Provisia™ Rice Production System
Efficacy and Stewardship

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Clearfield® rice is important to the U.S. rice industry and BASF.

Stewardship and herbicide rotation are important.

Another herbicide site of action is important for future postemergent control of red rice, volunteer rice and “weedy rice” (ALS-resistant grass weeds).
Clearfield® Rice System

Resistance

- Outcrosses
- F2 hybrids
- Weedy rice
Provisia™ Rice System

Introduction

Newest Trait System for Red Rice, Weedy Rice, Resistant Grass Control in Rice

Provisia™ Herbicide
ACCase Inhibitor Tolerant Rice System
Field Herbicide Tolerance Trial

Traits are not stacked together to minimize resistance to both traits.
**Provisia™ Herbicide**

**Mode of Action**

**Active Ingredient:** Quizalofop

**Chemical Family:** Aryloxyphenoxy-propionate (fops)

**Herbicide Group:** 1 (WSSA) A (HRAC)

**Mode of Action:** Lipid Synthesis Inhibitor

**Site of Action:** ACCase Inhibitor (acetyl CoA carboxylase)

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**Meristem Rot – Grasses**

(Only grasses affected)

Experimental Results – Not Registered or Available for Sale

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Provisia™ Rice
Seed Development

- New trait with non-GM technology
- Provisia Varieties and Hybrids being developed
- Specific disease, lodging, maturity, yield, grain quality, and other traits as per typical breeding procedure
- In mid-2015, there were 24 advanced variety lines in LSU trials
  - 2 lines look promising
  - Increased seed production this winter in Puerto Rico
  - On farm seed production planned in 2016
- Projected launch in 2017

Experimental Results – Not Registered or Available for Sale
# Provisia™ Herbicide
## Target Weeds

### Annual Grasses

<table>
<thead>
<tr>
<th>Weed Type</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn, Volunteer</td>
<td><em>Zea mays</em></td>
</tr>
<tr>
<td>Johnsongrass, seedling</td>
<td><em>Sorghum halepense</em></td>
</tr>
<tr>
<td>Shattercane</td>
<td><em>Sorghum bicolor</em></td>
</tr>
<tr>
<td><strong>Fall Panicum</strong></td>
<td><em>Panicum dichotomiflorum</em></td>
</tr>
<tr>
<td>Goosegrass</td>
<td><em>Eleucine indica</em></td>
</tr>
<tr>
<td><strong>Sprangletop</strong></td>
<td><em>Leptochloa spp.</em></td>
</tr>
<tr>
<td>Witchgrsas</td>
<td><em>Panicum capillare</em></td>
</tr>
<tr>
<td><strong>Barnyardgrass</strong></td>
<td><em>Chinochloa crus-galli</em></td>
</tr>
<tr>
<td>Crabgrass, Large</td>
<td><em>(Digitaria sanguinalis)</em></td>
</tr>
<tr>
<td>Crabgrass, Smooth</td>
<td><em>(Digitaria ischaemum)</em></td>
</tr>
<tr>
<td><strong>Junglerice</strong></td>
<td><em>Echinochloa colomum</em></td>
</tr>
<tr>
<td>Texas Panicum</td>
<td><em>Panicum texanum</em></td>
</tr>
<tr>
<td>Red Rice</td>
<td><em>Oryza sativa</em></td>
</tr>
<tr>
<td>Volunteer Rice</td>
<td>Conventional, Clearfield, hybrids</td>
</tr>
<tr>
<td>Broadleaf Signalgrass</td>
<td><em>Bracharia platyphylla</em></td>
</tr>
</tbody>
</table>

### Perennial Grasses

<table>
<thead>
<tr>
<th>Weed Type</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bermudagrass</td>
<td><em>Cyndon dactylon</em></td>
</tr>
<tr>
<td>Johnsongrass, Rhizome</td>
<td><em>Sorghum halepense</em></td>
</tr>
</tbody>
</table>
Provisia Rice System:

Projected Use Pattern:

- **Target Weeds:** Red rice, weedy rice, and other grasses
- **Timing:** Postemerge
  - 2 postemerge applications
  - 2 leaf to Panicle Initiation (rice)
- **Rate:** 2 applications of 100 to 140g (13-18 fl oz/A)
  - 240g (31 fl oz/A) max cumulative per season
  - Crop Oil Concentrate

- **Total Weed Control Program**
  - Preemerge herbicide
    - Residual grass & broadleaf control
  - Tank mix partners
    - Residual grass control
    - Broadleaf & sedge control

Experimental Results – Not Registered or Available for Sale
**Provisia™ Herbicide Ideal Program**

**Two Postemerge Applications**

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**Provisia – 1st Application**
- Pre Residual Herbicides
- 2 - 3 leaf rice*
- Rate of 13-18 fl oz/A
- Adjuvant – COC 1% v/v
- Broadleaf & Sedge TM partners (+)

**Provisia – 2nd Application**
- 1-2 tillers prior to permanent flood*
- Rate of 13-18 fl oz/A
- Adjuvant – COC 1% v/v
- 10 to 21 days after first application
- Broadleaf & Sedge TM partners (?)

