2018 Non-GMO Sweet Corn Weed Management

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Driven to Discover SM
Farm Level Weed Management
- Supersedes crop or field level

Manage fields for weeds in all rotations

• Type of crop, time planted/harvested, fallow or cover for a year, etc.

When the crop is sweet corn manage, weeds through:

• Planting date
• Variety
• Seedbed prep
  • tillage, herbicides, cover crops, etc.
Specific Crop / Field Weed Management

- Post planting:
  - Rotary hoe, tine weeders
  - Cultivate
  - Flaming
  - Grit

- Future?
  - Robotic weeders and sprayers
  - A.I.
  - Lethal genes, etc.

- What is not very promising in the future
  - New Herbicides!
Herbicide Resistance Issues

Driving much of the field corn and soybean market new products

- Influencing product coming online for sweet corn

Part of resistance management is to diversify modes of action (MOA) used

- Identifies how a herbicide kills a weed
- Weed Science Society of America (WSSA) website
  http://wssa.net
Classification Hierarchy

Mode of Action
- Lipid Synthesis Inhibitors
  - Group 1 ACCase Inhibitors
    - "Dims"
      - Sethoxydim “Segment” etc.
    - "Fops"
      - Fluazifop-P-butyl “Fusilade” etc.
    - "Dens"
      - Pinoxaden “Axial” etc.

Mechanism of Action
- One MOA

Herbicide Family

Herbicide Name
Herbicide Mode Of Action

The World of Herbicides
According to HRAC classification on mode of action 2010

HERBICIDES AFFECTING:
- Light Processes
- Cell Metabolism
- Growth/Cell Division

http://www.hracglobal.com
Soil Applied Single Ingredient

Preemergence options

Annual grasses and some broadleaves:

- **Acetochlor products:** (Harness, Surpass, Breakfree, Topnotch etc. (Do NOT use Warrant on SC) (15)

- **Metolachlor products:** (Dual MAGNUM / II, Brawl / II, Charger Basic / Max, Cinch, EverpreX, Medal, Pennant MAGNUM. (15)

- **Dimethenamid-P products:** (Outlook, Commit, Establish, OpTill PRO, Slider, Sortie, Tower) (15)

- **Also:** pyroxasulfone (Zidua) (15), Alachlor (Intrro, Micro-Tech) (15), pendimethalin (Prowl H2O) (3), EPTC (8)
Soil Applied Single Ingredient

Preemergence options (cont.)

Annual broadleaves and some grasses:
• Atrazine, simazine (Princep) (5)

Annual broadleaves:
• Mesotrione (Callisto) (27)
Soil Applied Package Mixtures
Preemergence options (cont.)

Most grasses and broadleaves
• Solstice (14, 27)
• Anthem, + Flex and Maxx (14, 15), Anthem ATZ (5, 14, 15)
• Acuron (5, 15, 27, 27), Acuron Flexi (15, 27, 27)
• Zemax (Camix) (15, 27), Lumax EX, Lexar EZ (5, 15, 27)
• Armezon PRO (15, 27)

Most grasses and some broadleaves:
• EPTC + acetochlor (Imperium) (8, 15)
  • (Must Incorporate, RUP product)
Soil Applied Herbicide Options

PRE package mixtures

Most grasses and broadleaves (cont.)

Acetanilide + atrazine pkg. mixtures: (5, 15)

- Acetochlor (Breakfree ATZ, Breakfree ATZ Lite, Degree Xtra, FullTime, Harness Xtra, Keytone, etc.)
- Metolachlor (Bicep Lite II Magnum, Cinch ATZ, Charger Max ATZ, etc.)
- Micro-Tech alachlor (Bullet or Lariat)
- Dimethenamid-P (G-Max Lite)
Postemergence Single Ingredient

Annual grasses only
- Accent*, Accent Q* (2)
- Poast, Poast Plus (1)
  - tolerant lines only

Annual broadleaves only
- Aim (14)
- Atrazine^ (5)
- Basagran (6)
- Cadet (14)
- Callisto (27)
- Impact, Amerzon^ (27)

*Activity on grasses and some broadleaves
^Activity on broadleaves and some grasses

- Laudis^ (27)
- Permit, Sandea (14)
- Shieldex^ (27)
- Starane (4)
- Stinger (4)
- 2,4-D (4)
Postemergence Single Ingredients

Annual grasses only

- Poast on Poast Tolerant lines
  - Non-GMO (trait derived thru breeding selections)

