

AGRICULTURE SOLUTIONS

from **FMC**

The Key To A Good Resistant Weed Control Program, Is Using Overlapping Residual Herbicides

Start Clean and Stay Clean with a good weed control herbicide program. This is essential in order to maximize soybean yields in today's weed resistant world. Many weeds today have evolved into a herbicide resistant nightmare, not only have they become resistant to one single mode-of-action herbicide but they have developed multiple resistance to several classes of herbicides. Over reliance or over use of non-residual herbicides like glyphosate has caused resistant weeds to become established and difficult for growers to control with just a postemergence the-top herbicide.

The #1 resistant weed problem in the Delta Region is Palmer pigweed. Not only is Palmer pigweed resistant to glyphosate (Group-9) it may also be resistant to the ALS (Group-2), DNA (Group-3) and PPO (Group-14) chemistries.

The key to a good resistant weed control program, is to use overlapping residual herbicides. Authority Brand herbicide from FMC are a good way to start out. There are two Authority Brand herbicide products used in the Delta Region in soybean production; Authority® Elite herbicide and Authority® MTZ DF herbicide, both are excellent pre-emergence herbicides. Follow either of these products with an early post application of Anthem MAXX herbicide for overlapping residuals.

- **Authority Elite herbicide:** 22 to 26 fl oz./acre
- Mode-of-action groups – 14 & 15
 - Strength on small seed broadleaf weeds like Palmer pigweed
 - Excellent grass control
 - Can be used in LibertyLink®, Roundup Ready®, or conventional soybean systems



- **Authority MTZ DF herbicide:** 12 to 14 oz./acre
- Mode-of-action groups – 14 & 5
 - Strength on small seed broadleaf weeds like Palmer pigweed
 - Non-ALS option to help combat herbicide resistance
 - Excellent residual base to reduce early-season weed competition allowing for maximum yields.



- **Anthem MAXX herbicide:** 2.5 to 3.24 fl oz./acre
- Mode-of-action groups - 14 & 15
 - Excellent Palmer pigweed control
 - Excellent grass control
 - Longer residual than acetochlor and S-metolachlor



Inside This Issue

SOYBEAN WEED CONTROL

Overlapping residuals

- **Authority® Brand Herbicides and**
- **Anthem® MAXX Herbicide**

Glyphosate + PPO-Resistant

- **Pigweed - Herbicide Selection Guide**

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Controlling Glyphosate Resistant Palmer Pigweed In Soybean

Overlapping Residual Programs – 2017

- Pre program using premix or tank mix containing an effective active ingredient against glyphosate-resistant Palmer pigweed. Always shoot for no Palmer emergence!!!
- Follow 14-21 days later with post program using overlapping residuals (Group 15)
- Post applications should target 1-2” emerged Palmer!
- Consider higher rates of pre herbicides safe to target crop.

Roundup Ready® Soybeans

PRE:

Authority® Elite herbicide 24 - 26 oz./A or
Authority® MTZ DF herbicide 12 to 14 oz./A or
Authority MTZ DF herbicide 12 to 14 oz./A + Anthem® MAXX herbicide 3.24 oz./A

followed by

Early Post (14-21 days after planting):

Roundup® herbicide 32 oz./A + Anthem MAXX herbicide 2.5 – 3 oz./A + fomesafen 16 oz./A

followed by

Post (7-10 days after Early Post):

Roundup herbicide 32 oz./A



Authority MTZ DF herbicide 14 oz. PRE
Anthem MAXX herbicide 3 fl. oz. EPOST
PowerMax® herbicide 30 fl. oz. + AMS 2.5%

LibertyLink® Soybeans

PRE:

Authority Elite herbicide 24 - 26 fl. oz./A or
Authority MTZ herbicide 12 to 14 oz./A + or
Authority MTZ herbicide 12 to 14 oz./A + Anthem® MAXX herbicide 3.24 fl. oz./A

followed by

Early Post (14-21 days after planting):

Liberty® herbicide 29 fl. oz./A + Anthem MAXX herbicide 2.5 - 3 fl. oz./A + fomesafen 16 fl. oz./A

followed by

Post (7-10 days after Early Post):

Liberty herbicide 29 fl. oz./A



Memphis Ag Center
Authority® Elite herbicide 24 fl. oz./A PRE fb
Liberty herbicide 29 fl. oz./A Post

