Review of 2018

• Grassiest crop in a long time

• Residuals did not get activated

• Hot, dry conditions led to reduced POST activity

• Some folks made a poor decision to not spray EPOST

• Large grass at flood

• Poor performance from several herbicides

• >$150 spent on weed control was common

• What happened with Loyant?
Loyant Issues in 2018

Off-target movement

Varietal sensitivity

Lack of performance

Barnyardgrass  Rice
Loyant 2016 Crop Tolerance
4-6 If application Grain Yield & Injury Ratings

All treatments are Loyant at listed rate + 0.5 pt/A MSO

Approximately 30 bu/A yield loss across hybrid rice cultivars
Loyant 2017 Crop Tolerance
2-3 If stage application – Grain Yield

All treatments are Loyant at listed rate + 0.5 pt/A MSO

Treatments refer to rate and timing. fb = followed by; PF = post-flood.
Loyant 2018 Soil Condition & Timing
Injury 15 DA-A

Visual Injury Rating (%)

<table>
<thead>
<tr>
<th>Product</th>
<th>UTC</th>
<th>7d Preflood</th>
<th>1d Preflood</th>
<th>Wet Preflood</th>
<th>Postflood</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLXL745</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>XP753</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diamond</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jupiter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All treatments refer to Loyant applied at 1 pt/A + 0.5 pt/A MSO.
Rice Injury from Sequential Loyant Applications

CLXL 745

Injury (%)

4 to 5 days | 11 to 13 days | 16 to 18 days | 21 to 23 days
---|---|---|---

* Initial application to 2-leaf rice
Rice Yield following Sequential Loyant Applications

CLXL 745

Generally 1 to 4 day delay in heading

<table>
<thead>
<tr>
<th>Days between applications*</th>
<th>PineTree</th>
<th>Stuttgart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nontreated</td>
<td>212.7</td>
<td>234.1</td>
</tr>
<tr>
<td>4 to 5 days</td>
<td>203.9</td>
<td>215.5</td>
</tr>
<tr>
<td>11 to 13 days</td>
<td>200.1</td>
<td>191.2</td>
</tr>
<tr>
<td>16 to 18 days</td>
<td>199.9</td>
<td>197.7</td>
</tr>
<tr>
<td>21 to 23 days</td>
<td>183.4</td>
<td>192.5</td>
</tr>
</tbody>
</table>

* Initial application to 2-leaf rice
Rice Injury from Sequential Loyant Applications

**CL 272**

<table>
<thead>
<tr>
<th>Injury (%)</th>
<th>Days between applications*</th>
</tr>
</thead>
<tbody>
<tr>
<td>PineTree</td>
<td>4 to 5 days</td>
</tr>
<tr>
<td>Stuttgart</td>
<td>11 to 13 days</td>
</tr>
<tr>
<td>Stuttgart</td>
<td>16 to 18 days</td>
</tr>
<tr>
<td>Stuttgart</td>
<td>21 to 23 days</td>
</tr>
</tbody>
</table>

* Initial application to 2-leaf rice
Rice Yield following Sequential Loyant Applications

Yield (bu/acre)

<table>
<thead>
<tr>
<th>Days between applications*</th>
<th>PineTree</th>
<th>Stuttgart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nontreated</td>
<td>162.4</td>
<td>131.7</td>
</tr>
<tr>
<td>4 to 5 days</td>
<td>158.2</td>
<td>126.1</td>
</tr>
<tr>
<td>11 to 13 days</td>
<td>136.5</td>
<td>131.6</td>
</tr>
<tr>
<td>16 to 18 days</td>
<td></td>
<td>125.7</td>
</tr>
<tr>
<td>21 to 23 days</td>
<td></td>
<td>120.1</td>
</tr>
</tbody>
</table>

* Initial application to 2-leaf rice

Generally 1 to 3 day delay in heading
### Application Rates and Weeds Controlled or Suppressed

At a rate of 16 fl oz/acre (1 pint/acre) the following weeds are either controlled or suppressed:

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Maximum Growth Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>barnyardgrass¹</td>
<td>3 tiller</td>
</tr>
<tr>
<td>broadleaf signalgrass¹</td>
<td>5 leaf</td>
</tr>
<tr>
<td>junglerice¹</td>
<td>3 tiller</td>
</tr>
<tr>
<td>tighthead sprangletop</td>
<td>2 tiller</td>
</tr>
<tr>
<td>rice flatsedge¹</td>
<td>6 leaf</td>
</tr>
<tr>
<td>purple nutsedge¹,²</td>
<td>5 leaf</td>
</tr>
<tr>
<td>yellow nutsedge¹,²</td>
<td>5 leaf</td>
</tr>
<tr>
<td>Smallflower umbrellasedge¹</td>
<td>6 leaf</td>
</tr>
<tr>
<td>alligatorweed</td>
<td>12” runners</td>
</tr>
<tr>
<td>Ammannia (red stem)</td>
<td>8”</td>
</tr>
</tbody>
</table>
Why variability in Loyant control?

