Johnsongrass Control

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Johnsongrass

- Perennial
  - Propagation: seeds and rhizomes
- Grows 6-8 feet tall
- A single plant can produce more than 80,000 seeds in a single growing season, and 275 feet of rhizomes!
  - Average 60 ft of rhizomes
275 feet = 91 yards
Johnsongrass

• Perennial
  • Propagation: seeds and rhizomes

• Grows 6-8 feet tall

• A single plant may produce more than 80,000 seeds in a single growing season, and 275 feet of rhizomes!

• Seed can remain viable in the soil for more than 10 years
Johnsongrass Rhizomes

- Rhizomes are produced in the top 10 inches of soil
  - Can be found as deep as 5 ft!

- Seedling plants can produce rhizomes in as few as 19 days after emergence
  - 5 to 7 leaf stage
  - Rhizome development is slow at first until 10 leaf stage
  - Rhizome system well developed 6-7 wks after emergence

- Plants originating from rhizomes emerge earlier in the spring than from seed

- Prolonged emergence pattern, with new plants emerging from seed and rhizomes throughout the growing season
Herbicide Resistant Johnsongrass

- Known ALS (Group 2) resistant populations in Michigan
  - How widespread?
    - Accent Q (nicosulfuron)
    - Thiencarbazone (component in Capreno)
    - Pursuit (imazethapyr)

- Are there resistant populations to other herbicide sites of action?
  - Glyphosate (Roundup, Group 9)
  - Select Max (clethodim, Group 1)
Apply rates from 0-8, 0-64 times the 1x field use rate
Glyphosate and Select Max

- All populations screened were susceptible
Accent Q

- Two populations survived 64x rate
Accent Q

- Two populations survived 8x rate
Accent Q

- Indiana population was susceptible
Thiencarbazone (Component in Capreno)

- All Michigan populations survived the 8x field use rate
Thiencarbazone (Component in Capreno)

- Indiana population survived 4x herbicide application
Pursuit

- All Michigan populations survived 8x rate
Pursuit

- Indiana population survived 8x rate
Herbicide Resistance Conclusions

- **Glyphosate and Select Max**
  - All populations susceptible

- **Accent Q**
  - Michigan resistant
  - Indiana susceptible (only 1 population screened)

- **Thiencarbazone (component in Capreno)**
  - All populations resistant

- **Pursuit**
  - All populations resistant
Taking Control of Johnsongrass Before it Takes Control of Your Fields

• Prevent johnsongrass from becoming established in new fields
  • Prevent spread of rhizomes from infested to uninfested areas
  • Clean equipment (especially combines) after working in infested fields
  • Harvest infested fields last

• Uncontrolled johnsongrass in fence rows and ditch banks is a common source of new johnsongrass infestations
  • Spot sprays on fences and ditch banks can eliminate these sources of seeds and rhizomes
Taking Control of Johnsongrass Before it Takes Control of Your Fields

• The critical time to kill johnsongrass is while the weed is becoming established and before it has spread over the entire field
  • Scout fields
  • Plants emerging from seed can produce rhizomes within 3-4 weeks

• Plant high-yielding varieties adapted to field conditions
  • Soil test
Rhizomes are the Friend and Foe of Johnsongrass!

• Johnsongrass is an extremely aggressive weed due to its rhizome system
• Use fall tillage to bring rhizomes to soil surface, where they may be killed by winter conditions
• Rhizomes are also one of johnsongrass’ largest weaknesses because they are not very cold tolerant
  • Factors Affecting Johnsongrass Rhizome Production and Germination (McWhorter 1972)
    • Buried rhizomes 1 inch deep in loam soil
    • Held at three “hot” and “cold” for 4-96 hr
Rhizome germination (%) vs. Exposure time (h)

Exposure time (h) and Rhizome germination (%) graph. Points indicating 23%, 26.6%, and 32% germination at various exposure times are shown.

(McWhorter 1972)
Minimum Soil Temperature 2in (F) - Constantine

Temperature graph showing minimum soil temperatures for the years 2021, 2022, and 2023.
McWhorter (1972)
Tillage Impacts on Johnsongrass

- Seeds cannot successfully emerge when buried at least 12 inches
  - Aggressive deep tillage, e.g. moldboard plow, may be another control tactic

- Tillage depth and impacts on bud emergence from rhizomes
  - Factors Affecting Johnsongrass Rhizome Production and Germination (McWhorter 1972)
    - Buried rhizomes or seeds 0.5-9 inches deep in clay or sandy-loam soil
Clay Soil
Tillage Impacts on Johnsongrass

- Disking chops johnsongrass rhizomes, making them more susceptible to herbicides
  - Disk to a 6- to 8-inch depth several times before planting, followed by herbicide program that is effective on johnsongrass
  - Disking alone can spread rhizome fragments!
    - Clean equipment!
Effective Johnsongrass Herbicide Programs-PRE

- Apply PRE herbicides with activity on johnsongrass to reduce competition
  - Disk if possible

- Suppression of rhizomes and control of seedlings
  - Balance Flexx
  - Corvus
    - Application rates vary by soil type
  - Effective preemergence, may be applied postemergence from spike through V2
Effective Johnsongrass Herbicide Programs-POST

- Many foliar-applied herbicides do not provide soil residual control of johnsongrass, two applications may be necessary