Annual broadleaves and grasses

- Roundup Ready on tolerant lines
- Liberty on tolerant lines
  - Both stacked with Bt traits in some cases
  - Be absolutely sure DOES have glufosinate or glyphosate trait before spraying
Postemergence Package Mixtures

Most grasses and broadleaves

- Armezon PRO (15, 27)
- Anthem, + Flex, Maxx (14, 27), + ATZ (14, 27, 5)
- Solsticce (14, 27)
- Callisto Xtra (5, 27)
- Laddok (atrazine + Basagran) (5, 4)
- Priority (Aim + Permit / Sandea) (14, 2)
- Revulin Q (Accent + Callisto + Safener) (14, 2)
The HPPD Revolution

Mesotrionone (Callisto) showing up in a lot of more recent package mixtures

• Various companies
• In part for resistance management for things like waterhemp
  • FMC Solstice
  • DuPont Revulin Q
  • Syngenta Acuron, Acuron Flexi
HPPD inhibitors

Bleaching: Inhibition of 4-hydroxyphenyl-pyruvate-dioxygenase (4-HPPD)

In order on market introduction:

- Isoxaflutole (Balance)
- Mesotrione (Callisto)
- Topramezone (Impact)
- Tembotrione (Laudis)
- Bycylcopyrione (in Acuron)
- Tolpyralate (Shieldex)
2016 Tested Tolerance of Varieties to New Herbicides

Acuron, Acuron Flexi
Anthem Maxx
Soltsice
Armezon
Verdict

Often x and 2x rates, heavy adjuvant loading, later POST stages, etc.
Acuron, Acuron Flexi

Syngenta (PRE herbicides)

• Acuron 3.34 SC (SYN-A197)
  • metolachlor + mesotrione + bicyclopyrone + atrazine
    (Grp 15, 27, 27, 5)

• Acuron Flexi (SYN-A205) (Acuron w/o atrazine)
  (Grp 15, 27, 27)

• Both include benoxacor (safener)
• Bicyclopyrone lower use rate than mesotrione and
  improves large-seeded broadleaf control
• Grasses, amaranths, lambsquarter,
  common and giant ragweed

Currently not labeled Early POST on Sweet Corn (is on other corn)
Anthem Products (FMC)
Anthem and Anthem Flex, ATZ, and Maxx

• Anthem, Anthem Maxx
  • pkg. mix pyroxasulfone (Zidua **Grp 15**) + fluthiacet (Cadet **Grp 14**)  
  • 2.087 + 0.063 vs. 4.174 + 0.126 ai/gal
  • 7-13 vs. 2.5-6.5 fl oz/A PRE
  • 5-12 vs. 2.0 – 6.0 POST up to V4 sweet corn
  • 40 day PHI

• Anthem ATZ
  • adds atrazine (**Grp 5**) to the pkg. mix
  • PRE 1.75 to 4 pt/A, POST 1.5 to 3 pts/A
  • 45 day PHI
Anthem Products (FMC)

- Anthem Flex
  - pkg. mix pyroxasulfone (Zidua **Grp 15**) + carfentrazone (Aim **Grp 14**)
  - 2.75 - 7.28 fl oz/A PRE/ Early Preplant (15-45 days)
  - 37 day PHI
  - Early preplant not recom. on irrigated soils or > 40 in precip.
Solstice (FMC)

Solstice 4 FL (F9387) = 4.0 lb ai

- 0.216 fluthiacet-methyl *(Cadet Grp 14)*
- 3.784 mesotrione *(Callisto Grp 27)*

POST broadleaf weeds up to V8 corn

- 2.5 to 3.15 fl oz/A (0.078 to 0.098 lb ai/A)
  - 0.25% v/v NIS
    - COC alone on sweet corn improve weed control dry conditions but may increase injury
    - COC 1% v/v + UAN,AMS on field corn
  - Amaranth group, cocklebur, velvetleaf, ragweeds (higher rates), vol. potatoes
  - Temporary leaf speckling or bleaching in some varieties
  - 10 mo. rotation to soybeans, 18 mo. other crops
Armezon PRO

BASF

Topramezone + dimethenamid-p

- Impact/Armezon (Grp 27) + Outlook (Grp 14)
- 14 – 20 fl oz/A PRE to 12 inch tall POST
- 50 day PHI

Most grasses and broadleaves
Verdict, Armezon Pro

BASF (PRE herbicides)

