Product: Alite 27®

Group 27 Herbicide

Mode of Action

Isoxaflutole, the active ingredient in **Alite 27**, is a **Group 27** (WSSA) herbicide. Isoxaflutole is classified as a HPPD inhibiting herbicide and inhibits 4-hydroxyphenyl-pyruvate dioxygenase (HPPD) enzyme which converts 4-hydroxymethyl pyruvate to homogentisate, a key step in plastoquinone biosynthesis. Inhibition of the HPPD enzyme results in bleaching symptoms on new tissues. These symptoms result from an indirect inhibition of carotenoid synthesis due to the involvement of plastoquinone as a cofactor of phytoene desaturase. Susceptible plants normally die within six to 14 days following application.

Isoxaflutole is most effective for controlling weeds when applied as a pre-plant/pre-emergence treatment. The product is primarily mobile in xylem and accumulates in leaf margins and tips. Germinating seedlings when in contact with isoxaflutole either do not emerge from the soil or emerge with white foliage, stop growing and die.

Any weed population may contain plants resistant to Group 27 herbicides. Weeds resistant to Group 27 herbicides may be effectively managed using herbicide(s) from a different group and/or by using cultural or mechanical practices. Consult your local BASF representative, state cooperative extension service, land grant university weed scientist, professional consultant, 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 27 herbicides is infrequent, populations of resistant biotypes are known. A given weed population may contain or develop resistance to an herbicide after repeated use. Appropriate resistance-management strategies should be followed to mitigate or delay resistance. Resistance management should be part a of a diversified weed control strategy that integrates multiple weed-control practices such as chemical, cultural, mechanical, biological management practices, and crop rotation. It is best to use multiple practices to manage or delay resistance, as no single strategy is likely to be totally effective.

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), 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 and equipment cleaning to avoid weed spread. An example of a biological control tactic is field grazing during or after cropping to manage weeds and reduce weed seed production. Fields with difficult to control weeds should be rotated to crops to allow the use of herbicides with alternative mechanisms of actions or different management practices.

Chemical Control

- **Rotate crops.** Crop rotation diversifies weed management practices.
- **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)
- **Control weeds in field borders** to prevent weeds from influx into 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. This practice 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 species documented on the International Resistant Weed Survey website which have been confirmed as resistant to HPPD inhibiting herbicides in the USA and may also be resistant to isoxaflutole, the active ingredient of this product (Table 1). They all have a non-target (HPPD) based resistance and may or may not be resistant to a specific HPPD inhibitor but may be also resistant to herbicides other than HPPD inhibitors. Control of these species may vary depending 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 SOAs effective on the target weed species.

Table 1. Weed Species with Confirmed Resistance to HPPD inhibiting herbicides

Active Ingredient(s): *mesotrione, pyrasulfotole, tembotrione, topramezone, isoxaflutole*	
Tall Waterhemp*	*Amaranthus tuberculatus* (=A. rudis)
Palmer Amaranth	*Amaranthus palmeri*

* confirmed resistance to isoxaflutole in 1 population in Iowa

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