

Effective Weed management in Soybean trait systems.

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Weed Management vs. Weed Control

Weed management is more than killing weeds

- It's about managing weed populations
 - Minimizing weed competition throughout the life of the crop
 - Timing of applications
 - Duration and length of control
 - Minimizing the risk of failure
 - Reducing or eliminating crop response
 - Build your weed management plans in multi year crop rotation blocks.
 - Know the “driver weeds” in the field or farm.



Herbicide Sites of Action Group Codes (example AI's in parentheses)

- 1 – Accase inhibitor (fluazifop, clethodim)
- 2 – ALS inhibitor (imazethyapyr, cloransulam)
- 3 – Microtubule inhibitor (trifluralin, pendimethalin)
- **4 – Synthetic auxin (dicamba, 2,4-D)**
- **5 – Photosystem II inhibitor (atrazine, metribuzin)**
- 6 – Photosystem II inhibitor (bentazon, bromoxynil)
- 7 - Photosystem II inhibitor (diuron, linuron)
- 8 – Lipid synthesis inhibitor (butylate, triallate)
- **9 – EPSP synthase inhibitor (glyphosate)**
- 10 – Glutamine synthetase inhibitor (glufosinate)
- 12 – Phytoene desaturase inhibitor (fluridone)
- 13 – DOXP synthase inhibitor (clomazone)
- **14 – PPO inhibitor (fomesafen, sulfentrazone)**
- **15 – Long chain fatty acid inhibitor (s-metolachlor, acetochlor)**
- 16 – specific site unknown (ethofumesate)
- 17 – nucleic acid inhibitor (MSMA)
- 19 – auxin transport inhibitor (diflufenzopyr)
- 22 – Photosystem I inhibitor (paraquat, diquat)
- **27 – HPPD inhibitor (mesotrione, isoxaflutole)**



Resistant Weeds by State by SOA *

North Dakota

Kochia – 2,4,5,7,9; Russian thistle – 2,9
 Wild mustard – 2; Eastern black nightshade – 2
 Redroot pigweed – 2; Marshelder – 2
 Common ragweed – 9; Tall waterhemp - 9
 Horseweed – 9; Green foxtail – 3
 Wild oat – 1,2; Downy brome - 2

South Dakota

Common sunflower - 2
Kochia – 2, 9
Tall waterhemp – 9
 Common ragweed – 9
Horseweed – 9
 Wild Oat – 1, 2

Nebraska

Kochia – 4,5,9
 Tall waterhemp – 2,4,5,9,14,27
 Common ragweed – 9
 Giant ragweed – 9
 Horseweed – 9
 Palmer amaranth – 5,9,27
 Shattercane - 2

Kansas

Redroot pigweed – 5; Common sunflower – 2
 Common cocklebur – 2; Bushy wallflower – 2
 Flixweed – 2; Henbit deadnettle - 2
 Kochia – 2,4,5,9; Tall waterhemp – 2,5,9,14
 Common ragweed – 9; Giant ragweed – 9
 Horseweed – 2,9; Palmer amaranth – 2,4,5,9,27
 Shattercane – 2; Japanese brome – 2; Cheat – 2

Minnesota

Common lambsquarters – 5
 Velvetleaf – 5
 Redroot pigweed - 5
 Common cocklebur - 2
 Kochia – 2
 Tall waterhemp – 2,9,14
 Common ragweed – 2,9
 Giant ragweed – 2,9
 Wild Oat – 1
 Giant foxtail – 1,2
 Giant green foxtail – 1,2
 Yellow foxtail - 2

Iowa

Common lambsquarters – 5
 Pennsylvania smartweed - 5
 Common cocklebur – 2
 Common sunflower – 2
 Kochia – 5
 Tall waterhemp – 2,5,9,14,27
 Giant ragweed – 2,9
 Horseweed – 9
 Shattercane - 2
 Giant foxtail – 1,5

*Source – Survey of Herbicide Resistant Weeds 5/2019, number following weed indicates site of action with resistance



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The Principles of Managing Weed Resistance are the same regardless of the herbicide trait.

- The best protection against resistance comes from....your management
 - Aaron Hager, U of IL - “The best predictor of whether glyphosate-resistance was in a field had to do with whether a farmer practiced herbicide mixing. It could be using tank mixes or pre-mixes, but the key is that you have to have two herbicides that are effective.”
 - U of IL, examined over 500 site years of farm records and determined that fields where 2.5 SOA compared to 1.5 SOA were 83X less likely to develop resistance. Evans, et. al. 2016 Pest Management Science
- Proper management
 - Will prevent/delay selection on a growers farm
 - If resistant weeds are introduced, proper management will not allow them to get established and fill the seedbank with resistant weeds



Syngenta resistant management principles

- Start clean, utilizing tillage or an effective burndown PLUS a preemergence residual herbicide application
- Always use a two-pass system - pre followed by properly timed post-emergence application using herbicides at full rate with recommended adjuvants
- Use multiple effective MoA's with efficacy on target weeds (activity on the same weed species)
- Use diversified management programs such as cover crops, mechanical weed control and crop rotation
- Do not allow weeds to go to seed and add to the seed bank (remove any escapes early: hand weed, spray off or cut out patches)
- Utilize good agronomic practices – narrow rows, increased plant populations, and other practices which promote crop growth and competitive ability



We use a soil applied, soil active herbicides

- Eliminate early season weed competition
 - By not allowing the weeds to emerge with the crop
 - Limit in-season weed growth and it's resulting yield impact.
- Manage weeds with
 - an application of a soil applied, soil active herbicide
 - Properly timed post treatments– 21 to 28 days after crop emergence.



