



# KOCHIA

## Key Characteristics

**Type:** Summer annual, common in cultivated fields, rangeland, and pasture.

**Germination:** Early spring to July, favors low temperatures.

**Seed Production:** Each plant yields 15,000 to 25,000 seeds.

**Seed Dispersal:** Mature plants tumble and spread seeds via wind.

**Root System:** Deep taproot enhances resilience.

## Plant Growth

**Competitive Environments:** Erect, single-stemmed.

**Open Environment:** Bushy, multibranched.

**Leaf Structure:** Early growth (button stage) has fine, dense white hairs that inhibit herbicide penetration by suspending droplets above the leaf cuticle.

After the button stage, as leaves grow the hair density decreases and plants will have smoother tops with hairy undersides. Kochia becomes more difficult to control as it matures, and products become less effective when the plant reaches heights of 10-15 cm or more.

## ENVIRONMENTAL ADAPTABILITY

Highly adaptable to diverse conditions, including saline and drought-prone areas. Kochia responds to fertility and tends to be larger and produces more seeds in cultivated fields.

## KOCHIA RESISTANCE OVERVIEW

### Genetic Variability:

Kochia can cross and self-pollinate which results in wide genetic diversity, including mutations linked to herbicide resistance.

## REPRODUCTIVE BIOLOGY

**Protogynous Flowering:** Female parts are receptive before male parts develop, promoting outcrossing. Many resistance traits are genetically transferable.

## CONFIRMED HERBICIDE RESISTANCE

**Group 2 (ALS Inhibitors):** First confirmed in 1988 (MB & SK).

**Group 4 (Auxin Mimics):** First confirmed in 2015 (SK).

**Group 9 (Glyphosate/EPSPS Inhibitors):** First confirmed in 2011 (AB); 87% of tested plants in Saskatchewan were resistant by 2019.

**Group 14 (PPO Inhibitors):** First confirmed in 2021 (SK).

## TRENDS

Most Kochia plants show resistance to Group 2 and many to Group 9.

Many plants have stacked resistance to multiple groups, severely limiting herbicide options.



Photo credit to Eric Westra, Colorado State University. Typical kochia in a cropping system



Photo credit to Eric Westra, Colorado State University. Button stage with fine dense hairs.



Photo credit to Phil Westra, Colorado State University. Kochia growth in the path of tumbling.



| Application                           | Product                              | Active Ingredients                     | Product Group | Notes   |
|---------------------------------------|--------------------------------------|--|---------------|---|
| <b>Pre-Seed (Cereal &amp; Canola)</b> |                                      |  |               |   |
|                                       | <u>EMPHASIS</u> ® and Glyphosate     | Carfentrazone, bromoxynil & glyphosate | Group 6 & 14  | Option for Glyphosate group 9 and ALS group 2 resistant biotypes. |
|                                       | <u>EMPHASIS</u> ® MAX                | Bromoxynil + carfentrazone             | Group 6 & 14  |   |
|                                       | <u>GORDEX</u> ™                      | DICAMBA + florasulam                   | Group 2 & 4   | Option for Glyphosate group 9 and ALS group 2 resistant biotypes. |
|                                       | <u>INVOLVE</u> ® 50 WDG & Glyphosate | Tribenuron-methyl & glyphosate         | Group 2 & 9   |   |
| <b>Cereals</b>                        |                                      |  |               |   |
|                                       | <u>2, 4-D Ester 700</u>              | 2, 4-D Ester                           | Group 4       |   |
|                                       | <u>BADGE</u> ®                       | Bromoxynil & MCPA Ester                | Group 4 & 6   | Spray before plants are two inches high.                          |
|                                       | <u>BROMOTRIL</u> ®                   | Bromoxynil octanoate ester             | Group 6       | Spray before plants are 2 inches high.                            |
|                                       | <u>ESTEEM ALL IN</u> ®               | Fluroxypyr & clopyralid                | Group 4       |   |
|                                       | <u>FORCEFIGHTER ALL IN</u> ®         | Fluroxypyr, bromoxynil & MCPA          | Group 4 & 6   | Option for Glyphosate group 9 and ALS group 2 resistant biotypes. |
|                                       | <u>OUTSHINE ALL IN</u> ®             | Florasulam, fluroxypyr & MCPA Ester    | Group 2 & 4   | Option for ALS resistant biotypes.                                |
|                                       | <u>MCPA ESTER 600</u>                | MCPA Ester                             | Group 4       | 2-4 leaf rapidly growing, good growing conditions.                |
|                                       | <u>RUSH 24 ALL IN</u> ®              | Fluroxypyr & 2, 4-D Ester              | Group 4       | Including ALS resistant biotypes.                                 |
| <b>Pulses</b>                         |                                      |  |               |   |
|                                       | <u>SQUADRON</u> ®                    | Metribuzin                             | Group 5       |   |
| <b>Canola</b>                         |                                      |  |               |   |
|                                       | <u>ADAMA GLUFOSINATE 150 SL</u>      | Glufosinate                            | Group 10      |   |

**INTEGRATED PEST MANAGEMENT** (A proactive approach is crucial in effective Kochia management)

- Diverse crop rotations and increased crop competition/density.
- Mitigate saline areas.
- Pre-seed strategies are effective.
- In crop: aim to spray early. Kochia emerges early and grows quickly, and is easier to control when small.
- Always **mix and rotate** herbicides – Read product labels for recommended tank mix partner, rate, and timing.
- Early spring tillage and mowing plants can both be effective management tools.
- Prevent Kochia plants from setting seed.
- Higher water volumes are most effective in reaching the plant cuticle through its dense hairs.

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