

Product: **Beyond®** or **Raptor®** herbicide

Group **2** Herbicide

Mode of Action (MOA)

Imazamox, the active ingredient in **Beyond** or **Raptor**, is a **Group 2** (WSSA) herbicide. Herbicides in this group inhibit acetolactate synthase (ALS) or acetohydroxyacid synthase (AHAS), a key enzyme in the biosynthesis of the branched-chain amino acids isoleucine, leucine, and valine. Growth of susceptible plants is inhibited within a few hours after application, but injury symptoms usually appear after 1-2 weeks or more. Meristematic areas become chlorotic, followed by slow, general foliar chlorosis and necrosis. Plant death results from events occurring in response to ALS inhibition and low branched-chain amino acid production. **Beyond** or **Raptor** is readily absorbed by leaves, shoots, and roots; translocates in both the xylem and phloem throughout the plant; and accumulates in areas of active growth to provide postemergence control of emerged weeds as well as moderate residual control of weeds.

Any weed population may naturally contain plants resistant to **Group 2** herbicides. Weeds resistant to **Group 2** herbicides may be effectively managed using herbicide(s) from a different group and/or by using cultural, mechanical, and biological control practices. Consult your local BASF representative, state cooperative extension service, land grant university weed scientist, professional consultants, or other qualified authority to determine appropriate actions if you suspect resistant weeds. These advisors can also help you develop a weed control plan tailored for your situation.

Resistance Management

While weed resistance to **Group 2** herbicides is common in a number of weed species, these herbicides remain an important component of successful weed control programs. Resistance management should be part a diversified weed control strategy that integrates multiple options including chemical, cultural, mechanical, and biological control tactics. Cultural control tactics include agronomic practices that improve the competitive ability of the crop via rotation, variety/cultivar selection, precision fertilizer placement and optimum crop plant density. Agronomic practices should also limit the development and spread of weeds by using clean crop seed (e.g. certified seed), prevent crop trait out-crossing, control weed influx from field borders, and manage weed seed at harvest / post-harvest to minimize the carryover weed seed-bank into the following crop. Mechanical control tactics include timely tillage where practical, equipment cleaning to avoid weed spread, and minimization of harvest crop seed losses in the field through close attention to timeliness of harvesting, correct setup of harvest equipment, and covering crop seed loads during harvest and transport to avoid dispersing seed. An example of a biological control tactic is field grazing during or after cropping to manage weeds and reduce weed seed production.

Chemical Control

- Start clean with tillage or an effective burndown herbicide program.
- Apply preemergence herbicides that provide soil residual control of broadleaf and grass weeds to reduce early season weed competition and allow for timely in-crop postemergence herbicide applications
- Use tank mixes and sequential applications with other herbicides possessing different modes of action (MOAs) that are also effective on the target weeds.
- Follow labeled application rate and weed growth stage specifications.
- **DO NOT** rely on a single herbicide mode of action for weed control during the growing season.
- Avoid application of herbicides with the same mode of action more than twice a season.
- Use recommended adjuvant, adequate spray volume, proper nozzle and pressure (see label) to ensure effective weed coverage for applications.
- Control weeds in field borders to prevent weeds from influx into field.

Scouting and Containment

- Scout fields before herbicide application to ensure herbicides and rates will be optimum for the weed species and weed sizes present.
- Scout fields after herbicide application to identify areas where weed control was ineffective. Consider application and environmental factors that may have led to incomplete control.
- Control weed escapes with herbicides possessing a different mode of action or use a mechanical control measure. Weed escapes should not be allowed to reproduce by seed or to proliferate vegetatively.
- Clean equipment before moving to a different field to avoid spread of resistant weeds (especially harvest and tillage equipment).
- Contact your herbicide supplier and/or your local BASF representative if resistance is suspected.
- Prevent crop trait out-crossing to weeds and weed influx from border to field.

Confirmed Resistant Weed Species

The following table lists weeds which have been confirmed as resistant to the active ingredient in this product in the USA and documented on International Resistant Weed Survey website or referred-scientific publications. Control of these species may depend on application rate and the frequency of resistance in a specific location. The use of the resistance management practices listed above is always important, but becomes critical when managing weed populations with known resistance. Other control tactics include the use of additional or alternative herbicides with other MOAs effective on the target weed species.

Table 1. Weed Species with Confirmed Resistance to Active Ingredients in this Product			
Active Ingredient(s): imazamox			
Common name	Scientific name	Common name	Scientific name
Barnyardgrass	<i>Echinochloa crus-galli</i> <i>var. crus-galli</i>	Nightshade, eastern black	<i>Solanum ptychanthum</i>
Brome, downy	<i>Bromus tectorum</i>	Nutsedge, yellow	<i>Cyperus esculentus</i>
Brome, Japanese	<i>Bromus japonicus</i>	Pigweed, redroot*	<i>Amaranthus retroflexus</i>
Bulrush, ricefield	<i>Schoenoplectus mucronatus</i>	Pigweed, smooth	<i>Amaranthus hybridus</i> (<i>syn: quitensis</i>)
Cheat	<i>Bromus secalinus</i>	Ragweed, common	<i>Ambrosia artemisiifolia</i>
Falseflax, smallseed	<i>Camelina microcarpa</i>	Ragweed, giant	<i>Ambrosia trifida</i>
Flatsedge, rice	<i>Cyperus iria</i>	Rice, red*	<i>Oryza sativa</i>
Flixweed	<i>Descurainia sophia</i>	Ryegrass, Italian*	<i>Lolium perenne ssp. multiflorum</i>
Foxtail, giant	<i>Setaria faberi</i>	Sedge, smallflower umbrella	<i>Cyperus difformis</i>
Foxtail, green*	<i>Setaria viridis</i>	Shattercane	<i>Sorghum bicolor</i>
Goatgrass, jointed	<i>Aegilops cylindrica</i>	Sowthistle, spiny	<i>Sonchus asper</i>
Kochia*	<i>Kochia scoparia</i>	Sunflower, common	<i>Helianthus annuus</i>
Lambsquarter, common	<i>Chenopodium album</i>	Wallflower, bushy	<i>Erysimum repandum</i>
Marshelder	<i>Iva xanthifolia</i>	Waterhemp*	<i>Amaranthus tuberculatus</i> (=A. rudis)
Mustard, wild	<i>Sinapis arvensis</i>		
Footnote: * Indicates widespread resistance			

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