



Herbicide-Resistant Kochia

Herbicide-resistant plants often develop from repeated use of a single mode of action herbicide. Plants can then develop resistance to additional herbicides, and then require integrated, and more costly, management techniques.

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Kochia is one of the most troublesome annual broadleaf weeds in crop fields, pastures, roadsides, wastelands, and ditch banks across the U.S. Great Plains. If not controlled early, kochia reduces yields up to 60% in crops and can be a major problem in chem-fallow cropping systems.

Kochia exhibits rapid growth and flowers in late summer, producing more than 100,000 seeds per plant, which are spread by wind, water, equipment, vehicles, etc. At maturity, the kochia plant breaks off at the base of the stem and “tumbles” across the landscape with the prevailing wind, which rapidly disperses seed. In addition, kochia is well-adapted to drought, salt, heat, and cold conditions.

Herbicide-resistant Cases

As of February, 2018, glyphosate-resistant kochia has been identified in Glacier, Toole, Pondera, Teton, Liberty, Chouteau, Hill, Blaine, Phillips, Custer, and Big Horn counties (indicated by shaded areas on the back page map), with more counties likely to be added as testing continues. Glyphosate-resistant kochia has resulted from repeated use of a single mode of action herbicide, i.e., glyphosate, for weed control in fallow, pre-plant or post-harvest burndown or Roundup Ready crops across the northwestern United States. Atrazine-resistant kochia was first identified along Montana railroads in 1984 and since then, resistance to additional herbicides (sulfonyleurea, dicamba) has continued to increase with glyphosate-resistant kochia being identified in 2012 in Liberty and Hill counties.



Prashant Jha

Integrated Management Techniques

To combat herbicide-resistant kochia, it is critical that a multi-faceted, integrated approach be utilized. Herbicide-resistant kochia developed as a result of repeated herbicide use. Solutions to this problem require actions beyond more herbicide applications.

Recommendations

- **Destroy kochia populations** - Eliminate any kochia plants prior to flowering that have survived herbicide application in-crop using alternative late-season herbicides or hand-weeding and any that existed in stubble using alternative postharvest/burndown herbicides (multiple modes of action) or tillage. The main goal should be to prevent seed production from those survivors.
- **Diversify crop rotation** - Diverse crop rotations inherently use multiple management tactics including herbicides with different modes of action. Cover crops and other cultural practices may be utilized as an integrated weed management strategy.
- **Till where appropriate** - Kochia seedlings emerge from very shallow soil depths, so tillage can potentially reduce the soil seed bank by burying short-lived seeds. Tillage also helps manage kochia plants before they start producing seed.

Herbicide Application

The following are herbicide recommendations for applying herbicides to glyphosate-resistant kochia:

- Apply herbicides at full labeled rates. Repeated exposure to low herbicide rates allows survival of resistant individuals and perpetuate herbicide-resistance.
- Scout fields regularly prior to and following herbicide applications. Promptly destroy any weed escapes prior to flowering.
- Rotate herbicides and tank-mix herbicides with different modes of action over multiple growing seasons in all fields. Consecutive applications of herbicide of the same

FIGURE 1. A ‘tumble’ pattern of kochia that exists following an herbicide application is an indication of potential herbicide-resistant kochia.

families (indicated by group number) increases the potential for developing herbicide resistance.

- Use best herbicide application techniques. Improperly calibrated sprayers, incorrect nozzles, poor water quality, etc. decreases herbicide effectiveness and can perpetuate resistance.
- Target early control of kochia. Kochia plants should be targeted as early as 3 - 4 inches for effective control with post-emergence herbicides.
- Include soil-residual herbicides (Valor, Spartan Charge, Authority MTZ, Sencor, Prowl + Outlook) in fall or early spring burndown program(s) in wheat stubble depending on the crop rotational intervals to reduce the resistant seed bank and selection pressure from repeated post-emergence herbicide applications. A majority of these soil-residual products identified are also compatible with a dry pea rotation.

Glyphosate - Resistant Testing

Growers who suspect a glyphosate-resistant weed population should contact their local MSU Extension office for instructions on submitting a sample for testing. Testing is offered as a free service through the MSU-Southern Ag Research Center Weeds Lab:

748 Railroad Highway
 Huntley, MT 59037
 Phone: 406-348-3400
 Email: pjha@montana.edu

For more information

Glyphosate-Resistant Kochia in Montana: Herbicide Recommendations and Best Management Practices for Growers. Montana State University Extension Research Bulletin No. 4602.

Shaded areas represent counties with confirmed cases of glyphosate-resistant kochia (Glacier, Toole, Liberty, Hill, Blaine, Phillips, Pondera, Teton, Chouteau, Big Horn and Custer).

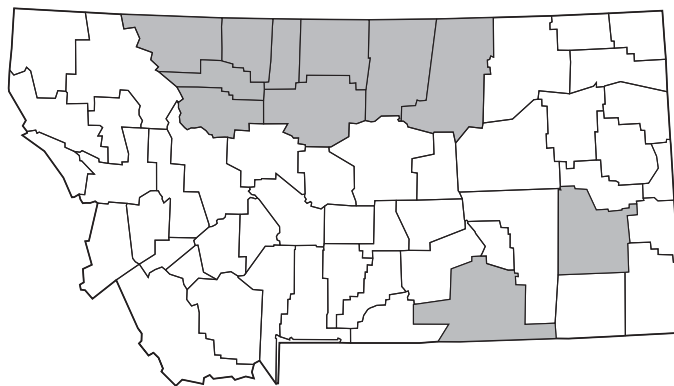


TABLE 1. Herbicide Options for Glyphosate-Resistant Kochia Control in Wheat-Fallow Rotation

Scenario	Herbicide	Groups
Wheat	Talinor/Huskie (15 oz) + Starane (4 oz)	27 + 6 + 4
Wheat	Starane NXT (27.4 oz) + NIS (0.5%)	4 + 6
Wheat	Bronate Advanced (25.6 oz) / Carnivore (1.5 pt)	4 + 6
Burndown	Gramoxone SL (32-48 oz)	22
Burndown	Sharpen (2 oz/a) + 2,4-D LV4 ester (8 oz)	14 + 4
Burndown	Kochiavore (2.5 pt)	4 + 6

TABLE 2. Herbicide Options for Glyphosate-Resistant Kochia Control in Wheat-Pulse Rotation

Scenario	Herbicide	Groups
Wheat	Starane NXT (27.4 oz)	4 + 6
Wheat	Bronate Advanced (25.6 oz) / Carnivore (1.5 pt)	4 + 6
Burndown	Gramoxone SL (32-48 oz)	22
Burndown	Sharpen (2 oz) + 2,4-D LV4 ester (8 oz)	14 + 4
Burndown	Kochiavore (2.5 pt)	4 + 6



This article is for education purpose only. Mention of a specific product should not be considered as approval, nor should failure to mention a product be considered disapproval. Read the product label before using any herbicide.

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