Processing Varieties Only

Verdict 5.57 EC

Saflufenacil + Dimethenamid-P

- Kixor (Grp 14) + Outlook (Grp 15)
- 10 fl oz/A PRE
- Do not apply on soils < 3% OM
- Very, very active or burndown applications
  - Severe injury POST to sweet corn

Most grasses and broadleaves
### 2016 Sweet Corn Tolerance Screen

**Rosemount MN**

<table>
<thead>
<tr>
<th>Syngenta</th>
<th>1 (Acuron Flexi ZC)</th>
<th>2.25 qt/A</th>
<th>(PRE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syngenta</td>
<td>2 (Acuron Flexi ZC)</td>
<td>4.5 qt/A</td>
<td>(PRE)</td>
</tr>
<tr>
<td>Syngenta</td>
<td>3 (Acuron 3.44 ZC)</td>
<td>3 qt/A</td>
<td>(PRE)</td>
</tr>
<tr>
<td>Syngenta</td>
<td>4 (Acuron 3.44 ZC)</td>
<td>6 qt/A</td>
<td>(PRE)</td>
</tr>
<tr>
<td>Syngenta</td>
<td>5 (Lumax EZ 3.67 ZC)</td>
<td>3.25 qt/A</td>
<td>(PRE)</td>
</tr>
<tr>
<td>Syngenta</td>
<td>6 (Lumax EZ 3.67 ZC)</td>
<td>6.5 qt/A</td>
<td>(PRE)</td>
</tr>
<tr>
<td>FMC</td>
<td>7 Anthem Maxx</td>
<td>4 oz/A</td>
<td>(PRE)</td>
</tr>
<tr>
<td>FMC</td>
<td>8 Anthem Maxx</td>
<td>6 oz/A</td>
<td>(PRE)</td>
</tr>
<tr>
<td>FMC</td>
<td>9 Anthem Maxx</td>
<td>8 oz/A</td>
<td>(PRE)</td>
</tr>
<tr>
<td>BASF</td>
<td>10 Verdict</td>
<td>10 oz/A</td>
<td>(PRE)</td>
</tr>
<tr>
<td>BASF</td>
<td>11 Armezon PRO + COC + N-PAK AMS</td>
<td>16 oz/A + 1.0% + 2.5% v/v</td>
<td>E POST (1-2)</td>
</tr>
<tr>
<td>FMC</td>
<td>12 Anthem Maxx + NIS</td>
<td>3 oz/A + 0.25% v/v</td>
<td>E POST</td>
</tr>
<tr>
<td>FMC</td>
<td>13 Anthem Maxx + NIS</td>
<td>5 oz/A + 0.25% v/v</td>
<td>E POST</td>
</tr>
<tr>
<td>--</td>
<td>14 Outlook + Atrazine 90 DF Std. trt. checks (imbedded)</td>
<td>18 oz/A + 0.6 lb/A</td>
<td>PRE</td>
</tr>
<tr>
<td>FMC</td>
<td>15 Anthem Maxx + NIS</td>
<td>7 oz/A + 0.25% v/v</td>
<td>E POST</td>
</tr>
<tr>
<td>FMC</td>
<td>16 Anthem Maxx + Solstice + atrazine + NIS</td>
<td>2 + 2.5 + 16 oz/A + 0.25% v/v</td>
<td>E POST</td>
</tr>
<tr>
<td>FMC</td>
<td>17 Anthem Maxx + Solstice + atrazine + NIS</td>
<td>4 + 5 + 32 oz/A + 0.5% v/v</td>
<td>E POST</td>
</tr>
<tr>
<td>FMC</td>
<td>18 (Anthem Maxx + P Solstice + Atrazine + NIS)</td>
<td>6 + 7.5 + 16 oz/A + 0.25% v/v</td>
<td>(PRE)</td>
</tr>
<tr>
<td>Syngenta</td>
<td>19 Acuron Flexi ZC + Induce + N-PAK AMS</td>
<td>2.25 qt/A + 0.25% + 2.5% v/v</td>
<td>POST (3-4 Inch)</td>
</tr>
<tr>
<td>Syngenta</td>
<td>20 Acuron Flexi ZC + Induce + N-PAK AMS</td>
<td>4.5 qt/A + 0.5% + 5% v/v</td>
<td>POST</td>
</tr>
<tr>
<td>Syngenta</td>
<td>21 Acuron 3.44 ZC + Induce + N-PAK AMS</td>
<td>3 qt/A + 0.25% + 2.5% v/v</td>
<td>POST</td>
</tr>
<tr>
<td>Syngenta</td>
<td>22 Acuron 3.44 ZC + Induce + N-PAK AMS</td>
<td>6 qt/A + 0.5% + 5% v/v</td>
<td>POST</td>
</tr>
<tr>
<td>Syngenta</td>
<td>23 Lumax EZ 3.67 ZC + Induce + N-PAK AMS</td>
<td>3.25 qt/A + 0.25% + 2.5% v/v</td>
<td>POST</td>
</tr>
<tr>
<td>Syngenta</td>
<td>24 Lumax EZ 3.67 ZC + Induce + N-PAK AMS</td>
<td>6.5 qt/A + 0.5% + 5% v/v</td>
<td>POST</td>
</tr>
</tbody>
</table>

