

Weed Science Society of America

FACT SHEET

HRAC Mode of Action Updates



The Herbicide Resistance Action Committee (HRAC) is an international body supporting growers in the fight against herbicide-resistant weeds. This fact sheet focuses on the organization's recent update of its Herbicide Mode of Action Classification System, which is a vital tool in the development of effective weed control programs.

What is the HRAC Mode of Action Classification System & why is it important?

Mode of action describes the way an herbicide works to control weeds – whether by interrupting a certain biological process or by impeding certain enzymes. The HRAC Mode of Action Classification System groups herbicides by their mode of action and provides a ready reference for growers as they design integrated weed management programs. By using diverse modes of action for weed control, they can delay the evolution of herbicide resistance.

Why was the mode of action classification system revised?

The HRAC classification system was last updated in 2010. This latest revision incorporates new active ingredients brought to market over the last decade, as well as new insights into modes of action and chemical family classifications.

What changes have been made to the classification system?

After many months of review and research, the committee has made the following changes:

- **5 new or reclassified modes of action:**
 - Fatty acid thioesterase inhibitors (cinmethylin)
 - Homogentisate solanesyltransferase inhibitors (cyclopyrimorate)
 - Solanesyl diphosphate synthase inhibitors (aclonifen)
 - Serine-threonine protein phosphatase inhibitors (endothall)
 - Inhibition of dihydroorotate dehydrogenase
- **15 new active ingredients:**
 - Acetolactate synthase (ALS) inhibiting herbicides triafamone and metazosulfuron
 - Protoporphyrinogen oxidase (PPO) inhibitors trifludimoxazine and tiafenacil
 - Homogentisate solanesyltransferase (HST) inhibitor cyclopyrimorate

- Fatty acid thioesterase (FAT) inhibitor methiozolin
- 4-hydroxyphenylpyruvate dioxygenase (HPPD) inhibitors bicyclopyrone, fenquinotrine and tolfenpyralate
- 1-deoxy-D-xyulose 5-phosphate synthase (DOXP) inhibitor bixlozone
- Very long chain fatty acid (VLCFA) inhibitors ipfencarbazone and fenoxasulfone
- Auxin inhibitors halauxifen and florpyrauxifen
- Dihydroorotate dehydrogenase inhibitor tetflupyrolimet

- **New numerical mode of action codes.**

The updates bring a new, more consistent approach to mode of action coding that relies on numbers instead of the English alphabet. Doing so overcomes global language barriers and aligns with the approach adopted by the Insecticide Resistance Action Committee, Fungicide Resistance Action Committee and Weed Science Society of America. As a result, growers around the world now have a single, trusted code system to help them mix and rotate herbicide modes of action for resistance management.

- **Updated chemical family names.**

The committee also revised and reorganized chemical family groups and subgroups to better highlight the similarities and differences among herbicides with the same mode of action. When a chemical group contained just one active ingredient, the active ingredient was moved into an “Other” group. The committee also aligned their nomenclature with that used by the International Union of Pure and Applied Chemistry (IUPAC).

Where can I get additional information?

HRAC offers a variety of tools and resources to support the recent classification system updates, including:

- A [summary](#) of the mode of action changes, as well as an [in-depth](#) technical description
- An updated herbicide mode of action [poster](#)
- A mode of action classification [look-up app and webtool](#)