Sedges & broadleafs

*Cyperus difformis*  
*Schoenoplectus mucronatus*  
*Ammannia spp.*

*Sagittaria montevidensis*  
*Alisma plantago-aquatica*
Grasses

Echinochloa crus-galli

E. phyllopogon = E. oryzicola

E. oryzoides

Leptochloa fascicularis
Effect of rice culture on weed competition

Continuous flood
\[ y = -0.59x + 92; \]
\[ R^2 = 0.15 \]

Early drain
\[ y = -1.13x + 101; \]
\[ R^2 = 0.71 \]

Drill seeded
\[ y = -1.34x + 93; \]
\[ R^2 = 0.45 \]
Drill seeded

- Flexibility for herbicide use in drift-risk areas
- Facilitates ground-rig applications
- Favors weeds adapted to dryland seedbeds (barnyardgrass, sprangletop)
- Less favorable to aquatic weeds (ricefield bulrush, ducksalad, redstem)
- Useful for alternation with water-seeded systems
Drill-seeded (field is initially dry and then is gradually flooded deeper)

- **June 43**: Crop seeded; 120 lb/acre ‘M206’

**Delayed PRE**
- Possible treatments:
  - Prowl H2O
  - Abolish

**Early POST (2-4 Lsr)**
- Possible treatments:
  - Prowl+propanil+Clincher
  - Prowl+Granite+Clincher
  - Clincher+Granite

**Late POST**
- Possible treatments:
  - propanil
    - (July 10)

**Flush irrigation**
- (June 11)
- 2-3 Lsr (June 22)
- 3-4 Lsr (June 29)

**Permanent Flood**
- July 3
### Selected programs (% control at canopy closure)

<table>
<thead>
<tr>
<th>Treatments in a Pin-Point system</th>
<th>WGrss</th>
<th>Sprgltp</th>
<th>Smlfl</th>
<th>Yield (lb/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weed Cover</td>
<td>45</td>
<td>2</td>
<td>3</td>
<td>2337</td>
</tr>
<tr>
<td>Weed Control (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Untreated</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2337</td>
</tr>
<tr>
<td>Clincher + Granite SC (3-4 lsr) fb Ultra Stam (1-2 Till)</td>
<td>98</td>
<td>100</td>
<td>71</td>
<td>6731</td>
</tr>
<tr>
<td>Clincher + Granite SC(3-4 lsr) fb SuperWham (1-2Till)</td>
<td>98</td>
<td>75</td>
<td>92</td>
<td>6695</td>
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<tr>
<td>Granite SC (3-4 lsr)</td>
<td>96</td>
<td>0</td>
<td>60</td>
<td>6583</td>
</tr>
<tr>
<td>Granite SC + Ultra Stam 80EDF (3-4 lsr) fb. Clincher (1-2 Till)</td>
<td>98</td>
<td>88</td>
<td>67</td>
<td>6280</td>
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<tr>
<td>Clincher (3-4 lsr) fb Ultra Stam 80EDF (1-2 Till)</td>
<td>99</td>
<td>88</td>
<td>42</td>
<td>6174</td>
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<tr>
<td>Regiment (4 lsr)</td>
<td>98</td>
<td>0</td>
<td>63</td>
<td>6000</td>
</tr>
<tr>
<td>Regiment (4 lsr) fb SuperWham</td>
<td>98</td>
<td>0</td>
<td>78</td>
<td>6925</td>
</tr>
<tr>
<td>Regiment + Abolish (3-4 lsr)</td>
<td>99</td>
<td>13</td>
<td>67</td>
<td>6392</td>
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<tr>
<td>LSD</td>
<td>803</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Early Drain-granule: for granular herbicides into the water after reflood

Seed (June 7)

Begin drain (June 11)

Water back on (June 15)

Granular herbicides (Rice 1–2 If; 18 June)

Possible Treatments

- Cerano (12 lb)
- Cerano + Granite

2nd leaf

¾ in pegged

3-4 in
Resistance: a Selection process

Resistance is a decision by the user, not by the herbicide
Confirmation of Resistance

Digitaria ischaemum

Quinclorac (kg ha\(^{-1}\))

0 1.12 2.24 4.48 8.96
Management

Herbicide use

• Avoid repeated use of herbicides with the same mechanism of action (MOA)

• Use mixtures & sequences
  ✔ different MOAs effective on same weeds

• Do not use ALS or ACCase inhibitors as sole tool, nor repeatedly within same season
Management

- Maintain low weed infestations
- Control all weed escapes & late-season flushes
- Prevent dispersal: pollen, seeds
- Use certified seed
- Diversify control techniques:
  - Use *many little hammers* rather than just one big one: **Integrated Weed Management.**
1. Rotations
DRY SEEDED

WATER SEEDED

Smallflower
Ricefield bulr.
Redstem
Ducksalad
Barnyardgrass
Sprangletop

Late WG

Continuous Flood
Pin-Pt/Leathers
Drill seeded
The watergrass resistance issue
2. Control escapes
(even if late in the season: prevent weed seeding)
3. **Tank mixes**
(different modes of action and synergism)

**Regiment + Abolish**
(Pin-point Flood)

5-6 lsr (10-15 g ai/ac + 2.0-3.0 lb ai/ac)

*Synergistic mixture intended only for mimic*
4. **Sequential**s

*(different modes of action)*

**Regiment fb. propanil**

*(Pin-point Flood)*

- NO RESISTANCE TO PROPANIL
- 5 lsr to 1 til (15 g ai/ac)
  - fb.
- 2-3 til (6 lb ai/ac)
5. Stale seedbed

(using a non selective herbicide)
glyphosate

Spring tillage (could be omitted)

Dry seeding

germination

2 – 3 lsr

tillering

flowering
The result
Smallflower cross- resistance testing

Foliar applied Herbicides:

1. Untreated control
2. Stam – 6726 g ai/ha
3. Londax – 70g ai/ha
4. Granite SC – 35g ai/ha
5. Shark H2O – 224g ai/ha
6. Sandea – 52.5g ai/ha
Ricefield bulrush propanil resistance & cross-resistance