

HPPD-inhibitor Resistance Stewardship

The Perspective of the HRAC HPPD-inhibitor Working Group

Created January 31, 2014



HERBICIDE
RESISTANCE
ACTION
COMMITTEE

Working Group Objectives

Since 2009, waterhemp (*Amaranthus tuberculatus*) and Palmer amaranth (*Amaranthus palmeri*) have been identified with resistance to hydroxyphenylpyruvate dioxygenase (HPPD)-inhibitor chemistries used in several agronomic production systems in North America. HPPD-inhibitors can be found in multiple products (Table 1) and have become valuable tools for managing weeds resistant to other herbicides. The objectives of the HPPD-inhibitor Working Group are to develop stewardship recommendations and implement key actions to support the use of HPPD-inhibitors with the intent of prolonging their efficacy in providing weed control solutions for agricultural producers. The objectives will be accomplished by understanding the current resistance situation and providing communication and education tools, consistent stewardship recommendations to stakeholders, and guidance on potential research objectives.

Working Group Stewardship Recommendations to Stakeholders

1. In order to avoid the development of resistance, require HPPD-inhibitors applied preemergence (PRE) and postemergence (POST) to always be used in combination with other products, either in tank mixtures or pre-mixtures.
2. Make applications to small, actively growing weeds.
3. In order to reduce the development of resistance, always use full labeled rate for all applications PRE or POST.

4. Follow explicitly the recommendations for application volume(s), nozzle(s), and other application parameters.

Working Group Recommendations for Label Alignment

1. Include mode-of-action labeling on all HPPD-inhibitor containing products.
2. Strengthen and align resistance management language on HPPD-inhibitor labels.
3. Adopt recommendations made by the HPPD-inhibitor Working Group and incorporate into products labels during revision.
4. Optimize product rate and weed size recommendations on POST applied HPPD-inhibitor labels
5. Emphasize tank mixtures or pre-mixtures with a minimum of two effective modes of action on product labels for driver weeds.

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Table 1. Current herbicide products* containing HPPD-inhibitors

Product Name	Active Ingredients (HPPD-inhibitor in bold)	Market Segment Use	Manufacturer [†]
Balance [®] Flexx	Isoxaflutole	Corn	Bayer CropScience
Prequel [®]	Isoxaflutole plus Rimsulfuon	Corn	DuPont
Corvus [®]	Isoxaflutole plus Thiencarbazone-methyl	Corn	Bayer CropScience
Callisto [®]	Mesotrione	Corn	Syngenta
Callisto [®] Xtra	Mesotrione plus Atrazine	Corn	Syngenta
Callisto [®] Ultra	Mesotrione plus Glyphosate	Corn	Syngenta
Instigate [™]	Mesotrione plus Rimsulfuron	Corn	DuPont
Realm [®] Q	Mesotrione plus Rimsulfuron	Corn	DuPont
Zemax [®]	Mesotrione plus s-Metolachlor	Corn and Grain Sorghum	Syngenta
Lumax [®] EZ	Mesotrione plus s-Metolachlor plus Atrazine	Corn and Grain Sorghum	Syngenta
Lexar [®] EZ	Mesotrione plus s-Metolachlor plus Atrazine	Corn and Grain Sorghum	Syngenta
Halex [®] GT	Mesotrione plus s-Metolachlor plus Glyphosate	Corn	Syngenta
Huskie [®]	Pyrasulfotole plus Bromoxynil	Cereals and Grain Sorghum	Bayer CropScience
Wolverine [®]	Pyrasulfotole plus Bromoxynil plus Fenoxypop-p	Wheat and Barley	Bayer CropScience
Huskie [®] Complete	Pyrasulfotole plus Bromoxynil plus Thiencarbazone-methyl	Wheat	Bayer CropScience
Laudis [®]	Tembotrione	Corn	Bayer CropScience
Capreno [®]	Tembotrione plus Thiencarbazone-methyl	Corn	Bayer CropScience
Impact [®]	Topramezone	Corn	AMVAC
Armezon [®] Herbicide	Topramezone	Corn	BASF

*Product names registered in the United States

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