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Experimental Results – Not Registered or Available for Sale
Provisia Rice System

At labeled rates Provisia Rice very tolerant to Provisia Herbicide

Single Application; 1 WAT

% Crop Injury

Rate (g ai/ha) / Treatment

120 PROVISA
120 + 1120 BASAGRAN
120 + 420 FACET L
120 + 1120 PROWL
120 + 25 SHARPEN
120 + 420 COMMAND
120 + 280 GRANDST'D
120 + 42 GRASP
120 + 52 PERMIT
120 + 33.6 REGIMENT
120 + 3370 STAM 4E

6 Locations;

Experimental Results – Not Registered or Available for Sale
Provisia Injury Symptoms
Plant Response from Very High Provisia Rate

Yellow Flash
White linear streaks
U.S. Rice Production
Problem Weeds

**Annual Grasses**
- Amazon sprangletop (*Leptochloa panicoides*)
- Barnyardgrass (*Echinochloa crus-galli*)
- Red rice (*Oryza punctata*)

**Perennial Grasses**
- Knotgrass (*Paspalum distichum*)
- Rice cutgrass (*Leersia oryzoides*)
- Southern Watergrass (*Luziola fluitans*)

**Annual Broadleaves**
- Hemp sesbania (*Sesbania herbacea*)
- Texasweed (*Caperonia palustris*)
- Redweed (*Melochia corchoriflora*)

**Aquatic Broadleaves**
- Alligatorweed (*Alternathera philoxeroides*)
- Ducksalad (*Heteranthera limosa*)

**Sedges & Rushes**
- Yellow nutsedge (*Cyperus esculentus*)
- Rice flatsedge (*Cyperus iria*)

Provisia Herbicide applied sequentially provided weedy rice control > 95% regardless of timings. MP / LP timing allows for weed competition. SMALL actively growing weedy rice is preferred.
**Provisia Rice System: Efficacy Programs**

**Tank Mix Partners / Early Post Weedy Rice Control**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>g ai/ha</th>
<th>% Control</th>
<th>1 Week Before Last Application</th>
<th>3 Weeks After Last Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROVISIA</td>
<td>120 / 120</td>
<td>+ FACET L / PROVISIA</td>
<td>+ 420 / 120</td>
<td>+ 420 / 120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ FACET L / PROVISIA</td>
<td>+ 120 / 120</td>
<td>+ 120 / 120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ SHARPEN / PROVISIA</td>
<td>+ 18 / 120</td>
<td>+ 18 / 120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ AIM / PROVISIA</td>
<td>+ 56 / 120</td>
<td>+ 56 / 120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ GRASP / PROVISIA</td>
<td>+ 42 / 120</td>
<td>+ 42 / 120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ PERMIT / PROVISIA</td>
<td>+ 52 / 120</td>
<td>+ 52 / 120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ REGIMENT / PROVISIA</td>
<td>+ 52 / 120</td>
<td>+ 52 / 120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ DUET / PROVISIA</td>
<td>+ 3400 / 120</td>
<td>+ 3400 / 120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ RICEBEAUX / PROVISIA</td>
<td>+ 5050 / 120</td>
<td>+ 5050 / 120</td>
</tr>
</tbody>
</table>

Application was Early Post / Mid Post. Weedy rice includes red rice.

1 Week Before Last Application: Control Early Post application only

3 Week After Last Application: Control 3 weeks after last application (flood should be established)

Experimental Results – Not Registered or Available for Sale
Provisia Rice System
Potential Tankmix Partners

- Preferred
  Prowl EC (pendimethalin) – increased foliar activity & added residual

- Acceptable (occasional antagonism)
  Grasp - penoxsulam
  Permit - halosulfuron
  Facet L - quinclorac
  League - imazosulfuron
  Basagran - bentazon
  Command - clomazone
  Regiment - bispyribac
  Sharpen - saflufenacil

- Problematic (often antagonistic - better as sequential treatment)
  Stam / RiceBeaux - propanil / propanil + thiobencarb
  Grandstand - triclopyr

Experimental Results – Not Registered or Available for Sale
Provisia Rice System
“Ideal Herbicide Program”

- PREEMERGE
  Command + Sharpen + Glyphosate

- Early Postemerge – 2 leaf rice
  - Provisia – 15 oz/ac with any tankmix partner for residual, broadleaf, and sedge control..............except!
  - Grandstand, RiceBeaux, Stam, other propanil containing products

- Late Postemerge – 1 tiller prior to permanent flood
  - Provisia alone at 15 oz/ac + COC

Experimental Results – Not Registered or Available for Sale
2015 PROVISIA TANKMIX STUDY
Application Timing: 2-3 leaf rice
14 Days After Treatment