Glyphosate + PPO-Resistant Pigweed - Herbicide Selection Guide

DIVERSIFYING EFFECTIVE HERBICIDE SITES OF ACTION ON RESISTANT WEEDS WILL INCREASE EFFECTIVENESS AND MAXIMIZE CROP YIELD



PRE

GOOD

- Two sites of action (Group 5, 15) with activity on pigweeds
 - **Anthem® MAXX herbicide 2.5 – 4 fl. oz.**
+ **Metribuzin 5 - 6.5 oz.**
 - Excellent grass and small seeded broadleaf activity
- Two sites of action (Group 14,15) with activity on pigweeds + grass activity
 - **Authority® Elite herbicide 26 – 28 fl. oz.**
- Two sites of action (Group 5,14) with activity on pigweeds and provides large seeded broadleaf activity
 - **Authority® MTZ DF herbicide 15 oz.**
 - **Authority® Maxx herbicide 5 oz.**
+ **Metribuzin 5 – 6.5 oz.**
 - **Authority® XL herbicide 4 oz.**
+ **Metribuzin 5 – 6.5 oz.**
 - **Authority® First DF herbicide 4-5 oz.**
+ **Metribuzin 5 – 6.5 oz.**
 - Soil pH flexibility (see labels)

(see product labels for use rates and precautions based on soil type)

BETTER

- Three sites of action (Group 5, 14, 15) with activity on pigweeds and provides broad spectrum grass and broadleaf weed control
 - **Authority Elite herbicide 28 – 32 fl. oz.**
+ **Metribuzin 6.5 - 8 oz.**
 - **Anthem MAXX herbicide 3 – 4 fl. oz.**
+ **Authority MTZ DF herbicide 15 - 19 oz.**
 - **Anthem MAXX herbicide 3 – 4 fl. oz.**
+ **Authority Maxx herbicide 5 oz.**
+ **Metribuzin 6.5 – 8 oz.**
 - **Anthem MAXX herbicide 3 – 4 fl. oz.**
+ **Authority XL herbicide 5 oz.**
+ **Metribuzin 6.5 – 8 oz.**
- Two sites of action (Group 14,15) with activity on pigweeds and provides broad spectrum grass and broadleaf control
 - **Anthem MAXX herbicide 3 – 4 fl. oz.**
+ **Authority First DF herbicide 5 oz.**
 - Soil pH flexibility (see labels)

(see product labels for use rates and precautions based on soil type)

POST

Liberty® herbicide OR Roundup Ready 2 Xtend® soybean technology (upon approvals) OR Enlist™ Weed Control System (upon approvals).

Liberty herbicide OR Roundup Ready 2 Xtend soybean technology (upon approvals) OR Enlist Weed Control System (upon approvals) + Anthem MAXX herbicide 2-3 fl. oz. (upon tank-mix approvals)

Anthem MAXX herbicide 2.5 – 4 fl. oz. (Do not exceed 5.7 fl. oz. in a soybean cropping season)

- Flexible application timing: 45 days prior to planting through 3 trifoliates
- Outstanding post sequential residual addition for waterhemp/Palmer amaranth, grass
- In post applications apply 21-28 days after planting or prior to new weed emergence

➤ **When a metribuzin herbicide is used, apply to metribuzin tolerant varieties**



PPO-Resistant Palmer amaranth

DIVERSIFYING EFFECTIVE HERBICIDE SITES OF ACTION ON RESISTANT WEEDS WILL INCREASE EFFECTIVENESS AND MAXIMIZE CROP YIELD



Glyphosate + PPO-Resistance

• Lack of Herbicide Diversity

- PPO-resistant waterhemp was confirmed prior to Roundup Ready® soybean technology
- As glyphosate-resistance developed, tank-mixing a foliar PPO was a common practice
 1. Shifted selection pressure to PPO-herbicides by implementing one effective site of action
 2. Glyphosate and PPO-Resistant females were allowed to produce seed after application which shifted field populations.

• PPO Resistance Mechanism

1. Is there a difference between soil and post applied resistance
 - A. No, the same low level resistance exists in the seed/plant seed until maturity
2. Why do soil applied PPO-inhibitors still provide activity?
 - A. Difference in Herbicide Dose
 - i. Foliar applied PPO-inhibitors are intended to control what is emerged at the time of application (Low Rate)
 - ii. Soil applied PPO-inhibitors are applied at high doses intended to control plants from application up to 6-8 weeks after (high rate). The higher dose is still able to overcome the low-level resistance mechanism to maintain activity
 - B. How does PPO resistance affect residual activity?
 - i. If no other effective sites of action are utilized, PPO-resistant individual plants will emerge first as the dose degrades enough in the soil that it can no longer overcome the resistance mechanism
 - ii. May see slightly less residual for a resistant biotype vs. a susceptible biotype

Glyphosate + PPO Resistant Biotype Management Tactics

Use Both Chemical and Cultural Practices to Improve Overall Weed Management.