<table>
<thead>
<tr>
<th>Postemergence</th>
<th>Site of Action No.*</th>
<th>Seedling Efficacy</th>
<th>Rhizome Efficacy</th>
<th>Corn Height/Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accent Q</td>
<td>2</td>
<td>Excellent</td>
<td>Good</td>
<td>-20 inches tall or V6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-20–36 inches tall, use drop nozzles</td>
</tr>
<tr>
<td>Beacon</td>
<td>2</td>
<td>Good</td>
<td>Fair</td>
<td>-4–20 inches tall</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-Drop nozzles can be used up to tassel emergence</td>
</tr>
<tr>
<td>Capreno</td>
<td>2, 27</td>
<td>Excellent</td>
<td>Good</td>
<td>-V1 to V5</td>
</tr>
<tr>
<td>Revulin Q</td>
<td>2, 27</td>
<td>Excellent</td>
<td>Good</td>
<td>-20 inches tall or V6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-Drop nozzles can be used up to 30 inch tall or V8</td>
</tr>
<tr>
<td>Steadfast Q</td>
<td>2, 2</td>
<td>Excellent</td>
<td>Good</td>
<td>-20 inches tall or V6</td>
</tr>
<tr>
<td>Glyphosate</td>
<td>9</td>
<td>Excellent</td>
<td>Excellent</td>
<td>-30 inches tall or V8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-30 to 48 inches drop nozzles only</td>
</tr>
<tr>
<td>Liberty</td>
<td>10</td>
<td>Good</td>
<td>Fair</td>
<td>-Emergence up to V6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-Drop nozzles until 36 inch tall</td>
</tr>
</tbody>
</table>
Johnsongrass Management in Soybean

• Control existing plants prior to planting
  • Burndown herbicide or tillage

• Utilize Group 1 herbicide postemergence
  • Assure II
  • Fusilade DX
  • Glyphosate
  • Select Max
  • Poast
Can late season herbicide applications control large johnsongrass and reduce seed production/viability?

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Rate (fl oz/A)</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyphosate (Powermax3)</td>
<td>10</td>
<td>Boot</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Full panicle</td>
</tr>
<tr>
<td>Glyphosate (Powermax3)</td>
<td>20</td>
<td>Boot</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Full panicle</td>
</tr>
<tr>
<td>Liberty 280 SL</td>
<td>28.8</td>
<td>Boot</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Full panicle</td>
</tr>
<tr>
<td>Liberty 280 SL</td>
<td>36</td>
<td>Boot</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Full panicle</td>
</tr>
<tr>
<td>Select Max</td>
<td>8</td>
<td>Boot</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Full panicle</td>
</tr>
<tr>
<td>Select Max</td>
<td>16</td>
<td>Boot</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Full panicle</td>
</tr>
</tbody>
</table>

- **Measurements**
  - Control three weeks after application
  - Seed production
  - Seed viability
  - Progeny emergence

Late Season Herbicide Application Control (%) - Boot

Control (%)

Herbicide Rate (fl oz/A)

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<td>Select Max</td>
<td>8</td>
</tr>
<tr>
<td>Select Max</td>
<td>16</td>
</tr>
</tbody>
</table>
Late Season Herbicide Application Control (%) – Full Panicle

Control (%)

Herbicide | Rate (fl oz/A)
---|---
Glyphosate (Powermax3) | 10
Glyphosate (Powermax3) | 20
Liberty 280 SL | 28.8
Liberty 280 SL | 36
Select Max | 8
Select Max | 16
Late Season Herbicide Application Seed Production - Boot

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Seed Production (ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>943</td>
</tr>
<tr>
<td>Glyphosate</td>
<td></td>
</tr>
<tr>
<td>Liberty</td>
<td></td>
</tr>
<tr>
<td>Select Max</td>
<td></td>
</tr>
</tbody>
</table>

Graph showing seed production with different treatments and application amounts.
Late Season Herbicide Application Seed Production – Full panicle

Seed production (ft²)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Seed production (ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyphosate</td>
<td>0</td>
</tr>
<tr>
<td>Liberty</td>
<td>50</td>
</tr>
<tr>
<td>Select Max</td>
<td>100</td>
</tr>
<tr>
<td>Untreated</td>
<td>150</td>
</tr>
</tbody>
</table>

Untreated = 943
Late Season Herbicide Application Viable Seed Reduction - Boot

The diagram shows the viable seed reduction in percentages for different herbicide applications at the boot stage. The seed reduction is compared between full and half treatments. The herbicides used are Glyphosate, Liberty, and Select Max, as indicated by the color-coding in the legend.

- **Full Treatment:**
  - Glyphosate: 100%
  - Liberty: 90%
  - Select Max: 80%

- **Half Treatment:**
  - Glyphosate: 90%
  - Liberty: 80%
  - Select Max: 70%

The data suggests that Glyphosate is the most effective in reducing viable seeds, followed by Liberty and then Select Max.
Late Season Herbicide Application Viable Seed Reduction – Full panicle

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Viable seed reduction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>full</td>
<td>100</td>
</tr>
<tr>
<td>half</td>
<td>80</td>
</tr>
</tbody>
</table>
Late Season Herbicide Application Emergence - Boot

Emergence (%)

full

half

Glyphosate
Liberty
Select Max

Emergence (%)
0
10
20
30
40
50
60
Late Season Herbicide Application Emergence – Full panicle

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<tr>
<td>Glyphosate</td>
<td>50</td>
</tr>
<tr>
<td>Liberty</td>
<td>60</td>
</tr>
<tr>
<td>Select Max</td>
<td>70</td>
</tr>
</tbody>
</table>

Emergence (%): 0, 10, 20, 30, 40, 50, 60, 70
Effective Johnsongrass Programs Take An Integrated Approach

• Step 1: prevention

• Step 2: control prior to becoming established

• Step 3: fall tillage to bring rhizomes to soil surface

• Step 4: disk in spring prior to herbicide application

• Step 5: two-pass programs with full labeled rates

• Intense infestations of Johnsongrass did not develop overnight
  • It will take persistence over several years to knock back well-established Johnsongrass infestations