

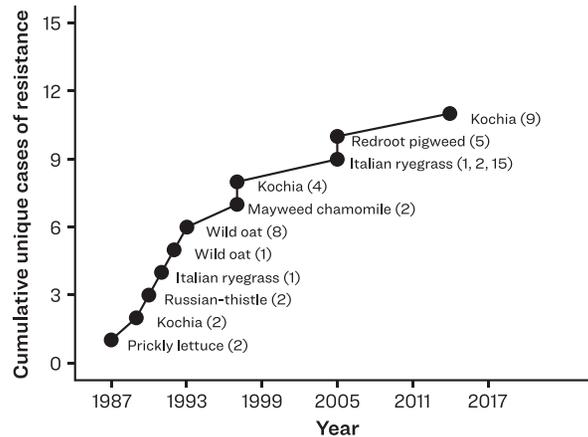
What Is Herbicide Resistance?

It is the ability of a weed species to survive a herbicide treatment to which the original population was susceptible.

- Some individuals in the population may be naturally resistant to that herbicide/ herbicide site of action.
- Although the occurrence is “one in a million,” if the same herbicide/herbicide site of action is used repeatedly, the resistant individuals continue to survive and reproduce while the susceptible die.
- Over time, this selection pressure results in resistance dominating the population, rendering the herbicide ineffective.

Best Management Practices to Prevent or Delay Resistance

- Integrated weed management—multiple weed control practices, including chemical, cultural, mechanical.
- Tank-mix herbicides with different sites of action but overlapping control of the same weed species.
- Crop rotation, use clean-certified seed, and avoid spreading weeds.
- Follow the label for correct rates, methods, and timing.
- Good recordkeeping and scouting fields regularly (before and after herbicide application).
- Zero tolerance of weed escapes.



Chronology of herbicide resistance in Idaho—eleven documented cases, seven weed species, and seven herbicide sites of action. Numbers in parentheses indicate herbicide groups to which the weed is resistant. Heap, I. 2020. *The International Herbicide-Resistant Weed Database*. www.weedscience.org

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KNOW YOUR **HERBICIDE-RESISTANT WEEDS**



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Idaho Herbicide-Resistant Weeds

Match the numbers with the guide on the right to identify the herbicide to which a weed is resistant.



Kochia
(*Bassia scoparia*)



Italian Ryegrass
(*Lolium multiflorum*)



Wild Oat
(*Avena fatua*)



Russian-Thistle
(*Salsola tragus*)



Redroot Pigweed
(*Amaranthus retroflexus*)



Prickly Lettuce
(*Lactuca serriola*)



Mayweed Chamomile
(*Anthemis cotula*)



Common Lambsquarters
(*Chenopodium album*)

Barnyardgrass
(*Echinochloa crus-galli*)

Look out for these potential herbicide-resistant weed threats. These weeds are common in Idaho crops. There are reports of poor control after certain herbicide applications.

Herbicide Sites/Modes/Mechanisms of Action

Classification and Groups: The Weed Science Society of America (www.wssa.net) has created an international classification system where herbicides with the same primary site of action are grouped together. There are twenty-four known and one unknown herbicide sites of action and each group has been given a number. Seven herbicide sites of action are listed below, followed by examples of herbicides in each group (*active ingredients* and trade names).

Site of Action: The specific protein or biochemical site in the plant to which the herbicide binds.

Mode of Action: The plant physiological or growth processes that the herbicide disrupts.

- 1 ACCase Inhibitor**
pinoxaden (Axial)
clethodim (Select Max)
fenoxaprop (Acclaim, Tacoma)
- 2 ALS Inhibitor**
rimsulfuron (Matrix, Solida)
imazamox (Beyond, Raptor)
florasulam (Goldsky)
- 4 Auxin Mimics**
2, 4-D (various)
clopyralid (Stinger)
picloram (Tordon, Grazon)
- 5 Photosystem II Inhibitor**
atrazine (AAtrex)
metribuzin (TriCor, Sencor)
hexazinone (Velpar)
- 8 Lipid Synthesis Inhibitor** (not ACCase)
EPTC (Eptam)
trilalate (Far-GO)
ethofumesate (Norton)
- 9 EPSPS Inhibitor**
glyphosate (Cornerstone, Roundup PowerMax, Touchdown)
- 15 Very Long-Chain Fatty Acid Synthesis Inhibitor**
S-metolachlor (Dual Magnum)
dimethenamid-P (Outlook)
pyroxasulfone (Zidua)