• Chemical Strategies.

- When Using Soil Applied PPO-inhibitors
 1. Include at least one additional effective site of action such as examples listed below
 - A. Authority® Elite herbicide (sulfentrazone + s-metolachlor)
 - B. Authority® MTZ DF herbicide (sulfentrazone + Metribuzin)
 - i. Include additional effective site of action to Authority® Brand herbicide
 - a. Group 5 (metribuzin), group 15 (Anthem® MAXX herbicide, or other), group 3 (trifluralin, pendamethalin)
 2. Anthem MAXX herbicide + Metribuzin
- Use LibertyLink® herbicide system, or other Effective Transgenic Herbicide Concept
 1. Offer postemergence options for control
 2. Requires strong pre-emergence and overlapping residual
 - A. Reduce selection pressure on post herbicides
 - B. Preserve yields by removing early-season weed competition
 - C. Maintain effectiveness by increasing sites of action
- If using Roundup Ready® soybean technology
 1. No viable postemergence options
 2. Zero tolerance for weed emergence
 3. Overlapping residual every 14-21 days up to canopy closure

• Cultural that can aid herbicides to reduce populations and weed competitiveness.

- Tillage
 1. Deep tillage to take advantage of shallow germination
 2. Cultivation in wide rows
 3. Hand removal of escapes and clean up field borders to reduce seed production.
- Row Spacing
 - Narrow row spacing to take advantage of quicker canopy formation to prevent seed germination.
- Seeding rate
 - Increase seeding rates to outcompete weeds / establish quicker canopy
- Cover Crops
 - Establish fall cover crops to impede early spring weed emergence
- Crop Rotation
 - Rotate to crops such as corn to take advantage of early canopy closure and more robust herbicide options for control.

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Always read and follow label directions. NOTE REGARDING RESTRICTED USE PESTICIDES: Anthem ATZ herbicide; Athena insecticide, Brigade 2EC insecticide/Miticide, Brigade WSB Insecticide/Miticide, Brigadier Insecticide Capture 3RIVE 3D insecticide, Capture LFR Insecticide, Declare insecticide, Hero Insecticide, Mustang Insecticide, Mustang Maxx Insecticide, Pounce 25WP Insecticide, Stallion Brand Insecticide, Temitry LFR Insecticide/Fungicide, Triple Crown Insecticide, Ethos XB Insecticide/Fungicide and Gladiator Insecticide/Miticide are **Restricted Use Pesticides**. NOTE FOR CALIFORNIA: Accurate Extra herbicide, Aim herbicide, Aim EC herbicide, Aim EW herbicide, Anthem herbicide, Anthem ATZ herbicide, Anthem Flex herbicide, Anthem MAXX herbicide, Authority Assist herbicide, Authority Elite herbicide, Authority First DF herbicide, Authority MAXX herbicide, Authority MTZ DF herbicide, Authority XL herbicide, Cadet herbicide, Chisum Herbicide, Command 3ME microencapsulated herbicide, Crusher Herbicide, Edition Broadspec herbicide, Edition Tankmix Herbicide, Marvel herbicide, Nimble Herbicide, Nuance Herbicide, Preemptor SC fungicide, Report Extra Herbicide, Solstice herbicide, Spartan 4F herbicide, Spartan Charge herbicide, Spartan Elite herbicide, Temitry LFR Insecticide/Fungicide, Topguard EQ fungicide, Zeus Prime XC herbicide, Zeus XC herbicide, Capture 3RIVE 3D insecticide, Ethos XB Insecticide/Fungicide, Hero Insecticide, Mustang Maxx Insecticide, Display cotton harvest aid, Zoro Miticide and VGR Soil Amendment are **not registered for sale or use in California**. VGR Soil Amendment is not a pesticide. Beleaf and Carbine are trademarks of Ishihara Sangyo Kaisha, Ltd. Cercobin is a trademark of Nippon Soda Co., LTD. Sovran is a registered trademark of BASF. FMC, 3RIVE 3D, Accurate, Aim, Anthem, Athena, Authority, Brigade, Brigadier, Cadet, Capture, Chisum, Command, Crusher, Declare, Display, Edition, Ethos, Preemptor, Fracture, Fyfanon, Gladiator, Hero, Koverall, LFR, Marvel, Mustang, Nimble, Obey, Pounce, Report, Rhyme, Rovral, Shark, Solida, Solstice, Spartan, Stallion, Temitry, Topguard, Topguard Terra, VGR and Zeus are trademarks and HatchTrak and Investing in farming's future are service marks of FMC Corporation or an affiliate. ©2016 FMC Corporation. All rights reserved. 11/16

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