Protein Survey of the 1979 Six-Rowed Barley Crop

R. E. Pyler, E. L. Cummings, C. A. Barr

For the past three crop years (1977-1979), the Department of Cereal Chemistry at North Dakota State University, in cooperation with and with the financial assistance of the Malting Barley Improvement Association, has undertaken a survey of the six-rowed malting barley crop grown in North Dakota, South Dakota and Minnesota.

The third annual survey was conducted on the crop grown in 1979. This report summarizes the data obtained on over 700 samples collected in the three-state area from August 7 to September 12, 1979.

Determination of protein levels for the 1977 and 1978 surveys was carried out by the classical Kjeldahl method. Protein assays this year were carried out using a Technician Infralyzer. The accuracy of this unit was checked by taking every tenth sample for Kjeldahl analysis. The average protein content for some 70 samples was 13.0 by both methods.

The 1979 Crop Year

The 1979 crop year proved to be a difficult one for barley producers in the three-state area and some of these difficulties have affected the survey.

The year began with a very late and very wet spring which delayed general planting until late May. By the end of May, only slightly more than half of the barley crop had been planted but almost all was in the ground by June 10. The crop lagged well behind normal with the condition of the crop in most areas being described as fair to good. Harvest of early planted fields began early in August but the general harvest was considerably delayed in many areas by frequent precipitation. Only about half of the crop had been combined by the end of August compared with the normal average of over 70 per cent.

In addition to the late crop, producers faced reluctance on the part of elevators to accept barley due to poor rail transportation and the Duluth strike.

The survey was affected by these factors and also by the declining acreage planted to barley. The fewer number of samples collected for the 1979 survey reflect all of these factors.

Results

Table 1 presents the North Dakota county averages for protein, moisture and kernel brightness, the ranges for these parameters encountered in 1979 and the change in the county average from the 1978 crop. The protein content of the 1979 crop was equal to that of the 1978 crop at 13 per cent, with individual counties showing differences of from 1.4 per cent higher in 1979 to 3.2 per cent lower. Ten counties showed higher protein levels than in 1978, 13 showed lower levels and two remained the same.

The average moisture level for the 1979 North Dakota crop dropped by 0.1 per cent from that in 1978 and kernel brightness suffered in 1979. This decline in kernel brightness was probably due to staining which occurred after swathing because of the frequent showers.

Tables 2 and 3 give corresponding data for Minnesota and South Dakota samples, respectively. Minnesota showed a decline of 0.2 per cent in protein levels. The average moisture level increased by 1.4 per cent and kernel brightness was very poor, declining by two units to an average score of 8. The South Dakota samples showed a 1.5 per cent decline in protein content to an average of 12.0 per cent. Moisture levels increased slightly and kernel brightness was equal to that of 1978.

The authors would like to acknowledge the help of Terry Howe and Truman Olson who aided in sample collection and Debbie Turnow and Tom Wiesner who performed the quality analyses.

This survey would not have been possible without the financial support of the Malting Barley Improvement Association and the continued excellent cooperation of the barley producers and county elevators in the three-state area.

Dr. Pyler is assistant professor, Cummings and Barr are technicians, Department of Cereal Chemistry and Technology.
Table 1. North Dakota County Averages, Ranges and Changes from 1978 for Protein Content, Moisture and Color for the 1979 Crop

<table>
<thead>
<tr>
<th>County</th>
<th>1979 Protein</th>
<th>Range</th>
<th>Change*</th>
<th>1979 Moisture</th>
<th>Range</th>
<th>Change*</th>
<th>1979 Color</th>
<th>Range</th>
<th>Change*</th>
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<td>+3</td>
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</table>

Average 13.0

*From 1978 Averages.

Table 2. Minnesota County Averages, Ranges and Changes from 1978 for Protein Content, Moisture and Color for the 1979 Crop

<table>
<thead>
<tr>
<th>County</th>
<th>1979 Protein (%)</th>
<th>Range</th>
<th>Change*</th>
<th>1979 Moisture (%)</th>
<th>Range</th>
<th>Change*</th>
<th>1979 Color</th>
<th>Range</th>
<th>Change*</th>
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<td>+2</td>
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<td>11.1-14.1</td>
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<td>7</td>
<td>6-9</td>
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<td>5-9</td>
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</table>

Average 12.8

*From 1978 Averages.
Table 3. South Dakota County Averages, Ranges and Changes from 1978 for Protein Content, Moisture and Color for the 1979 Crop

<table>
<thead>
<tr>
<th>County</th>
<th>Protein (%)</th>
<th>1979</th>
<th>Range</th>
<th>Change*</th>
<th>Moisture (%)</th>
<th>1979</th>
<th>Range</th>
<th>Change*</th>
<th>Color</th>
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<td>+0.9</td>
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<td>+0.6</td>
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</table>

*From 1978 Averages.

