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A HISTORY OF WHEAT IMPROVEMENT AT KANSAS STATE UNIVERSITY

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Wheat is the most important crop in Kansas. It supports growers, their communities, and an array of industries as well as feeding millions of people around the world. Kansas didn’t become the “Wheat State” by accident. Settlers introduced numerous kinds of wheat, learned to grow them by trial and error, and suffered crop failures during many years. Today’s growers, in contrast, have varieties adapted to Kansas; modern methods and machinery for producing the crop; and up-to-date information on tilling the soil, protecting the plants against adverse conditions, and marketing the grain.

Most of the improved varieties and much of the modern technology for producing wheat in Kansas were developed at Kansas State University (K-State). Over three-fourths of the 2003 Kansas wheat crop was planted to K-State varieties (Figure 1). These varieties became popular because they are productive, yield high-quality grain, and resist the pests and adverse weather that often damage wheat in the state. Their annual contribution to Kansas agriculture amounts to hundreds of millions of dollars.

The high percentage of K-State varieties in the 2003 crop continues a long tradition of improving wheat for Kansas growers. Thirty-six varieties have been released since 1917, each an improvement in some respect over its predecessors (Table 1). In addition to improved productivity and resistance to pests and weather, all of the quality traits of Kansas wheat have been maintained and many of them have been enhanced (Table 2). It is difficult to improve some traits, such as protein, as yield increases because of an inverse relationship between...
The article discusses the history of wheat production in Kansas and the development of improved wheat varieties. It highlights the challenges and successes of wheat farming in Kansas, including the introduction of new varieties and the techniques used to improve yields. The text mentions the importance of wheat as a staple crop and its role in the state's economy. It also includes a table listing various wheat cultivars and their characteristics. The article ends with a discussion of the current status of wheat production in Kansas, noting the ongoing efforts to improve yields and adapt to changing conditions.
Early researchers at Kansas State Agricultural College (KSAC, now K-State) faced the same uncertainties with wheat as settlers did with other field crops. Improvements were made by M.A. Carleton, a graduate (B.S. 1887, M.S. 1893) and cross-pollinating parents with desirable traits to create new varieties.

**Introduction of Wheat in Kansas**

Two important introductions of 'Turkey'-type wheats were made by M.A. Carleton, a graduate (B.S. 1887, M.S. 1893) and cross-pollinating parents with desirable traits to create new varieties.

The soft red winter wheats 'Little May', 'Big May', 'Red Swamp' by J.H. Parker, Professor of Agronomy from 1917 to 1921, became K-State's standard soft white wheat and 'Zimmerman' continued as its standard hard red winter wheat.

Some of the new varieties released by K-State were:

- **'Kharkof'**, from Russia in 1900. 'Crimean' became the parent of the first improved wheat varieties developed by K-State. 'Kharkof' was introduced by C.C. Georgeson in 1900 and released in 1902. It had high protein content, long mixing time, large loaf volume, better crust structure, and a much higher quality rating.

- **'Crimean'** was introduced by C.C. Georgeson in 1900 and released in 1902. It had high protein content, long mixing time, large loaf volume, better crust structure, and a much higher quality rating.

- **'Turkey'** was introduced by C.C. Georgeson in 1900 and released in 1902. It had high protein content, long mixing time, large loaf volume, better crust structure, and a much higher quality rating.

- **'Little May'** was introduced by C.C. Georgeson in 1900 and released in 1902. It had high protein content, long mixing time, large loaf volume, better crust structure, and a much higher quality rating.

- **'Big May'** was introduced by C.C. Georgeson in 1900 and released in 1902. It had high protein content, long mixing time, large loaf volume, better crust structure, and a much higher quality rating.

- **'Red Swamp'** was introduced by C.C. Georgeson in 1900 and released in 1902. It had high protein content, long mixing time, large loaf volume, better crust structure, and a much higher quality rating.

- **'Kanred'** was introduced by C.C. Georgeson in 1900 and released in 1902. It had high protein content, long mixing time, large loaf volume, better crust structure, and a much higher quality rating.

- **'Jagger'** was introduced by C.C. Georgeson in 1900 and released in 1902. It had high protein content, long mixing time, large loaf volume, better crust structure, and a much higher quality rating.

- **'Zimmerman'** was introduced by C.C. Georgeson in 1900 and released in 1902. It had high protein content, long mixing time, large loaf volume, better crust structure, and a much higher quality rating.

- **'Betty'** was introduced by C.C. Georgeson in 1900 and released in 1902. It had high protein content, long mixing time, large loaf volume, better crust structure, and a much higher quality rating.

- **'Norkan'** was introduced by C.C. Georgeson in 1900 and released in 1902. It had high protein content, long mixing time, large loaf volume, better crust structure, and a much higher quality rating.
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Turkey 72 11.5 56 2.4  935 6.3 14.7
Bison 74 11.7 56 2.9   985 7.7 24.0
Wichita 76 11.2 54 2.2   946 7.2 15.3
Newton 72 10.9 55 3.3   980 7.7 21.7
Another high-quality variety, 'Karl 92', was selected from winter wheat.*