Good, better,... BEST

- Good – rotate sites of action
- Better – multiple effective sites of action
- **Best – multiple effective sites of action with overlapping residual**
 - LIMIT POST SELECTION PRESSURE
- Syngenta strategy has been and will be
 - To employ premixes using multiple effective SOA's
 - Premixes built using effective, not reduced rates
 - Premixes with good residual activity

Classification: Public



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Regardless of Trait Platform

- Apply a preemergence herbicide containing at least two effective modes of action. Examples include:
 - Boundary – Two modes of action (Group 5,15) - non PPO option
 - BroadAxe XC – Two modes of action (Group 5,14)
 - Prefix - Two modes of action (Group 5,14)
 - All three options above provide a strong start for control of waterhemp and Palmer Pigweed.
 - BroadAxe XC provides best activity against kochia and morningglory



Kochia management in Soybeans.

Why control is needed before Kochia emergence.



2 to 4" Kochia Removed by hand.

When the Kochia is hand pulled it doesn't look like it should be difficult to control with post emerge herbicides. But...



Look below the surface.

There is a massive amount of biomass both above and below the ground. 2" to 4" Kochia, 30 days after germination, roots reach 20" deep making post emerge control difficult – if not impossible

30 oz Broadaxe XC + 8 oz/acre 2,4-D applied 10 days prior to planting

Untreated Kochia



Photo taken 40 days after application

2020 Resistance Management Recommendations for various Soybean trait platforms in South Dakota

Comprehensive soybean trait platform recommendations using multiple, effective mode of action residual products for management of *problem weeds: including Marehail, Waterhemp, Foxtail species and Kochia*

Soybean Trait Platform	Pre emerge tank mix burndown for emerged weeds	PRE at Planting	Overlapping Residual 21 to 28 days after PRE
Conventional Soybeans	3 to 4 pt./acre Gramoxone SL 2.0 Add 1% V/V COC	30 oz/acre BroadAxe XC + 4 oz./acre metribuzin*	Dual Magnum ⁴ 1 pt./acre + Flexstar ¹ 12 to 16 oz/acre + Fusilade DX (6 to 8 oz./acre) for volunteer corn plus COC (1% V/V) & AMS (8.5 to 17 lbs./100 gal)
Roundup Ready II Yield	3 to 4 pt./acre Gramoxone SL 2.0 Add 1% V/V COC	28 oz/acre BroadAxe XC + 4 oz./acre metribuzin *	Dual Magnum ⁴ (1 pt/acre) + Flexstar GT ¹ (2.68 pts to 3.5 pts/acre) + Fusilade DX (6 to 8 oz./acre) for volunteer corn plus COC (1% V/V) & AMS (8.5 to 17 lbs./100 gal)
Liberty Link	3 to 4 pt./acre Gramoxone SL 2.0 Add 1% V/V COC	28 oz/acre BroadAxe XC + 4 oz./acre metribuzin *	Dual Magnum (1 pt/acre) + plus Glufosinate (Liberty) (32 oz./acre) + Fusilade DX (6 to 8 oz./acre) for volunteer corn plus AMS (8.5 to 17 lbs./100 gal)
Roundup Ready II Xtend	3 to 4 pt./acre Gramoxone SL 2.0 Add 1% V/V COC	28 oz/acre BroadAxe XC + 4 oz./acre metribuzin *	Tavium plus VaporGrip Technology ² (56.5 oz/acre) + Glyphosate (Roundup Power Max), (32 oz./acre) + Fusilade DX (6 to 8 oz./acre) for volunteer corn
E3 (Enlist)	3 to 4 pt./acre Gramoxone SL 2.0 Add 1% V/V COC	28 oz/acre BroadAxe XC + 4 oz./acre metribuzin *	Dual Magnum (1 pt/acre) + plus Enlist One ³ (2 pt./acre) + plus Glyphosate (32 oz/acre) or Liberty (32 oz./acre) + Fusilade DX (10-12 oz./acre) for volunteer corn Add AMS (8.5 to 17 lbs./100 gal)

Read and follow all label requirements for timing, use rates, and adjuvants. Follow PRE or At Plant applications with Early POST 21 to 28 days after initial application.

¹ Refer to the Flexstar or Flexstar GT label for specific Geography and rate recommendations.

² Use an approved drift reducing agent (DRA) listed on the Tavium with VaporGrip Technology label and/or web site detailed below. Read and follow all label restrictions.

Label requirements for Tavium With VaporGrip Technology can change and should be checked for every application. <http://www.Taviumtankmix.com>

³ Label requirements including tank mix approvals and nozzle selection for Enlist One can change and should be checked prior to each application. <https://www.enlist.com/en/approved-tank-mixes/enlist-one.html>

⁴ For control of Volunteer corn up to 12", add 6 to 8 oz./acre Fusilade.

* The addition of Metribuzin adds an additional, effective mode of action to the pre emergence application.



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Summary- The Guiding Principles to Weed and Resistance Management

- Start clean and apply a preemergence residual herbicide with multiple effective sites of action.
- Overlap preemergence residual with postemergence residual herbicide program with multiple effective sites of action.
- Use full label use rates, follow proper application timing and procedures.
- Adjust herbicide program to target your most resistant prone and competitive weeds.



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Some seed treatment offers are separately registered products applied to the seed as a combined slurry. **Always read individual product labels and treater instructions before combining and applying component products.** Orondis Gold is a combination of separately registered products: Orondis Gold 200 and Orondis Gold B.

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