Table 4 shows the protein distribution for the 1979 barley crop from the three states. Seventy-six per cent of the North Dakota crop samples, 74 per cent of the Minnesota samples and all of the South Dakota samples fell below 13.5 per cent protein. Of the 731 samples collected during the survey, 76.9 per cent were below this level and should be suitable for malting on this basis. Cumulative per cent data for the 1977 and 1978 crops show that 46.7 and 65.1 per cent, respectively, were below 13.5 per cent protein.

The levels of plump kernels and test weights for the three states is given in Table 5. All three states showed small declines in test weight and all three were virtually equal in this respect. Samples from North Dakota and South Dakota showed improved kernel plumpness over 1978 while Minnesota samples were less plump.

Table 5 summarizes the data obtained from the three crop years for the three states. The total protein content has declined in each of the last two years as has test weight. Moisture levels have remained fairly constant and kernel brightness has varied only between scores of 5 and 7. Kernel plumpness, which showed a significant decline in 1978, is slightly higher in 1979.

Table 4. Protein Distribution of 1979 Barley Samples

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<th>State</th>
<th>Less Than</th>
<th>More Than</th>
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<td>11.6-12.5</td>
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<td>26</td>
<td>137</td>
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<tr>
<td>South Dakota</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>Minnesota</td>
<td>35</td>
<td>44</td>
</tr>
<tr>
<td>Per cent in class</td>
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<td>26.0</td>
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<tr>
<td>Cumulative Per cent</td>
<td>(1979) 9.7</td>
<td>35.7</td>
</tr>
<tr>
<td></td>
<td>(1978) 13.7</td>
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</tr>
<tr>
<td></td>
<td>(1977) 9.8</td>
<td>26.4</td>
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</table>

* Per cent retained on 8/64 inch screen.  ** From 1978 average.
Summary

The 1979 six-rowed malting barley crop grown in North Dakota, South Dakota and Minnesota has an average protein content of 12.9 per cent, a decline of 0.1 per cent from the 1978 average. Moisture levels average 11.8 per cent. The test weight is slightly lower than the 1977 and 1978 averages but the level of plump kernels has risen this year. The 1979 crop suffers from poor kernel brightness and this may be a factor in its suitability for malting purposes.

Figure 1 shows the average protein levels for the 42 counties sampled in the 1978 barley crop survey.

Table 6. Summary of Data for 1977, 1978, and 1979 Crops*

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Samples</th>
<th>Protein (%)</th>
<th>Moisture (%)</th>
<th>Color</th>
<th>Test Weight (lbs/bu)</th>
<th>Plumpness (%)</th>
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<td>46.5</td>
<td>74.4</td>
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<td>68.1</td>
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<td>43.6</td>
<td>69.6</td>
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Figure 1: Average protein content for all counties sampled in 1979 barley survey.
ANNUAL REPORT, 1979
Financial Statement
North Dakota Agricultural Experiment Station
July 1, 1978 to June 30, 1979

OPERATIONS

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<td>CR, USDA Sales &amp; Services</td>
<td>660,718.89</td>
<td>432,642.66</td>
<td>421,108.63</td>
<td>21,885.00</td>
<td>694,137.92</td>
<td>120,052.33</td>
<td>69,612.82</td>
<td>170,711.37</td>
<td>60,732.11</td>
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<td>Gifts &amp; Grants</td>
<td>266,949.20</td>
<td>1,222,160.69</td>
<td>1,227,026.06</td>
<td>21,984.66</td>
<td>284,068.49</td>
<td>916,138.98</td>
<td>131,198.83</td>
<td>114,450.49</td>
<td>65,237.76</td>
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<tr>
<td>TOTAL Main Station</td>
<td>$1,368,690.34</td>
<td>$8,997,914.46</td>
<td>$8,495,860.74</td>
<td>$21,984.66</td>
<td>$1,892,728.72</td>
<td>$6,186,114.09</td>
<td>$842,863.18</td>
<td>$865,621.12</td>
<td>$601,262.35</td>
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<tr>
<td>Branch Stations</td>
<td>820,630.07</td>
<td>1,276,913.49</td>
<td>1,283,759.63</td>
<td>3,786.48</td>
<td>817,570.41</td>
<td>703,892.03</td>
<td>153,319.43</td>
<td>290,861.25</td>
<td>135,686.92</td>
</tr>
<tr>
<td>TOTAL OPERATIONS</td>
<td>$2,189,320.41</td>
<td>$10,274,827.95</td>
<td>$9,779,620.37</td>
<td>$25,771.14</td>
<td>$2,710,299.13</td>
<td>$6,890,086.12</td>
<td>$956,182.61</td>
<td>$1,156,482.37</td>
<td>$736,919.27</td>
</tr>
</tbody>
</table>

