Items to Cover

- Brake F2
- Dicamba tolerance Roundup Xtend
- 2,4-D tolerance Enlist
History on Fluridone

- Evaluated for field crops in early 70’s
- Cotton was very tolerant; other crops not tolerant at rates being tested
- Marketing decision to discontinue development; sold to SePro
- SePro registered for aquatic weed control
For use in:

- Ponds
- Lakes
- Reservoirs
- Potable water supplies
- Drainage canals
- Irrigation canals

#1 herbicide in US aquatic weed control
Fluridone - History

• Fluridone revisited in 2012 - Research in AR/TN/MS/GA/NC/SC showed great cotton safety

• Inconsistent Palmer residual control
  • Needs a good 0.75” to become active
  • Sec 18 in AR in 2012 – expensive and inconsistent Palmer control
Brake F2 Herbicide:
Flowable formulation containing
1.6 lb/gal of fluridone*
+ 1.0 lb/gal of fomesafen**

* Active ingredient in Sonar
** Active ingredient in Reflex
Fluridone

- **Brake F2**
  - Premix with fomesafen
  - Rate is 1 pt - fluridone (0.2 lbs) + fomesafen (0.125 lbs) (8 oz Reflex)
  - Provided consistent Palmer residual control in 2013
  - Got a Sec 18 in SC in 2013 – Good results
Cotton Injury 28 DAT

- Prowl: CDE
- Dual Mag: CDE
- Zidua: ABC
- Brake + Zidua: A
- Brake + Reflex (Brake F2): BCD
- Brake + Cotoran: CDE
- Brake (0.35): AB
- Brake (0.22): BCD
- Cot+Cap: DE
- Caparol: DE
- Cot: EF
- Reflex: CDE
- Warrant: ABC

% Injury
Injury Symptoms
Cotton Yield

- Prowl: EF
- Dual Mag: EDF
- Zidua: EDF
- Brake + Zidua: ABCDE
- Brake + Reflex (Brake F2): ABC
- Brake + Cotoran: AB
- Brake (0.35): A
- Brake (0.22): ABCDE
- Cotoran + Caparol: ABC
- Caparol: BCDE
- Cotoran: EDF
- Reflex: ABCD
- Warrant: CDE
- untreated: F

Seed Cotton (lb/a)
Brake F2

- Good cotton tolerance with Brake F2
- Good Palmer amaranth control
- No TN data demonstrating better Palmer control with Brake F2 at proposed rates than tank mix of Cotoran+Caparol
- However, in TN better residual control was seen than Cotoran or Caparol applied alone depending upon rain
Brake F2

- Contains fluridone and fomesafen
- Fluridone is a “bleacher”; same MOA as Zorial (Group 12 MOA)
- Main justification for Section 18 was resistance management; no other Group 12 herbicides used in any agronomic crop
Fluridone

- Brake F2
  - GA/TN/NC/SC have applied for Sec 18 for limited acres in 2014
  - 7,500 acres
  - Really be a large research trial in 2014
From proposed Brake F2 Section 18 label:

APPLICATION RATES
Apply BRAKE F2 as a preplant soil or surface application at or prior to planting for the control of glyphosate resistant Palmer amaranth. Refer to Table 2 for specific rates by soil type. Use the lower rates in soils where weed pressure is low and the higher rates in soils where weed pressure is heavy. Application of BRAKE F2 to soils with high organic matter and/or high clay content may require higher rates than soil with low organic matter and/or low clay content. Refer above to the APPLICATION METHODS section of this label for additional use directions.

<table>
<thead>
<tr>
<th>Soil Texture</th>
<th>Rate in ounces/acre (rate range)</th>
<th>Application Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coarse</strong> (sand, sandy loam, loamy sand, loam, or sandy clay loam)</td>
<td>8 ounces (8 to 16 ounces)</td>
<td>Preemergence; or preplant up to 14 days prior to planting</td>
</tr>
<tr>
<td><strong>Medium</strong> (silt loam, silt, silty clay loam) and <strong>Fine</strong> (clay loam, silty clay, clay)</td>
<td>16 ounces (12 to 24 ounces)</td>
<td>Preemergence at rates of 16 oz/acre or less; or preplant up to 14 days prior to planting</td>
</tr>
</tbody>
</table>

†Silty clay loam is a transitional soil and may be classified as medium or fine.
†† Do not apply more than 24 oz per acre.