- Barnyardgrass too big and high populations?
  - Used as rescue?
- Soil moisture?
  - Time till flood matters
- Coverage
  - Failures with both ground and air applications
- Tank-mixtures/antagonism
- Are some populations more tolerant than others?
138 samples screened
- Control ranged from 0 to 100%
- Average = 67%
- Most of these are from Loyant failures
- 16 oz/A rate is because of barnyardgrass

14 days after 4-leaf application

Loyant (1X)
Loyant on Barnyardgrass

• Lower than expected control of some barnyardgrass populations was observed in the field last summer and again this winter in the greenhouse.

• Size of plants and growing conditions in the greenhouse were optimized for Loyant activity.

• Further research is underway to characterize this variability among populations and the cause for reduced sensitivity.
What do we know and hypothesize about Loyant on barnyardgrass?

- There are quinclorac-, propanil-, and imazethapyr-resistant accessions that are sensitive to Loyant.

- Unlikely that propanil resistance (elevated aryl acylamidase) is linked to variability in control with Loyant.

- Unlikely that quinclorac is being metabolized.

- Could metabolic resistance to imazethapyr lead to a similar response with Loyant?
Barnyardgrass Screening

• About 5% of samples did not contain enough seed
• About 15% of samples would not germinate
• Sizeable increase in resistance to all herbicides evaluated, except clomazone
  – Results are scary
  – Approximately 10% of samples had four-way resistance (5-way found in a 2017 sample)
• Some samples showed slight reduction in glyphosate sensitivity (1/2X rate)
Comparison of Loyant and 2,4-D for levee weed control

Palmer amaranth control 3 weeks after application

- None
- Loyant
- 2,4-D

Bar chart showing the control of Palmer amaranth for different treatments.

- Treatments: None, Sharpen + COC, Sharpen + MSO, Riceshot, Ricebeaux, Grandstand, Facet L, Grasp
- Control levels: 0% to 100%
- Letters (A, B, C, D, E) indicate significance levels.
Comparison of Loyant and Enlist One for levee weed control

- Treatments that did not contain Loyant or 2,4-D were ineffective
- Loyant-containing treatments were similar to 2,4-D containing treatments
- The addition of other herbicide to Loyant or 2,4-D did not further improve control
Row Rice

- 2018 – 100,000 acres
- Increased weed control costs
- Flushing is no longer an option for activation of PRE
- Broadleaves will move up on the most wanted list!
- Similar to levee weed control
- Flood not there as weed barrier
Command 17 oz PRE

Command 17 oz + Sharpen 2 oz PRE
4 weeks after late-postemergence application - Marianna

Command + Facet L fb
Ricestar HT fb
Loyant + Prowl fb
Grasp

Non-treated check
Control 4 weeks after LPOST

Palmer amaranth (% control)

- Loyant
- Loyant + Prowl
- Loyant + Clincher + Prowl
- Riceshot + Prowl

- W/Grasp Xtra
- W/o Grasp Xtra
Row Rice Summary

- Row-rice weed control will likely cost more $$
  - Hybrid rice w/low population leaves room for weeds
- Plant early to reduce weed competition early
- Load up on Residuals up front: Command +
  - Sharpen or Facet L, or both
  - Prowl + Bolero delayed PRE
- Add residuals early POST, split Command or Prowl
- Watch moisture levels for POST grass control
  - Clearfield/ Newpath fits well for grass control with added residual
Row Rice Summary

• Likely two applications for pigweed/broadleaves
  • No great residuals POST for pigweed control

• Loyant fits well & works best as part of a herbicide program – needs moisture for grass control
  • >95% Palmer amaranth control 4 WAT

• Propanil + Grandstand or Grasp Xtra in late POST
  • 2,4-D in counties where restrictions allow

• POST grass – Facet, Regiment, Newpath, Clincher, Ricestar or Provisia

• Irrigate to optimize POST grass control

• Timely applications will be key to success

• Less crop response, at least in areas not flooded
Cleanest plots had more than two residual applications (PRE & EPOST) in 2018...If they were activated.
Command FB Loyant 2018
Command FB Obey FB Loyant
2018
Obey FB Command FB Loyant
What about benzobicyclon?