**15 GPA**

**3 Reps**

0 to 2 inch weeds, V1 to V2 / 1 to 3 inch sweet corn for Early Post trts.

3 to 4 inch weeds, V3 to V5 / 4 to 6 inch corn for POST trts.
### 2016 Sweet Corn Tolerance Screen
Rosemount MN

<table>
<thead>
<tr>
<th>Variety</th>
<th>Seed Co.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMFI 21-84</td>
<td>Del Monte</td>
</tr>
<tr>
<td>DMFI 21-05</td>
<td>Del Monte</td>
</tr>
<tr>
<td>DMFI C448</td>
<td>Del Monte</td>
</tr>
<tr>
<td>DMFI C451</td>
<td>Del Monte</td>
</tr>
<tr>
<td>C–1679 / XTH1679</td>
<td>IFSI</td>
</tr>
<tr>
<td>SC 1263</td>
<td>Seminis</td>
</tr>
<tr>
<td>GH 3333</td>
<td>Syngenta</td>
</tr>
<tr>
<td>GH 9394</td>
<td>Syngenta</td>
</tr>
<tr>
<td>WH 1428P</td>
<td>Syngenta</td>
</tr>
<tr>
<td>GSS 3071</td>
<td>Syngenta</td>
</tr>
<tr>
<td>SVSK 0391</td>
<td>Seminis</td>
</tr>
<tr>
<td>SV 1339 SK</td>
<td>Seminis</td>
</tr>
<tr>
<td>C–124</td>
<td></td>
</tr>
<tr>
<td>C–449</td>
<td></td>
</tr>
<tr>
<td>C–1972</td>
<td></td>
</tr>
<tr>
<td>C–624</td>
<td></td>
</tr>
<tr>
<td>SV 1514</td>
<td>Seminis</td>
</tr>
<tr>
<td>Owatonna</td>
<td>Harris Moran</td>
</tr>
<tr>
<td>Overland</td>
<td>Syngenta</td>
</tr>
<tr>
<td>Protégé</td>
<td>Syngenta</td>
</tr>
<tr>
<td>GSS 1477</td>
<td>Syngenta</td>
</tr>
<tr>
<td>Galaxy</td>
<td>Crites/Snowy River</td>
</tr>
<tr>
<td>GH 4927</td>
<td>Syngenta</td>
</tr>
<tr>
<td>BC 0805/Remedy</td>
<td>Syngenta 81 DTM Attributes</td>
</tr>
<tr>
<td>274 A</td>
<td>IFSI, Ripens Seeds</td>
</tr>
<tr>
<td>2171</td>
<td>IFSI</td>
</tr>
<tr>
<td>Anthem XR</td>
<td>IFSI, Seminis</td>
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<tr>
<td>XTH20173</td>
<td>IFSI, Ripens Seeds</td>
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<tr>
<td>Latte</td>
<td>Ripens Seeds</td>
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<tr>
<td>Montauk</td>
<td>Ripens Seeds</td>
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<tr>
<td>EX 7143 , EX 08767143</td>
<td>Seminis, Ripens Seeds</td>
</tr>
<tr>
<td>Merit (Crop response indicator)</td>
<td>Seminis</td>
</tr>
<tr>
<td>Obsession</td>
<td>Seminis</td>
</tr>
<tr>
<td>Devotion</td>
<td>Seminis</td>
</tr>
<tr>
<td>Super Surprise</td>
<td>IFSI</td>
</tr>
</tbody>
</table>
HPPD chlorosis injury post on highly susceptible Merit
Seed provided by:

- Teyker, Casper, Thompson, Linge, Paulson, Hallcock, Jorgenson, Deidirck, Jenkins

THANK YOU!
Recent herbicides introduced for sweet corn

Roughly in order of most recent first
Shieldex

Shieldex 400 SC (tolpyralate 3.3 lb ai/gal)
Summit Agro USA (Sold by Helena)

• Group Herbicides (**Grp 27 HPPD inhibitor**)
• POST to < 20 inch or 6 lf collar (V6) sweet corn
  • Weeds < 5 inches
• 1 - 1.35 fl oz/A + SU (MSO / NIS and UAN)
• 35 day PHI
• Many bdlfs. and some grasses
• 9-12 month replant restriction most crops, 3 mo. for small grains and forage/seed grasses
Zidua® 0.85 WDG

BASF  PRE or PPI

• pyroxasulfone (Zidua Grp 15/K₃)
• 1.0-4 oz/A
• Apply before or after planting before crop emergence, or at spiking up to V₄ (4 leaf collars visible)
  • Will not control emerged weeds
• Seed at least 1 inch deep
• Do not exceed
  • 2.75 oz/A per season on coarse soils
  • 5 oz/A per season on other soils
• 37-day PHI
Impact, Armezon (topramezone)

POST in field corn, sweet corn, pop corn

- 1° broadleaf weed control
- 2° partial grass control
  - Synergized by atrazine

- **Rate:** 0.5 to 0.75 oz/A
  - Can go to 1 oz, prefer 0.75 to reduce carryover
  - If can, TM with 0.5 lb atrazine, control Similar to 1 oz/A

- **Adjuvant:** MSO or COC plus nitrogen additive
- **PHI:** 45 days
**Cadet**

**Cadet (fluthiacet)**

- **POST**
  - 0.6-0.9 fl oz/A
    - Do not exceed 1.25 fl oz/A per year
  - V2 to tasseling
  - Velvetleaf and several other broadleaves
  - Add COC or NIS
  - 40-day PHI

*Used alone is for processing ONLY*  
*In Anthem, Anthem Maxx, and Anthem ATZ which are labeled for fresh market*
Revulin Q

DuPont Revulin™ Q –
(DPX-UKU48 dry formulation)

• 3.4 to 4 oz/A POST
  • Accent (nicosulfuron Grp 2)
  • Callisto (mesotrione Grp 27)
  • Safener (isoxadifen-ethyl)

• NIS only for sweet corn

• COC, AMS/UAN for field corn
Revulin Q

DuPont Revulin™ Q – 2012

• Do not add AMS/UAN for sweet corn

• Always add 0.25 % NIS
  • COC only if dry (COC risk of injury)
    • COC, AMS/UAN for field corn

• Since can not add AMS or UAN
  • Weeds < 5 in. target
  • Add atrazine if allowed

• Broadcast up to 12 in. tall or <= 5 if collars

• Drop nozzles up to 18 inches
Starane Ultra® 2.8 L

Dow Agrosciences

Starane Ultra® 2.8 L (ae), 1.5 EC phasing out

- Fluroxypyr
- 0.4 fl oz/A PRE
- POST broadcast (up to V4)
  - No additives used alone
  - Use directed spray beyond V4
- Volunteer potato (can apply sequentials)
  - preplant to emerged potato 4-8 in.
  - POST suppression to emerged potato 4-8 in.
- 31-day PHI
Callisto Pkg. Mix

PRE’s
Lexar EZ
3 to 3.5 qts

1.74 S-metolachlor + 0.224 mesotrione+ 1.74 atrazine lb ai/gal
(Grp 15, 27, 5)

60 day PHI
RUP because contains atrazine
Callisto Pkg. Mix

PRE’s

Zemax

3.34 S-metolachlor + 0.33 mesotrione lb ai/gal  
(Grp 15, 27)

Apply  2.0 qt/A if < 3% OM  
2.4 qt/A if >= 3% OM

45 day PHI

(do not apply POST, POST labeled in field corn but can injury sweet corn)
Callisto Pkg. Mix

PRE’s (Cont.)