16 fl oz will be suggested rate in TN
16 fl oz Brake F2 = 0.2 lb ai fluridone + equivalent of 1/2 pt Reflex
Brake F2

- Projected cost for 1 pt/acre:

<table>
<thead>
<tr>
<th>Volume purchased</th>
<th>Cost/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>40-80 acres</td>
<td>$40.62</td>
</tr>
<tr>
<td>120-160 acres</td>
<td>$38.42</td>
</tr>
<tr>
<td>200+ acres</td>
<td>$34.58</td>
</tr>
</tbody>
</table>
Brake F2
Only 16-oz rate suggested in TN

- No access to data on rates less than 16 oz; gut feel is 16 oz is rate needed
- How will 8 oz/A of Brake F2 compare to Cotoran/Caparol?
- Main justification for Section 18 was resistance management; fluridone is MOA not currently used
- Concerned about potential resistance to PPO inhibitors; two MOA’s in Brake F2, but one is fomesafen (PPO inhibitor); 8 oz Brake F2 gives very low rate of fluridone; is that rate sufficient to achieve goal (prevent resistance to PPO inhibitors)?
Brake F2

• Rotational restrictions

  Soybean                      4 months
  Small grains                4 months
  Peanut                      6 months
  Corn                        6 months
  Tobacco, sorghum,           18 months
  others
New Herbicide Traits
Glyphosate-Resistant Ryegrass
Horseweed Was More of an Issue in 2013
Auburn population – Dicamba and Dicamba plus glyphosate

McElroy et al.
Palmer is the driver weed!
Impact of GR Palmer amaranth on TN cotton.

Liberty-based Programs
New Technologies on the Horizon

- What will they do???
  - They can be good tools in a system to manage GR Palmer amaranth

- What won’t they do???
  - Be easy
New Herbicide Trait Technology

- Roundup Xtend Cotton
  - Will be able to use 1lb of dicamba pre plant or pre and two 0.5 lbs post
  - Dicamba tankmixed with another pre will provide more consistent Palmer control than exists today
  - Dicamba can be used post but so can Liberty and it should work better because the pre worked
New Technologies on the Horizon

- **Enlist**

- Cotton and Soybean – tolerance to 2,4-D, glufosinate and glyphosate

- Only labeled 2,4-D products that can be used is the Colex-D formulation (choline salt)

- Colex-D mitigates drift and stays put better after application

- Sequential application of 2,4-D fb glufosinate can control larger Palmer than is possible today - similar to dicamba
14 days after 16 oz Clarity on 8” Palmer
Pre Palmer Control – Jackson, TN

% Control 27 DAT

Valor SX Pre

Dicamba Pre

Does Dicamba Provide Palmer Control Pre?
GR Palmer Control – Jackson, TN

% Control 40 DAT

Valor Pre fb Roundup WeatherMax + Dicamba

Dicamba Pre fb Roundup WeatherMax + Dicamba

% Control

0 20 40 60 80 100
Valor 2 oz PRE fb/22 oz Roundup WM 22 oz + Dicamba 16 oz
Summary

These studies would suggest that dicamba tankmixed with another pre applied herbicide (Cotoran, Caparol, herbicide etc.) could provide more consistent control of Palmer than what we have today.
Enlist Cotton Great 2,4-D Tolerance
Xtend and Enlist System Strengths

- Great fit for burndown near planting....
- Crop safety a big plus....
- Can provide more consistent pre emerge control in dry springs....
- More consistent post control of GR Palmer than what is in use today....
- A new mode of action in crop....
Xtend and Enlist System Considerations

- Glyphosate-resistant grass control?
- Can 2,4-D provide residual control in dry springs?
- Is horseweed becoming less sensitive to dicamba?
- Off-target concerns and tank clean out?
- Resistance management will be important
Questions?