Management Practices to Optimize Winter Barley & Wheat Yield and Quality

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April 2, 2021. Grains for Brewing and Distilling Virtual Happy Hour
Identify current and emerging issues in cropping systems of Michigan with an overall goal to improve the productivity, profitability, and resiliency of these systems.

**Benefits of Small Grains in crop rotation**
- Economic
- Environmental
Integrated Crop Management: Yield vs Quality

- Crop rotation
- Variety Selection
- **Planting Date**
- Plant Population
- Row Spacing
- Fertility management
- Pest management
- Harvest timing

Winter Wheat  Winter Barley
Plant dates (PD):
PD1: Sept 19
PD2: Oct 7
PD3: Oct 18
PD4: Oct 29
PD5: Nov 15

Seed rates (SR):
SR1: 0.8 m/ac
SR2: 1.2 m/ac
SR3: 1.6 m/ac
SR4: 2.0 m/ac
SR5: 2.4 m/ac

2019-20 Growing Season, MSU Mason Farm
• Variety: Teepee (barley), Whitetail (wheat)
Nitrogen: 30 lbs fall, 75 lbs spring for barley
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Winter Wheat- 2020 Trial

With Dennis Pennington, MSU
Winter Malting Barley - 2020 Trial

Poor stand:
• PD1 >70%, PD2 >50%, PD3 >40%
• PD4, 5 ~30%

Plant Date x Seed Rate

PD vs Yield

\[ y = 0.0483x^2 - 29.875x + 4637.4 \]
\[ R^2 = 0.9936 \]
## Winter Malting Barley- 2020 Trial

<table>
<thead>
<tr>
<th>Plant date</th>
<th>Protein (%)</th>
<th>Plump kernels (%)</th>
<th>Thin kernels (%)</th>
<th>Germination (4ml 72 hr GE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criteria</td>
<td>≤12%</td>
<td>&gt;90%</td>
<td>&lt;3%</td>
<td>&gt;98%</td>
</tr>
<tr>
<td>19-Sep</td>
<td>10.3 C</td>
<td>84.4 C</td>
<td>2.2 A</td>
<td>99.2 A</td>
</tr>
<tr>
<td>7-Oct</td>
<td>12.6 B</td>
<td>96.1 A</td>
<td>0.2 B</td>
<td>98.4 AB</td>
</tr>
<tr>
<td>18-Oct</td>
<td>14.7 A</td>
<td>95.7 A</td>
<td>0.4 B</td>
<td>93.2 C</td>
</tr>
<tr>
<td>29-Oct</td>
<td>16.4 A</td>
<td>90.8 B</td>
<td>1.7 A</td>
<td>95.5 BC</td>
</tr>
<tr>
<td>15-Nov</td>
<td>15.6 A</td>
<td>92.4 AB</td>
<td>1.4 A</td>
<td>95.9 BC</td>
</tr>
<tr>
<td>P value</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Data from 3 higher seed rates (1.6, 2.0, 2.4 m seeds/ac)

- RVA (for PHS): ≤120 only for PD 5
- DON (vomitoxin) <0.15 ppm for all samples
2021 Trials

Plant dates (PD):
PD1: Sept 17
PD2: Sept 29
PD3: Oct 14
PD4: Oct 29
PD5: Nov 12

Pictures taken on Nov 20, 2020
2021 Trials

Winter Barley

Winter Wheat

Pictures taken on March 14, 2021
Seed Placement in Small Grains

Conventional drill with rotating gear that “spills” seed into the drop tube.