- Rouge and Rouge Plus
- 2020-2021
- Postflood only
- Broad-spectrum activity
- Excellent on sprangletop, aquatics, annual sedge
- Activity on barnyardgrass, sedges and weedy rice
- Ideally suited for zero grade
Weedy Rice Control with Benzobicyclon

Stuttgart - 6 weeks after treatment
Weedy Rice Control with Benzobicyclon

Colt - 7 weeks after treatment

Nontreated

Benzobicyclon
- Some populations of weedy rice are more sensitive than others
- Addition of MSO will improve control (may increase risk for injury)
- Control will increase as flood depth increases
- Tolerance mechanism is partially associated with size at application
- Control improves with length of time water is held
What about Warrant, Dual, and Zidua on rice?

• They are not labeled!
• They can cause injury!
• They may show up in rice residue!
• If someone does apply these in season and it shows up in rice at checkpoints....It will be devastating to ALL Arkansas Rice Industry!!
• Do not apply off-label products!
- Rice is more tolerant to Warrant than Harness
- Rice tolerance increases as application is delayed
- Injury often increases when rainfall occurs soon after application
- Tolerance when tank-mixing with other rice herbicides is not well understood

• There is no label for use of Warrant in rice!!!!
• Bayer (formerly Monsanto) has shown no interest in labeling Warrant in rice
Late-Season Rice Injury (Provisia Trial)

- Provisia – 4 LF
- Provisia – PREFLD
- Rogue – POSTFLD
- Provisia – 4 LF
- Rogue – POSTFLD
- Prowl + Bolero – DPRE
- Warrant – 2 LF
- Warrant – 4 LF
- Rogue – POSTFLD
- Prowl + Bolero – DPRE
- Pethoxamid – 2 LF
- Pethoxamid – 4 LF
- Rogue – POSTFLD

Injury (%)
Provisia – 4 LF
Provisia - PREFLD

Provisia – 4 LF
Rogue - POSTFLD

Provisia – PREFLD
Rogue - POSTFLD

Prowl + Bolero – DPRE
Warrant – 2 LF
Warrant – 4 LF
Rogue - POSTFLD

Prowl + Bolero – DPRE
Pethoxamid – 2 LF
Pethoxamid – 4 LF
Rogue - POSTFLD
Fall-applied Herbicides for Weedy Rice Control

Zidua (5 oz/A)

Warrant (2.5 pt/A)

Warrant (5 pt/A)

Warrant (5 oz/A)
Fall-applied Herbicides for Weedy Rice Control

Zidua (5 oz/A)

Warrant (2.5 pt/A)

Warrant (5 pt/A)

Warrant (5 pt/A)

Zidua (5 oz/A)
• FullPage™ Rice - RiceTec (similar to Clearfield technology)
  – Tolerant to Preface (Imazethapyr) – Adama
  – Tolerant to Postscript (Imazamox) - Adama

• Rice tolerance is better than Clearfield hybrid and is comparable to inbred (4X tolerance)
  – 4 varieties for 2019, but RT7521 may be most prevalent

• Newpath and Beyond cannot be used on Fullpage!
• 20,000 acres in 2018; 25,000 acres in 2019

• Barnyardgrass and “weedy” rice control was generally excellent

• Plan for a three-pass system (PRE, EPOST, Preflood)

• Use a good residual upfront for best results – similar to CL

• 15.5 fl oz/A twice, add COC provided best control

• Apply Nitrogen and then Preflood application

• No tank-mixes preflood

• May need a postflood application for sedges or broadleaves
Thoughts for 2019

- Protect Command! Resistance increasing
  - Command plus Facet (Obey) PRE
  - Command PRE; Prowl + Bolero Delayed PRE

- Overlap residuals: Follow PRE or Delayed PRE app. With another residual (Command, Facet, Prowl, Bolero)

- Include Provisia into a rotation if possible

- Rotate problem fields into soybean for 2 years and prevent barnyardgrass seed production

- There are no silver bullets for barnyardgrass. Timely applications will lead to success.

- Use caution with Loyant
Loyant in 2019

- Strong need in furrow-irrigated rice
- Extreme caution should be used if applying to hybrid
  - Injury has been observed on medium grain and Diamond
- Dry, hot conditions during and after application will increase injury
- Use screening results to make an informed decision about barnyardgrass
- Use as part of a program with residuals applied PRE & EPOST
- Consider tank-mixing with Clincher, Ricestar, or Regiment, especially if grass is larger than 2- to 3-leaf
- Recommend downwind setback from soybean:
  - 0.25 miles by ground; 1.0 miles by air
Barnyardgrass Management in Rice

• Planned three pass system *(technology does not matter)*
  – Preemergence or Delayed preemergence
  – Early postemergence
  – Preflood

• Know what **WILL** or **WILL NOT** work *(screening)*

• Kill it before it comes up!

• If it comes up, you will spend more money
  – Difficulty with timely applications
  – Complete resistance to quinclorac postemergence
Questions?
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