SEED SIZE IMPACTS AND SEEDING RATE RECOMMENDATIONS FOR BETTER YIELDS & WEED CONTROL

Clark Neely, Extension Agronomist
Adams County Wheat Producer Meeting
January 30, 2024
DOES SEED SIZE MATTER?

WHAT IS YOUR IDEAL SEEDING RATE?
JUSTIFICATION

• Little published data on impacts of seed size on performance of wheat in iPNW
  • How much and how often?

• Little published data on ideal seeding rates for wheat production in iPNW
  • Are variety trials being planted at correct rates?
SEEDING RATE IMPACT ON SPRING WHEAT
WASHINGTON STATE UNIVERSITY EXTENSION

SEEDING RATE TRIALS

• Trial Sites: Farmington, Horse Heaven, Reardan, and St. John
• Four replications
• Seeding rates:
  • 5, 10, 15, 20, 25, 30, 35 seed/sq ft
    (218k, 436k, 653k, 871k, 1.1 mil, 1.3 mil, 1.5 mil sd/a)
• Hard red spring wheat variety ‘Hale’
• Soft white spring wheat variety ‘Ryan’
# Conversion Table

<table>
<thead>
<tr>
<th>Seed/sq ft</th>
<th>Seed/ac</th>
<th>Lbs/ac (AVG)</th>
<th>Lbs/ac (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>218,000</td>
<td>17</td>
<td>13-24</td>
</tr>
<tr>
<td>10</td>
<td>436,000</td>
<td>34</td>
<td>26-48</td>
</tr>
<tr>
<td>15</td>
<td>653,000</td>
<td>50</td>
<td>38-73</td>
</tr>
<tr>
<td>20</td>
<td>871,000</td>
<td>67</td>
<td>51-97</td>
</tr>
<tr>
<td>25</td>
<td>1.1 million</td>
<td>84</td>
<td>64-121</td>
</tr>
<tr>
<td>30</td>
<td>1.3 million</td>
<td>101</td>
<td>77-145</td>
</tr>
<tr>
<td>35</td>
<td>1.5 million</td>
<td>117</td>
<td>90-169</td>
</tr>
<tr>
<td>40</td>
<td>1.7 million</td>
<td>134</td>
<td>103-193</td>
</tr>
</tbody>
</table>

*AVG seed size = 13,000 seed/lb; Range in seed size = 9,000-17,000 seed/lb*
## CONVERSION TABLE

<table>
<thead>
<tr>
<th>Lbs/ac (AVG)</th>
<th>9,000 sd/lb (Seed/ac)</th>
<th>13,000 sd/lb (Seed/ac)</th>
<th>17,000 sd/lb (Seed/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>180,000</td>
<td>260,000</td>
<td>340,000</td>
</tr>
<tr>
<td>35</td>
<td>315,000</td>
<td>455,000</td>
<td>595,000</td>
</tr>
<tr>
<td>50</td>
<td>450,000</td>
<td>650,000</td>
<td>850,000</td>
</tr>
<tr>
<td>65</td>
<td>585,000</td>
<td>845,000</td>
<td>1,105,000</td>
</tr>
<tr>
<td>80</td>
<td>720,000</td>
<td>1,040,000</td>
<td>1,360,000</td>
</tr>
<tr>
<td>95</td>
<td>855,000</td>
<td>1,235,000</td>
<td>1,615,000</td>
</tr>
<tr>
<td>110</td>
<td>990,000</td>
<td>1,430,000</td>
<td>1,870,000</td>
</tr>
<tr>
<td>135</td>
<td>1,215,000</td>
<td>1,755,000</td>
<td>2,295,000</td>
</tr>
</tbody>
</table>
WASHINGTON STATE UNIVERSITY EXTENSION

DRYLAND YIELD

**Farmington**

- **Grain Yield (bu/ac)**
  - 40 to 65
- **Seeding Rate (seed ft\(^2\))**
  - 0 to 40
  - Hale: Blue dots
  - Ryan: Orange dots

**St. John**

- **Grain Yield (bu/ac)**
  - 40 to 75
- **Seeding Rate (seed ft\(^2\))**
  - 0 to 50
  - Hale: Blue dots
  - Ryan: Orange dots

**Horse Heaven**

- **Grain Yield (bu/ac)**
  - 15 to 40
- **Seeding Rate (seed ft\(^2\))**
  - 0 to 40
  - Hale: Blue dots
  - Ryan: Orange dots

