

Kochia Management in Soybeans



Management of this summer annual weed is vital – kochia can reduce soybean yields by 70 percent or more.

Kochia Distribution and Biology

- Kochia is well adapted to the Great Plains and western regions of the U.S. and Canada because it is tolerant to hot, dry conditions and soils with high salinity.
- Kochia, which can produce up to 30,000 seeds per plant, can emerge as early as February in Kansas and March in the northern Great Plains, but germination can extend through August throughout the Great Plains states.
- Kochia is competitive with crops and problematic in fallow periods between crops. Early-emerging kochia can reduce crop yields by 70 percent or more and can also interfere with harvest.
- Kochia has an alternating arrangement of linear leaves that are covered with dense hairs. It can grow to a height of 6 feet and has a spherical shape, especially when growing with limited competition. Kochia roots can extend down 15 feet and measure 21 feet in diameter.
- Kochia is especially hard to control because seeds initiate germination within 2 to 3 hours under favorable conditions, and seedlings establish quickly.



Photo Credit: Dallas Peterson, Kansas State University

Seedling kochia plants. Research in Kansas, Nebraska, Colorado and Wyoming found that more than 90 percent of kochia emerges before April 1, but germination can extend through August in the Great Plains states.

Herbicide Resistance in Kochia

Evolution of herbicide-resistant kochia is rapid due to high genetic diversity, short seed life and heavy reliance on herbicides for control in minimum- and no-till cropping systems. Kochia has developed resistance to the four different herbicide sites of action listed in Table 1. Many kochia populations are resistant to multiple sites of action. One population in Kansas was resistant to all four herbicide sites of action listed in Table 1.

Table 1. Herbicide resistance in kochia has been shown in these sites of action.

Group #	Group 2	Group 4	Group 5	Group 9
Site of Action	ALS Inhibitors	Synthetic Auxins	Photosystem II Inhibitors	EPSP Synthase Inhibitors
Product Examples	Finesse [®] , Ally [®] , Harmony [®] , Pursuit [®]	Clarity [®] , Starane [®]	AAtrex [®] , metribuzin	Roundup [®]

Chemical control of even non-herbicide-resistant kochia can be difficult due to application and spray coverage issues, inadequate herbicide rates, adjuvant selection, plant size and environmental stress at time of application.

Management of Kochia in Soybeans

1. Rotate crops. Crop rotation is important to help diversify kochia-control strategies and herbicide programs over time.
 - More effective kochia herbicides are available in grass crops than in broadleaf crops, especially for postemergence control. A competitive winter wheat crop can greatly suppress kochia emergence and growth.
2. Start clean. It is imperative to control kochia in early spring because of its emergence patterns, dense populations and difficult-to-control large plants.
 - Kochia should be controlled at or before planting.
 - Very few effective postemergence herbicides are available for kochia control in broadleaf crops.

Table 2. Soil-applied herbicides for kochia control.

Herbicide	Group #	Crops	Comments
Dicamba products	4	Fallow, corn, sorghum	<i>Residual is dependent on rate and time of year. Observe preplant intervals.</i>
Authority® products	14	Soybeans	<i>Residual is dependent on rate.</i>
Valor® products	14	Corn, sorghum, soybeans	<i>Not as effective as Authority products.</i>
Atrazine	5	Fallow, corn, sorghum	<i>Some resistant populations have been confirmed.</i>
Metribuzin	5	Fallow, soybeans	<i>Some resistant populations have been confirmed.</i>
Balance® products, Callisto® products	27	Corn	<i>Most effective when combined with atrazine.</i>
Scoparia®	27	Fallow	<i>Observe guidelines for residuals in relation to future crops.</i>
Sharpen®	14	Corn, sorghum, soybeans	<i>Residual is dependent on rate.</i>
Zidua®	15	Corn, soybeans	<i>Highest labeled rates required for good control.</i>
Spartan®	14	Fallow, soybeans, sunflowers	<i>Residual is dependent on rate.</i>

3. Apply an effective soil-applied, pre-emergence herbicide. Kochia can be controlled by a number of residual herbicides if activated before germination.
 - Residual herbicides should be applied in late fall or very early spring to be activated before kochia starts to germinate.
 - Early season control with pre-emergence residual herbicides greatly reduces the reliance on postemergence herbicides for control.
4. Target small weeds after they emerge. Timing of the herbicide application is critical for postemergence control of kochia.
 - To optimize herbicide performance, apply postemergence herbicides with the recommended adjuvants, tank-mix partners, spray volumes and application guidelines before kochia grows taller than 3–4 inches.
5. Prevent seed production. Kochia is day-length sensitive and begins flowering in late July and August. Due to its short seed life, killing kochia before it flowers and produces seed is an effective way to manage it. Strategic tillage and cover crops might be helpful in minimizing kochia seed production.
 - Fall cover crops can suppress kochia establishment and out-compete young seedlings in the spring.
 - Tillage controls kochia by disrupting the roots and dehydrating plants, but it also depletes soil moisture and leaves soil more vulnerable to wind and water erosion.

Table 3. Postemergence herbicides for kochia control.

Herbicide	Group #	Crops	Comments
Dicamba products	4	Fallow, corn, sorghum, wheat, Xtend® crops (soybeans and cotton)	Some resistant populations have been confirmed.
Starane® products	4	Fallow, corn, sorghum, wheat	Some resistant populations have been confirmed.
Huskie®	27 & 6	Sorghum, wheat	Apply to small plants.
Glyphosate	9	Burndown, fallow, glyphosate-tolerant crops	Many resistant populations.
Liberty®	10	Burndown, glufosinate-tolerant crops (canola, corn, cotton, soybeans)	Apply to small plants with high spray volume and ammonium sulfate. Less effective in dry conditions.
Paraquat	22	Burndown, fallow	Apply to small plants with surfactant and high spray volume.
Callisto®, Laudis®, Armezon®, Impact®	27	Corn	Add atrazine to optimize control. Use recommended adjuvants.
Zidua®	15	Wheat	Residual control only.



Photo Credit: Dallas Peterson, Kansas State University

Glyphosate-resistant kochia can spread through wind-blown plants from an adjacent field. As kochia matures, the stem can separate from the root and become tumbleweeds, causing seed to spread across great distances.

For more information and links to additional resources, visit www.IWillTakeAction.com.

Technical editing for this publication was led by Dallas Peterson, Ph.D., Kansas State University; Curtis Thompson, Ph.D., Kansas State University; and Richard Zollinger, Ph.D., North Dakota State University; in partnership with researchers from other universities in the soybean-growing regions of the United States. Take Action is supported by BASF, Bayer, Dow, DuPont, FMC, Monsanto, Syngenta, Valent and corn, cotton, sorghum, soy and wheat organizations. The United Soybean Board and all Take Action partners, including the companies mentioned above, neither recommend nor discourage the implementation of any advice contained herein, and are not liable for the use or misuse of the information provided. ©2018 United Soybean Board

Brought to you by the soy checkoff. 

