Time of Weed Emergence and Economic Impact on Crops

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Factors to Understand

- Weed Biology
  - Emergence
  - Natural mortality
  - Growth
  - Competition
  - Seed production

- Economic Simulations
80% of foxtail and lambquarters emerged by 6 weeks after planting
Weed Survival and Mortality

<table>
<thead>
<tr>
<th></th>
<th>Corn</th>
<th>Soybeans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Giant foxtail mortality:</td>
<td>42 - 56%</td>
<td>40 - 58%</td>
</tr>
<tr>
<td>Velvetleaf mortality:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>without verticillium</td>
<td>44%</td>
<td>38%</td>
</tr>
<tr>
<td>with verticillium</td>
<td>58%</td>
<td>92%</td>
</tr>
</tbody>
</table>

Natural mortality helps but is not enough

Bussan and Boerboom 2000, 2001
Woolly cupgrass growth when emerging at different corn growth stages

Woolly cupgrass biomass (g/plant)

1997
1998

Mickelson and Harvey 1999
Reduction in giant ragweed growth when emerging 4 weeks after corn planting

![Graph showing reduction in giant ragweed biomass (% reduction) for different giant ragweed density (number/10 m²) in 1997 and 1998.]
Corn yield loss from giant ragweed emerging with and 4 weeks after corn planting

Harrison et al. 2001

Corn yield loss (%) vs. Giant ragweed density (number/10 m²)
Reduction in giant ragweed seed production when emerging 4 weeks after corn planting

Harrison et al. 2001
Woolly cupgrass seed production when emerging at different corn growth stages

Mickelson and Harvey 1999
- Major percentage of weeds emerge early in the season
  - while preemergence herbicides have residual activity or
  - prior to postemergence herbicide applications
- Natural mortality will further reduce weed survival
- Late emerging weeds have greatly reduced
  - growth
  - competition against crops
  - seed production
- Still, late emerging weeds are a concern
  - especially when crop canopies are not vigorous
What are the economic impacts of late emerging weeds?

- **Keys factors**
  - Weed species
  - Weed density
  - Time of emergence or size

- **WeedSOFT simulations**
  - Predict estimated yield loss
  - Provide calculation of return to herbicide treatment
Estimated corn yield loss and returns to Accent based on giant foxtail competition

<table>
<thead>
<tr>
<th>Corn size (inch)</th>
<th>Giant foxtail Size (inch)</th>
<th>Density (no/100 ft²)</th>
<th>Yield loss (%)</th>
<th>Return to Accent ($/a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>2-4</td>
<td>100</td>
<td>22</td>
<td>54.23</td>
</tr>
<tr>
<td>6-12</td>
<td>2-4</td>
<td>100</td>
<td>16</td>
<td>29.73</td>
</tr>
<tr>
<td>12-24</td>
<td>2-4</td>
<td>100</td>
<td>8.5</td>
<td>3.23</td>
</tr>
<tr>
<td>&gt; 24</td>
<td>2-4</td>
<td>100</td>
<td>3.9</td>
<td>-18.52</td>
</tr>
</tbody>
</table>
## Estimated corn yield loss and returns to NorthStar based on giant ragweed competition

<table>
<thead>
<tr>
<th>Corn size (inch)</th>
<th>Giant ragweed Size (inch)</th>
<th>Density (no/100 ft(^2))</th>
<th>Yield loss (%)</th>
<th>Return to NorthStar ($/a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>2-4</td>
<td>30</td>
<td>25</td>
<td>74.14</td>
</tr>
<tr>
<td>6-12</td>
<td>2-4</td>
<td>30</td>
<td>18</td>
<td>48.14</td>
</tr>
<tr>
<td>12-24</td>
<td>2-4</td>
<td>30</td>
<td>9.9</td>
<td>18.64</td>
</tr>
<tr>
<td>&gt; 24</td>
<td>2-4</td>
<td>30</td>
<td>4.7</td>
<td>-0.49</td>
</tr>
</tbody>
</table>
Considerations toward management

1. Focus on excellent control of early emerging weeds
   - most competitive and produce most seed

2. Common weeds that emerge later (> 6 weeks after planting) have minimal effect on yield and control may be hard to economically justify
   - may have few herbicide options or risk injury
   - control of highly competitive weeds may be justified

3. Crop competition greatly reduces seed production of late emerging weeds
   - reduction may be 90% or greater
   - seed production should not be a concern at lower weed densities

4. Threshold for treatment may need to be lowered if conditions cause poor canopy growth