Table 2. Grain quality traits of wheat varieties released by Kansas State University relative to 'Turkey' hard red winter*.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Flour yield (%)</th>
<th>Protein (%)</th>
<th>Absorption (%)</th>
<th>Maximum min.</th>
<th>Low volume (ml)</th>
<th>Crumb grain</th>
<th>Quality index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkey</td>
<td>72</td>
<td>11.5</td>
<td>56</td>
<td>2.4</td>
<td>935</td>
<td>6.3</td>
<td>14.7</td>
</tr>
<tr>
<td>Tamarack</td>
<td>75</td>
<td>12.0</td>
<td>56</td>
<td>2.7</td>
<td>940</td>
<td>8.0</td>
<td>18.6</td>
</tr>
<tr>
<td>Comanche</td>
<td>74</td>
<td>12.0</td>
<td>56</td>
<td>3.1</td>
<td>917</td>
<td>7.0</td>
<td>18.5</td>
</tr>
<tr>
<td>Pawnee</td>
<td>73</td>
<td>11.4</td>
<td>55</td>
<td>2.0</td>
<td>928</td>
<td>6.8</td>
<td>13.8</td>
</tr>
<tr>
<td>Wichita</td>
<td>76</td>
<td>11.2</td>
<td>54</td>
<td>2.2</td>
<td>946</td>
<td>7.2</td>
<td>13.3</td>
</tr>
<tr>
<td>Bishop</td>
<td>74</td>
<td>11.6</td>
<td>54</td>
<td>2.9</td>
<td>985</td>
<td>7.0</td>
<td>24.0</td>
</tr>
<tr>
<td>Eagle</td>
<td>73</td>
<td>12.3</td>
<td>58</td>
<td>4.6</td>
<td>922</td>
<td>8.0</td>
<td>23.9</td>
</tr>
<tr>
<td>Newton</td>
<td>72</td>
<td>10.9</td>
<td>55</td>
<td>3.3</td>
<td>980</td>
<td>7.7</td>
<td>21.7</td>
</tr>
<tr>
<td>Kansan</td>
<td>75</td>
<td>11.9</td>
<td>58</td>
<td>5.1</td>
<td>1003</td>
<td>8.0</td>
<td>28.1</td>
</tr>
</tbody>
</table>

Note: Trade names are used to identify products. No endorsement is intended, nor is any criticism implied of similar products not mentioned.

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Two varieties that occupied significant acreage, 'Karl' and 'Jagger', were released by Sears during 1988 and 1994, respectively (Table 1). 'Karl', from a cross made by Hayne in 1977, had superior productivity and resistance to Hessian fly and its eastern and central Kansas. 'Jagger' was developed from a cross made by Sears in 1984 and proved to be highly productive. It had high yield, disease resistance, and quality. A mother release, '2137', from T.J. Martin's experiments at Hays and Pioneer Hi-Bred International, K; had high yields and resulted in many disease-resistant lines. Another release, '2145', was selected from a field of 'Jagger' in 1991 and released for production in western Kansas. '2145' had excellent disease resistance and was recommended for central and southwestern Kansas.

Table 1. Percentage of 2003 Kansas wheat crop planted to varieties released by Kansas State University Agricultural Experiment Station and Cooperative Extension Service dated January 28, 2003.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkey</td>
<td>27.2</td>
<td>1.5</td>
<td>56.4</td>
<td>2.1</td>
<td>1.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Tenmarq</td>
<td>27.2</td>
<td>1.5</td>
<td>56.4</td>
<td>2.1</td>
<td>1.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Comanche</td>
<td>77.1</td>
<td>1.1</td>
<td>12.1</td>
<td>0.8</td>
<td>1.8</td>
<td>3.6</td>
</tr>
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<td>12.1</td>
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<td>3.6</td>
</tr>
<tr>
<td>Newton</td>
<td>77.1</td>
<td>1.1</td>
<td>12.1</td>
<td>0.8</td>
<td>1.8</td>
<td>3.6</td>
</tr>
<tr>
<td>Kansas</td>
<td>77.1</td>
<td>1.1</td>
<td>12.1</td>
<td>0.8</td>
<td>1.8</td>
<td>3.6</td>
</tr>
</tbody>
</table>

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Wheat is the most important crop in Kansas. It supports the state’s economy, its communities, and an array of industries as well as feeding millions of people around the world. Kansas didn’t become the ‘Wheat State’ by accident. Settlers introduced a new technique: dividing the crop into two or more plantings to avoid disease, which increased yield and efficiency, and suffered crop failures during many years. Today’s improved wheat varieties are the result of the labors of scientists and agencies. A.H. Boyer and A.H. Miller developed new varieties and modern methods and machinery for producing the crop; and up-to-date information on tillage, the soil, protecting the plant, and adverse conditions, the market trend. The most of the improved varieties and much of the modern technology for producing wheat in Kansas were developed at Kansas State University (K-State). Over three-fourths of the 2003 Kansas wheat crop was planted to K-State varieties (Figure 1). These varieties became popular because they are productive, high-yield-friendly, and resistant to pests and adverse weather that often damage wheat in the state. Their annual contribution to Kansas agriculture amounts to hundreds of millions of dollars.

The high percentage of K-State varieties in the 2003 crop continues a long tradition of improving wheat for Kansas growers. Thirty-six varieties have been released since 1917, each an improvement in some respect over its predecessors (Table 1). In addition to improved productivity and resistance to pests and disease, varieties released during 1988-2003 have been maintained and many of them have been enhanced (Table 1). It is difficult to improve on a trait. Such improvement as yield increase because of an inverse relationship between the yield and the자가 높아지는 비례. The high percentage of K-State varieties in the 2003 crop continues a long tradition of improving wheat for Kansas growers. Thirty-six varieties have been released since 1917, each an improvement in some respect over its predecessors (Table 1). In addition to improved productivity and resistance to pests and disease, varieties released during 1988-2003 have been maintained and many of them have been enhanced (Table 1). It is difficult to improve on a trait. Such improvement as yield increase because of an inverse relationship between the yield and the자가 높아지는 비례.