

Product: Liberty® ULTRA Herbicide

Group 10 Herbicide

Mode of Action

Glufosinate-P (also known as L-Glufosinate-ammonium or LGA) is the active ingredient in Liberty ULTRA and is a Group 10 (WSSA) herbicide. Glufosinate-P is classified as a glutamine synthetase inhibitor herbicide, that binds to the glutamate site. Glutamine synthetase inhibitors stop the conversion of two chemicals, glutamate, an enzyme involved in the incorporation of ammonium into the amino acid glutamine, and ammonia. Glufosinate-P-treated plants die due to a buildup of phytotoxic ammonia in the thylakoid lumen, leading to the uncoupling of photophosphorylation. The uncoupling of photophosphorylation causes the production of reactive oxygen species, lipid peroxidation, and cell membrane destruction. Elevated levels of ammonia are detectable within one hour after application.

Glufosinate-P is a contact herbicide with limited translocation within the plant. Control is best when weeds are actively growing and not under stress.

Any weed population may contain plants resistant to Group 10 herbicides. Weeds resistant to Group 10 herbicides may be effectively managed using herbicide(s) from a different group and/or by using cultural or mechanical practices. If resistant biotypes of target weeds have been reported, use the application rates of this product specified for your local conditions. 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

Since weed resistance to Group 10 herbicides is relatively rare compared to the other groups that have high level of resistance tolerance, these herbicides are a very important component of resistant weed management 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 which diversifies weed management practices, 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.

Chemical Control

- **Rotate herbicide-tolerant traits.** Alternate herbicide-tolerant (HT) traits and/or use HT trait stacks for more efficient rotation
- **Start with clean fields.** Effective tillage or the use of an effective burndown herbicide program can control emerged weeds prior to planting.
- **Stay clean – use residual herbicides.** Regardless of tillage system, pre-emergence or early post-emergence soil-applied residual herbicides should be used when possible to reduce early season weed competition and allow for timely in-crop postemergence herbicide applications

- **Use multiple herbicide sites of action** - during both the growing season and from year to year to reduce the selection pressure of a single site of action. Use tank mixes and sequential applications with other herbicides possessing different sites of action (SOAs) that are also effective on the target weeds.
- **Apply herbicides correctly.** Ensure proper application, including timing, full labelled use-rates, the use of recommended adjuvant, appropriate spray volume, proper nozzle and pressure (see label).
- Avoid application of herbicides with the same site of action more than twice a season.
- Apply appropriate rates of **Liberty ULTRA** based on weed size, species, and conditions.
- Apply **Liberty ULTRA** in the field at the specified time (correct weed size and time of the day) to minimize weed escapes.
- 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 moving into the field.

Scouting and Containment

- **Know your weeds, know your fields.** Closely monitor problematic areas with difficult-to-control weeds or dense weed populations.
- **Scout fields before application** to ensure optimum herbicide selection, rates and timing for effective control of target weeds.
- **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. Consider spot herbicide applications, row wicking, cultivation or hand removal of weeds or other techniques to stop weed seed production and improve weed management
- **Zero tolerance** – reduce the seed bank. **DO NOT** allow weed escapes to reproduce by seed or to proliferate vegetatively, which will help decrease weed populations from year to year and prevent major weed shifts.
- **Clean equipment.** before moving to a different field to prevent spread of resistant weeds and their seed (especially harvest and tillage equipment).
- **Contact** your herbicide supplier and/or your local BASF representative if resistance is suspected.

Confirmed Resistant Weed Species

The following table lists weed(s) which have been confirmed as resistant to the active ingredient in this product in the USA and documented on International Herbicide-Resistant Weed Database (<http://www.weedscience.org/Home.aspx>). 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.

Table 1. Weed Species with Confirmed Resistance to glufosinate-ammonium.

Common name	Scientific name	Common name	Scientific name
Italian Ryegrass	<i>Lolium perenne ssp. multiflorum</i>	Palmer Amaranth	<i>Amaranthus palmeri</i>

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.