Lumax EZ, 2.7 to 3.25 qts/A (Grp 5, 15, 27)
- 2.49 metolachlor + 0.94 atrazine + 0.249 mesotrione lb ai/gal
- 45 day PHI

POST

Callisto Xtra (Grp 5, 27)
- 20 to 24 fl oz/A
- 45 day PHI
  - 3.2 lb atrazine + 0.5 mesotrione lb ai per gallon
Poast (sethoxydim) on Sweet Corn

Naturally occurring sethoxydim resistance in corn

- Insensitive ACC-ase inhibitor selected through tissue culture at the U of M
- Not transgenic (not GMO)
- Grasses only, good option for woolly cupgrass and proso millet POST
Organic/nontraditional Products

Suppress (Caprylic and capric acids) Westbridge (label includes “Organic”)
Axxe (ammonium nanoate) BioSafe Systems
Ecotec, Brandt Ecotec Plus (rosemary + peppermint oils) Exempt
Scythe (pelargonic acid) Gowan
StorOx, SaniDate, (hydrogen peroxide + peroxyacetic acid) BioSafe Systems
Weed Zap (clove + cinnamon oils) JH Biotech, Inc.

ALL are Nonselective POST products

Compiled from sweet corn search on CDMS (www.cdms.net)
Dicamba on Sweet Corn

Still not labeled, probably will not be.

Vapor drift still likely from neighbors.
Leaf Wrapping From Status
Suregold @ 7 DAT (not all plants affected)
Capreno on Sweet Corn No Longer

Bayer Capreno® POST

- 2.88 lbs. tembotrione (Laudis) (Grp 27)
- 0.57 lb. thiencarbazone-methyl (Corvus) (Grp 2)

Sweet corn on the old 4-3-09 Label

- 3 fl oz/A
- 1 qt. of COC per 25 gals + 1.5 qt./A UAN or 1.5 lb./A AMS
- After V1 and before V6
- Do not use with Lorsban®, Counter®, Dyfonate®, Thimet®, or other OPs
- 18-month rotation restriction for other vegetable crops
Option on Sweet Corn No Longer Bayer, in 2006 talks (foramsulfuron) (Grp 2)
ALS-inhibiting herbicide similar to Accent
- Labeled in field and seed corn at 1.5 oz/a
- POST grass control and several broadleaf weeds
- Evaluated for processing and fresh market sweet corn
- Accent intolerant hybrids even morso w/ Option
Sweet Corn Herbicides

Only two products for GMO Treated Sweet Corn You Will Not be Using

• Roundup (Grp 9)
• Liberty (Grp 10)
Roundup Tolerant Sweet Corn

• Check individual states for labeling
• Currently for use with Monsanto products

Apply anytime emergence through V8 stage or 30 inches (free-standing), which ever comes first
• 11 to 32 fl oz/A
• Recommend drop nozzles if 24 to 30 inches (free-standing) or required if 30 to 48 inches or at reproductive stage
• Reduced rate of residual UM recommendation
• Do not add additional surfactants
• 30-day PHI
Liberty 280 SL on Sweet Corn

Bayer supplemental label thru 2016

NO LONGER LABELED?

• EPA Reg. No. 264-829 Supplemental label
  • Expires 11/05/16, issued 11/21/2013
Palmer vs. Waterhemp

**Palmer**
- Native to the desert Southwest
- Most competitive of the Amaranth sp.
- Growth rate as fast as ~2.5”/day

**Waterhemp**
- Native to the Midwest
- 2nd most competitive of the Amaranth sp.
- Growth rate as fast as ~1.75”/day

http://www.extension.iastate.edu/CropNewerers/2013/0820hartzlerpope.htm

http://southeastfarmpress.com/management/waterhemp-showing-greater-resistance-glyphosate
Palmer vs. Waterhemp
35 days after seeding
Palmer vs. Waterhemp

**Herbicide resistant**
- ALS (#2),
- PSII (#5)
- glycines (#9)
- HPPD (#27)
- DNA (#3)

**Herbicide resistant**
- ALS (#2)
- PSII (#5)
- glycines (#9)
- HPPD (#27)
- PPO (#14), 2,4-D (#4)

- Both dioecious
- Both produce overwhelming nos. of seed
Hand Weeding
Palmer amaranth plant from above, notice the rosette leaf pattern that is similar to a poinsettia plant
Palmer has long leaf petioles
Female plants ‘bracts’ sharp and pointed – Spiny to touch
Which pigweed is it?

Pigweed identification: A pictorial guide to the common pigweeds of the great plains

Horak et al. KSU, Extension

- Redroot pigweed
- Smooth pigweed
- Powell amaranth
- Palmer amaranth
- Waterhemp

Gunsolus 2014
Questions?