Wheat (Triticum aestivum L.) is one of the most important food grains in the world. Wheat dough has the unique rheological properties for bread making. High-molecular-weight glutenin subunits (HMW-GS) play an important role on wheat quality. HMW-GS are encoded at Glu-A1, Glu-B1 and Glu-D1 loci on the long arms of group 1 chromosomes. At each locus, there are two genes encoding x and y type subunits. However, not all subunits are always expressed. Variations of those subunits strongly affects wheat quality. Subunits Axl or Axs* are positively correlated with bread making quality [1-3]. The subunit pair Bx7+By9, Bx14+By15, Bx17+By18 at Glu-B1[2-3]. The subunit pair Dy5+Dy10 had more significant effects on mixing time, SDS-sedimentation, dough strength, and loaf volume than Dx2+Dy12 at Glu-D1 [1-4]. Additionally, interactions among those subunits also affect wheat qualities[4]. Sodium-dodecyl-sulphate polyacrylamide gel electrophoresis (SDS-PAGE) is the traditional method to detect HMW-GS. However, a number of functional markers have been developed to determine the HMW-GS, which make it more convenient[5-6]. In this study, a large set of breeding lines developed at Kansas State University were investigated for quality traits and HMW-GS with molecular markers.

### Materials and Methods

- **Materials**
  - 458 wheat breeding lines developed at Agricultural Research Center-Hays, Kansas State University
  - **Wheat quality evaluation**
    - Flour protein, ash content, flour yield, water absorption, mixing time, loaf volume, and grain score were determined by standard AACC methods.
  - **Genotyping using functional markers**
    - Leaf tissues were collected at two-leaf stage and DNA were extracted by CTAB method.
    - Function markers for subunits Ax2*, Bx7, Dx2, Dx5, Dy10 and Dy12 were analyzed.
  - **Statistical analysis**
    - t test was used to determine the effects of HMW-GS on wheat quality.
    - Regression was used to construct prediction models.

### Results and Discussion

#### Composition of HMW glutenin subunits (Table 1)

- Ax2*, Bx7, Dx5, and Dy10 were the prevailing subunits
- Dx5+Dy10 was the prevailing subunit pair at Glu-D1 locus

<table>
<thead>
<tr>
<th>Subunit</th>
<th>Ax2*</th>
<th>Bx7</th>
<th>Dx2</th>
<th>Dx5</th>
<th>Dy10</th>
<th>Dx2*Dy10</th>
<th>Dx2+Dy10</th>
<th>Dx5*Dy10</th>
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<tr>
<td>%</td>
<td>68.6</td>
<td>97.8</td>
<td>20.9</td>
<td>87.9</td>
<td>88.8</td>
<td>20.5</td>
<td>10.2</td>
<td>20.3</td>
</tr>
</tbody>
</table>

#### Effects of HMW-GS on wheat quality (Figure 1)

- Ax2* had significantly positive effects on loaf volume.
- Dx5, Dy10, or Dx5+Dy10 had significantly positive effects on mixing time and loaf volume, but negative effects on flour yield.
- Dx2, Dy12, or Dx2+Dy12 had had significant positive effects on flour yield, but negative effects on mixing time and loaf volume.

### Summary

- Ax2*, Bx7, Dx5 and Dy10 were the prevailing HMW subunits in the breeding lines.
- HMW glutenin subunits had significant effects on flour yield, mixing time and loaf volume, but not on water absorption and grain score.
- Protein quantity and interaction between certain HMW-GS also played an important role on wheat quality.

### Literature Cited