All treatments with 1% Crop Oil

CHECK

Provisia – 15 oz/ac
2015 PROVISIA TANKMIX STUDY
Application Timing: 2-3 leaf rice
14 Days After Treatment

All Treatments with 1% Crop Oil

Provisia + Permit (1 oz)  
Provisia – 15 oz/ac
2015 PROVISIA TANKMIX STUDY
Application Timing: 2-3 leaf rice
14 Days After Treatment

All Treatments with 1% Crop Oil

Provisia + Facet L (32 oz)  Provisia – 15 oz/ac
2015 PROVISIA TANKMIX STUDY
Application Timing: 2-3 leaf rice
14 Days After Treatment

All Treatments with 1% Crop Oil

Provisia + Duet (3 qt)  Provisia – 15 oz/ac
2015 PROVISIA TANKMIX STUDY
Application Timing: 2-3 leaf rice
14 Days After Treatment

All Treatments with 1% Crop Oil

Provisia + RiceBeaux (3 qt)  
Provisia – 15 oz/ac

Experimental Results – Not Registered or Available for Sale
2014 PROVISIA TANKMIX STUDY - TX
Application Timing: 2-3 leaf rice
9 Days After Treatment
AgGro Innovations, LLC

All Treatments with 1% Crop Oil

Provisia + RiceBeaux – 9 DAT
2014 PROVISIA TANKMIX STUDY
2 Applications: 2 If & 1-2 tiller
13 DALT

All Treatments with 1% Crop Oil

Provisa (13 oz) + RiceBeaux (4 qts) fb Provisia (13 oz)
Provisia Herbicide Aerial Application
7 Days After 1st Application

Command + Sharpen @ Spike / 1 leaf
Provisia + Facet L + Relay + Drift-Guard + Defoamer @ 3 leaf

Experimental Results – Not Registered or Available for Sale
Clearfield® Rice Production System and Provisia™ Rice Production System
Stewardship Guidelines

- Purchase registered IMI herbicides through BASF authorized retailer
- Purchase registered / certified seed from authorized Clearfield seed retailer
- Make a minimum of 2 applications of the registered IMI herbicides
- Follow good agronomic production practices during the season

- Purchase registered Provisia herbicides through BASF authorized retailer
- Purchase registered / certified seed from authorized Provisia seed retailer
- Make 2 applications of Provisia herbicide (not to exceed maximum rates)
- Follow good agronomic production practices during the season

Experimental Results – Not Registered or Available for Sale
Clearfield® Rice Production System and Provisia™ Rice Production System

Stewardship Guidelines

**Crop Rotation**
- Do not plant Clearfield rice in consecutive years
- Use non ALS herbicides in rotational crop for red / weedy rice control
- Fallow rotation should be treated with glyphosate fb tillage
- Do not allow any rice to go to seed in a non rice year

Experimental Results – Not Registered or Available for Sale

**Crop Rotation**
- Do not plant Provisia rice in consecutive years
- Use non ACC-ase herbicides in rotational crop for red / weedy rice control
- Fallow rotation should be treated with glyphosate fb tillage
- Do not allow any rice to go to seed in a non rice year
Provisia™ Rice System
Stewardship – Possible Crop Rotation

**Year 1**
Soybeans

- GMO Broadleaf,
  - No ALS,
  - No ACCase

Use a residual herbicide for red rice and grass control.

**Year 2**
Provisia Rice

DO NOT plant Provisia rice in consecutive years in the same field.

**Year 3**
Clearfield Rice*

DO NOT plant Clearfield rice in consecutive years in the same field.

*or other crop options

Experimental Results – Not Registered or Available for Sale
Provisia™ Rice System
Stewardship – Possible Crop Rotation

Year 1, 3, & 5
Provisia Rice

Use a residual herbicide for red rice and grass control.

Year 2, 4, & 6
Soybeans

DO NOT plant Provisia rice in consecutive years in the same field.

*NO ACCase in soybeans
Provisia Rice provides growers an option for the control of volunteer weedy rice, red rice and annual grasses. Launch projected for 2017.

Provisia Herbicide use rate: 100 – 140 g a/ha (13 – 18 fl oz/A) sequentially; not to exceed 240 g a/ha (31 fl oz/A)

Provisia Herbicide applied Early Post to small actively growing grasses is the most effective timing and reduces weed competition

Sequential application is essential for complete weedy rice control
  ▶ Mid Post is preferred over Late Post
  ▶ Tankmix partners for residual grass, broadleaf, and sedge control

Stewardship of the Provisia rice trait will be very similar to that of the Clearfield rice trait.

Rotations of Provisia rice, Clearfield rice, and soybean provides sustainability of the Clearfield and Provisia trait and production systems.
University Rice Researchers from LA, MS, TX, AR, MO

Review research

New research ideas

Stewardship

Assist in launch of Provisia Rice
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Any sale of this product after registration is obtained shall be solely on the basis of an EPA approved label. Any claims regarding product safety and efficacy shall be addressed solely by the label.
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