LAND & STRUCTURES

|                          |                |          |              |           |                 |          |                |                     |           |
|--------------------------|----------------|----------|--------------|-----------|-----------------|----------|                |                     |           |
| Main Station             |                |          |              |           |                 |          |                |                     |           |
| State Appropriations     | $ 10,028.95    | $ -0-    | $ 10,028.95  | $ -0-     | $ -0-           | $ -0-    |                |                     |           |
| Branch Stations          |                |          |              |           |                 |          |                |                     |           |
| State Appropriations     | 508,266.04     | $ -0-    | 508,266.04   | $ -0-     | $ -0-           | $ -0-    |                |                     |           |
| TOTAL LAND & STRUCTURES  | $ 518,294.99   | $ -0-    | $ 518,294.99 | $ -0-     | $ -0-           | $ -0-    |                |                     |           |
| GRAND TOTAL              | $2,707,615.40  | $10,274,827.95 | $10,297,915.36 | $25,771.14| $2,710,299.13   | $6,890,086.12| $956,182.61     | $1,156,482.37       | $736,919.27   |
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NORTH DAKOTA STATE UNIVERSITY
OF AGRICULTURE AND APPLIED SCIENCE
(as of June 30, 1979)

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LANGDON: Robert E. Nowatzki, B.S., Superintendent.

NORTH CENTRAL: Ben K. Hoag, M.S., Superintendent; John Lukach, B.S., Assistant Agronomist.

WILLISTON: Ernest W. French, M.S., Superintendent; Neil Riveland, M.S., Associate Agronomist.

CARRINGTON: Howard Olson, M.S., Superintendent and Agricultural Engineer; Joseph J. Caroline, B.S., Assistant Agronomist; Robert Hoffman, B.S., Assistant Agricultural Engineer.

AGRONOMY SEED FARM: LeRoy A. Spilde, Ph.D., Superintendent.

The small superscript figure after each title indicates the per cent of the salary paid by the Agricultural Experiment Station. The superscript zero indicates the entire salary is paid by some state or federal agency, usually the United States Department of Agriculture.

PROFESSIONAL STAFF CHANGES

(to June 30, 1979)

ADDITIONS TO STAFF

Hugo O. Carvallo, Ph.D.
Research Associate

Duane E. Gronhovd, M.S.
Research Assistant

Steven C. Hvinden, M.S.
Research Assistant

Timothy W. Martens, B.S.
Instructor

Gary L. Williams, Ph.D.
Assistant Professor

Kenneth D. Kofoid, Ph.D.
Assistant Professor

Michael W. Lund, B.S.
Instructor

Fredric S. Carter, B.S.
Research Assistant

Jerome D. Frankowski, Ph.D.
Associate Professor

Chung S. Park, Ph.D.
Assistant Professor

Lyle D. Prunty, Ph.D.
Assistant Professor

Lawrence E. Mack, Ph.D.
Assistant Professor

Dennis A. Saari, D.V.M.
Associate Professor

Joseph F. Giles, Ph.D.
Assistant Professor

Rollin G. Sears, Ph.D.
Assistant Professor

Kent A. Belland, B.S.
Research Assistant

Gary A. Halvorson, Ph.D.
Research Associate

H. Allan Mann, M.S.
Instructor

Dennis A. Saari, D.V.M.
Associate Professor

Joseph F. Giles, Ph.D.
Assistant Professor

Rollin G. Sears, Ph.D.
Assistant Professor

Kent A. Belland, B.S.
Research Assistant

Gary A. Halvorson, Ph.D.
Research Associate

H. Allan Mann, M.S.
Instructor

Jay K. Larsen, B.S.
Research Assistant

Dan E. Parfitt, M.S.
Research Associate

DELETIONS TO STAFF

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Research Associate

David C. Ebeltott, Ph.D.
Professor

Robert E. Sojka, Ph.D.
Assistant Professor

Jay A. Leitch, M.S.
Research Associate

James W. Bauder, Ph.D.
Assistant Professor

Gary M. Bedker, M.S.
Research Associate

Arlon G. Hazen, M.S.
Research Assistant

Damian A. Runge, B.S.
Research Assistant

Raul Weiss, D.V.M.
Associate Professor

John R. Erickson, Ph.D.
Associate Professor

Fred E. Rhoton, Ph.D.
Research Associate

Franklin B. Arnold, M.S.
Research Assistant

Fred W. Schroer, M.S.
Associate Professor

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Numerous grants of money and gifts of equipment, supplies, and other services are provided the North Dakota Agricultural Experiment Station each year in support of its research programs. The station expresses its sincere thanks to the following for the support provided during Fiscal year 1979.

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Mississippi State University
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Montana State University
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