</td>
<td>97</td>
<td>1804</td>
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<tr>
<td>Gramoxone Extra + X-77</td>
<td>+1.5 pt+.5%</td>
<td>91</td>
<td>94</td>
<td>1634</td>
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</tr>
<tr>
<td>Acetochlor 6.4L +</td>
<td>2.5 pt+</td>
<td>27</td>
<td>91</td>
<td>94</td>
<td>1634</td>
</tr>
<tr>
<td>Gramoxone Extra + X-77</td>
<td>+1.5 pt+.5%</td>
<td>42 84</td>
<td>98</td>
<td>1394</td>
<td></td>
</tr>
<tr>
<td>Prowl + 2.4-D ester +</td>
<td>3 pt+1 qt+</td>
<td>42 84</td>
<td>98</td>
<td>1394</td>
<td></td>
</tr>
<tr>
<td>Gramoxone Extra + X-77</td>
<td>+1.5 pt+.5%</td>
<td>8</td>
<td>98</td>
<td>1394</td>
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<td><strong>PREEMERGENCE &amp; POSTEMERGENCE</strong></td>
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<td>Gramoxone Extra + X-77&amp; Assert + X-77</td>
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<tr>
<td>Gramoxone Extra + X-77&amp; Poast + Assert + COC</td>
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<td>3 93 96</td>
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Table 4. No-Till Sorghum Evaluation

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<th>FALL</th>
<th>EARLY PREPLANT</th>
<th>PREEMERGENCE</th>
<th>POSTEMERGENCE</th>
<th>% VCRR 6/29/95</th>
<th>% Gfrt 6/29/95</th>
<th>% Bdif 6/29/95</th>
<th>Yield bu/A</th>
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</thead>
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<td></td>
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<td>97</td>
<td>44</td>
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<tr>
<td>Dual II (2.5 pt)</td>
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<td></td>
<td></td>
<td>0</td>
<td>98</td>
<td>98</td>
<td>55</td>
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<tr>
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<td></td>
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<td>99</td>
<td>57</td>
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<td>Atrazine (1.1 lb)</td>
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<td>Dual II (2.5 pt)</td>
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<td>95</td>
<td>95</td>
<td>58</td>
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<td>Dual II (2.5 pt)</td>
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<td>Buctril (1.5 pt) + Atrazine (9 oz)</td>
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<td>34</td>
<td>94</td>
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<td>Dual II (2.5 pt)</td>
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<td>Atrazine (1.1 lb) + COC (1 qt)</td>
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<td>25</td>
<td>90</td>
<td>88</td>
<td>44</td>
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<tr>
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<td>Banvel (0.5 pt) + Atrazine (9 oz)</td>
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<td>85</td>
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<td></td>
<td>Banvel (0.5 pt)</td>
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<td>9</td>
<td>91</td>
<td>90</td>
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<tr>
<td>Dual II (2.5 pt)</td>
<td></td>
<td>2,4-D amine (1 pt)</td>
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<td>41</td>
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<td>Dual II (2.5 pt)</td>
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<td>Ally (0.05 oz) + 2,4-D ester (5 pt)</td>
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<td>Lasso (3 qt) + Atrazine (1.1 lb)</td>
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<td>Frontier 7.5L (1.6 pt) + Atrazine (1.1 lb)</td>
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<td>0</td>
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<tr>
<td>Gramoxone Extra (1.6 pt) + X-77 (1.5%)</td>
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<td>22</td>
<td>69</td>
<td>77</td>
<td>31</td>
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<td>Atrazine (1.4 lb) + COC (1 qt)</td>
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<td>2</td>
<td>92</td>
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<td>49</td>
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<td>Permit (0.67 oz) + X-77 (25%)</td>
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<td>Roundup (1 pt) + X-77 (5%) + Ramrod (4 qt)</td>
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<tr>
<td>Gramoxone Extra (1.6 pt) + X-77 (5%) + Ramrod (4 qt) + Atrazine (1.1 lb)</td>
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<tr>
<td>LSD (.05)</td>
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</table>
FIELD EVALUATION OF WOODY PLANT MATERIALS

Russell J. Haas - Plant Materials Specialist - USDA/ARS

OBJECTIVES

1. Assemble and evaluate the adaptation and performance of selected woody plant materials for field and farmstead windbreaks and wildlife plantings in the Northern Great Plains.

2. Select and cooperatively release, superior cultivars for increase by commercial nurseries.

ACTIVITIES IN 1995

140 accessions of 87 species are currently under evaluation.

May 8 - Due to extremely wet spring, planting and evaluation were three weeks behind usual. Ten accessions of eight species were added and spring survival and animal injury were noted.

October 10 - Each surviving plant of accessions planted in 1976, 1981, 1986, 1991, 1993, and 1995 was measured for crown spread and plant height; and rated for disease and insect damage, drought and cold tolerance, fruit production, survival and vigor. 9063130 river birch, 'Streamco' purpleosier willow and ND-3902 sandbar willow show superior stabilization. Photographs were taken to document performance, noted plot locations available for future plantings and replacement stakes needed and performed minor pruning. Also rogued volunteer seedlings of "tree weeds" such as mulberry, chokecherry, green ash etc. out of rows in shrub block.

SUMMARY OF ACCOMPLISHMENTS

Based on observations and data collected at this site, the released cultivars in the following table are recommended for use in South Dakota. Numbered experimental selections will be placed in field plantings for further evaluation when planting stock becomes available.

- 'Cardan' green ash
- 'Centennial' cotoneaster
- 'Sakakawa' silver buffaloberry
- 'Indigo' silky dogwood
- ND-1135 plum
- ND-21 sandbar willow
- ND-1879 honeylocust
- ND-83 late lilac
- 'Streamco' purple osier willow
- 9058862 tamarack

- 'Oahe' hackberry
- 'Scarlet' mongolian cherry
- 'McDermand' ussuriian pear
- ND-283 Russian almond
- ND-21 nannyberry
- 9047238 seabuckthorn
- 9008041 false indigo
- ND-1863 honeylocust
- 'Freedom' blueleaf honeysuckle
- 'Meadowlark' forsythia
This field evaluation planting was established in 1978. Data from this planting has been used to document the cooperative release of ten cultivars listed below. These are currently in large scale production and use in conservation and wildlife plantings in the Northern Great Plains. Data has also assisted nurserymen and plant researchers from several agencies determine the range of adaptation and performance of many other cultivars.

- ND-170 cotoneaster
- 'Bighorn' skunkbush sumac
- 'Bighorn' skunkbush sumac
- 14272 hybrid poplar
- 9069081 littleleaf linden
- 'Midwest' manchurian crabapple
- 323957 chokeberry
- 323957 chokeberry
- ND-2103 highbush cranberry
- 'Cardan' green ash
- 'Sakakawea' silver buffaloberry
- 'Centennial' cotoneaster
- 'Homestead' Arnold hawthorn
- 'Oahe' hackberry
- 'Scarlet' mongolian cherry
- 'McDermand' ussurian pear
- 'Regal' (ND-283) Russian almond