Precision planter with vacuum that picks up individual seeds and drops one seed at a time down the drop tube.
Uniform Seed Placement

- Variable planting depth
- Skips and doubles
- Uniform planting depth
- Uniform seed to seed spacing (singulation)
Objective #1

- **Seed drill**
  - 7.5” Row Spacing
  - 1 million seeds/acre
  - 0.8 in/seed

- **Precision Planter**
  - 7.5” Row Spacing
  - 0.4 in/seed

Objective #2

- **Precision Planter**
  - 5” Row Spacing
  - 2 million seeds/acre
  - 0.6 in/seed

- **Precision Planter**
  - 5” Row Spacing
  - 1.3 in/seed
Variability in Seed Placement

DRILL

PLANTER
Precision Planter (PP) vs Drill: Seed Placement Accuracy

CV is a measure of how variable the planting depth or spacing is. Lower number represents lower variability (increased consistency) in planting depth.
Precision Planter (PP) vs Drill: Yield

<table>
<thead>
<tr>
<th></th>
<th>Yield (bu/a)</th>
<th>Stand/acre</th>
<th>Heads/ft²</th>
<th>Seeds/head</th>
<th>TKW</th>
<th>DON*</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5&quot;PP</td>
<td>101.1A</td>
<td>732,744B</td>
<td>76.1A</td>
<td>29.7A</td>
<td>29.1A</td>
<td>1.8A</td>
</tr>
<tr>
<td>7.5&quot;Drill</td>
<td>96.7B</td>
<td>852,822A</td>
<td>72.5A</td>
<td>28.9A</td>
<td>28.8A</td>
<td>2.8B</td>
</tr>
</tbody>
</table>

Yield response was significant in 2019 (>10 bu difference) but not in 2020

Data from 4 site years, except DON (Mason 2019 only)

- Max yield ~1.0 m seeds/ac, lower in planter vs drill
Planter Configuration: row spacing

- **15 inch row spacing**
  - 2 million seeds per acre: 0.2 in/seed
  - 1 million seeds per acre: 0.4 in/seed

- **10 inch row spacing**
  - 2 million seeds per acre: 0.3 in/seed
  - 1 million seeds per acre: 0.6 in/seed

- **7.5 inch row spacing**
  - 2 million seeds per acre: 0.4 in/seed
  - 1 million seeds per acre: 0.8 in/seed

- **5 inch row spacing**
  - 2 million seeds per acre: 0.6 in/seed
  - 1 million seeds per acre: 1.3 in/seed
Precision Planter - row spacing, seeding rate

Data from 4 site years
DC Soybeans - Maturity Selection

Mason Seed Yield

- MG
- Yield (bu/a)

- Apr. 30
- May 20
- Jun. 09
- Jun. 29
## DC Soybeans - Phenology

<table>
<thead>
<tr>
<th>Date</th>
<th>MG 1.0</th>
<th>MG 2.0</th>
<th>MG 3.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 26</td>
<td>25</td>
<td>42</td>
<td>24</td>
</tr>
<tr>
<td>April 26</td>
<td>25</td>
<td>46</td>
<td>26</td>
</tr>
<tr>
<td>April 26</td>
<td>25</td>
<td>50</td>
<td>32</td>
</tr>
<tr>
<td>May 15</td>
<td>18</td>
<td>38</td>
<td>20</td>
</tr>
<tr>
<td>May 15</td>
<td>18</td>
<td>35</td>
<td>32</td>
</tr>
<tr>
<td>May 15</td>
<td>18</td>
<td>43</td>
<td>27</td>
</tr>
<tr>
<td>June 4</td>
<td>11</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>June 4</td>
<td>11</td>
<td>31</td>
<td>33</td>
</tr>
<tr>
<td>June 4</td>
<td>11</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>June 27</td>
<td>4</td>
<td>29</td>
<td>28</td>
</tr>
<tr>
<td>June 27</td>
<td>4</td>
<td>30</td>
<td>28</td>
</tr>
<tr>
<td>June 27</td>
<td>4</td>
<td>38</td>
<td>19</td>
</tr>
</tbody>
</table>

**Day of Year**

- **P-VE**
- **VE-R1**
- **R1-R5**
- **R5-R7**
DC Soybeans - Seeding Rate

Optimal Seeding Rate

- Agronomic optimal SR:
  - Late-April: +43,447 seeds/acre
  - Mid-May: +48,160 seeds/acre
  - Early-June: +52,849 seeds/acre
  - Late-June: +76,102 seeds/acre

- Economic optimal SR:
  - Late-April: +50/unit
  - Mid-May: $8.6/bu
  - Early-June: $50/unit
  - Late-June: (140k seeds)
Thanks!

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