**Reardan**

- **Grain Yield (bu/ac)**
  - 35 to 65
- **Seeding Rate (seed ft\(^2\))**
  - 0 to 40
  - Hale: Blue dots
  - Ryan: Orange dots
IDEAL SPRING WHEAT SEEDING RATES

\[ y = 0.2854x + 10.382 \]

\[ R^2 = 0.47 \]
SEEDING RATE IMPACT ON WINTER WHEAT
Impact of seeding rate on grain yield of hard red winter wheat variety ‘Keldin’ when averaged across multiple locations within each precipitation zone during the 2022 season.
SEED SIZE IMPACT ON SPRING WHEAT
SEED SIZE TREATMENTS

- Soft white spring wheat ‘Ryan’
- Seed size treatments
  - Small = 16,200 seed/lb
  - Medium = 13,150 seed/lb
  - Large = 9,400 seed/lb
- Sifted seed from same seed source
  - Used 3mm and 5mm screens to sort seed
## SIGNIFICANT DIFFERENCES

Table 1. Table of significance for measurements of seed size treatments across multiple dryland environments in Eastern Washington.

<table>
<thead>
<tr>
<th>Seed Size</th>
<th>Grain Yield</th>
<th>Test Weight</th>
<th>Grain Protein</th>
<th>Grain Moisture</th>
<th>Heading Date</th>
<th>Plant Height</th>
<th>Stand Count</th>
<th>Canopy Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>**</td>
<td>***</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>**</td>
<td>***</td>
<td>**</td>
<td>***</td>
</tr>
<tr>
<td>Location</td>
<td>***</td>
<td>***</td>
<td>***</td>
<td>***</td>
<td>***</td>
<td>***</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Seed Size*Location</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>*</td>
</tr>
<tr>
<td>Observations</td>
<td>132</td>
<td>132</td>
<td>133</td>
<td>80</td>
<td>108</td>
<td>144</td>
<td>117</td>
<td>135</td>
</tr>
<tr>
<td>CV %</td>
<td>10.7</td>
<td>1.0</td>
<td>4.5</td>
<td>4.3</td>
<td>0.6</td>
<td>5.2</td>
<td>22.3</td>
<td>33.2</td>
</tr>
<tr>
<td>Mean</td>
<td>3840</td>
<td>77</td>
<td>109</td>
<td>111</td>
<td>162</td>
<td>72</td>
<td>159</td>
<td>9.6</td>
</tr>
</tbody>
</table>

p > 0.05 = NS; p < 0.05 = *; p < 0.01 = **; p < 0.001 = ***
Stand count increased ~2 plants/sq ft from small/medium to large seed.
Canopy Cover increased ~4.5% from small/medium to large seed (on average).
Increased Canopy Cover by 73% at Lamont.
Example of early season canopy cover between large and small seed size treatments. Green pixels converted to black and white image in Canopeo software to estimate percent cover.
Heading date shortened ~1 day from small/medium to large seed.
MATURITY

Small Seed (16,200 sd/lb)  Large Seed (9,400 sd/lb)

Images taken June 20, 2023 near Fairfield, WA.
Plant height increased ~1 inch from small/medium to large seed.
Grain Yield increased ~4 bu/ac from small/medium to large seed.
SEED SIZE IMPACT ON WINTER WHEAT
LCS Shine seed size treatments taken fall 2022. Medium and small seed sizes were 10,810 and 13,432 seeds per pound, respectively.
LCS Shine seed size treatments taken fall 2022. Medium and small seed sizes were 10,810 and 13,432 seeds per pound, respectively.
LCS Shine seed size treatments taken harvest year 2023. Medium and small seed sizes were 10,810 and 13,432 seeds per pound, respectively.
LCS Shine seed size treatments taken harvest year 2023. Medium and small seed sizes were 10,810 and 13,432 seeds per pound, respectively.
LCS Shine seed size treatments taken harvest year 2023. Medium seed size increased yield 4 bu/ac on average. Medium and small seed sizes were 10,810 and 13,432 seeds per pound, respectively.
Relationship between seed size and stand counts from Winter Wheat Variety Trials in fall 2022.
Relationship between seed size and stand counts from Winter Wheat Variety Trials in fall 2022.
SEEDING RATE CONCLUSIONS

• Optimal seeding rates for maximizing spring wheat grain yield increased with increasing yield potential.

• Optimal seeding rates for winter wheat are less clear but some evidence supporting increasing rates in lower yielding environments.

• Higher seeding rates provided greater canopy cover and could be used to help compete with problematic weeds.
SEED SIZE CONCLUSIONS

• Larger seed size had an overall positive impact on early season vigor and grain yield

• Growers should seek out larger seed for planting *if possible* (or increase seeding rates?)

• Selecting good emerging variety still more important for good stands
FUTURE RESEARCH

• Repeat seed size and seeding rate treatments in 2024

• Do higher seeding rates compensate for smaller seed?
  • Trials in Douglas, Creston, and Ritzville this year
QUESTIONS?

Clark Neely
Extension Agronomist
Variety Testing Program
814-571-5628
clark.neely@wsu.edu