

STEWARDSHIP GUIDELINES

Prevent the Development of Grass Weed Resistance to igrowth®, Double Team™ and Inzen™ Sorghum Technologies

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Sorghum growers now have available three technologies that allow for the use of specific herbicides for grass control. This has been made possible by the development of sorghum hybrids tolerant to ALS- and ACCase-inhibitor herbicides. These are:

IGROWTH[®] HYBRIDS

Tolerant to the imidazolinone (IMI) herbicides which are a subclass of the ALS-inhibitor (Group 2) herbicides and developed by Advanta Seeds. The herbicide labeled for use with igrowth hybrids is ImiFlex[™], with the active ingredient imazamox, and is sold by UPL.

INZEN[™] HYBRIDS

Tolerant to the sulfonylurea (SU) herbicides which are also a subclass of the ALS-inhibitor (Group 2) herbicides and developed by Corteva (Pioneer). The herbicide labeled for use with Inzen hybrids is Zest[™], with the active ingredient nicosulfuron, and is sold by Corteva.

DOUBLE TEAM™ HYBRIDS

Tolerant to the FOP subclass of the ACCase-inhibitor (Group 1) herbicides and developed by S&W Seeds. The herbicide labeled for use with Double Team hybrids is FirstAct[™], with the active ingredient quizalofop, and is sold by ADAMA.



For these technologies to last, it is very important that growers use sound stewardship practices to prevent the development of herbicide resistance in grasses. Prior to the development of these technologies, resistance to all three of the herbicides used had already been observed, so there should be no doubt that resistance can develop (Heap 2022).

Resistance in johnsongrass (Sorghum halepense) and shattercane (Sorghum bicolor ssp. drummondii) are of particular concern.

Both of these grasses are closely related to grain sorghum and can potentially cross pollinate (Ohadi et al. 2017). While gene flow between sorghum and weedy relatives does occur at low frequencies, the risk can be greatly minimized by strictly following good stewardship practices. It



should be noted that johnsongrass and shattercane are not labeled under any of the HT sorghum technology systems.

Although igrowth (IMI) and Inzen (SU) hybrids are very different, for stewardship purposes it is important to remember that they are both tolerant to ALS herbicides, although different subclasses. When resistance develops in weed populations cross-resistance between SUs and IMIs is possible, making the weeds resistant to both subclasses. For this reason, rotation between the two is NOT a stewardship strategy.

SPECIFIC STEWARDSHIP GUIDELINES FOR HERBICIDE TOLERANT (HT) SORGHUM

Use a preemergence herbicide containing one of the following Group 15 herbicides:

- S-metolachlor or metolachlor
- Acetochlor
- Dimethenamid

Using one of the Group 15 herbicides provides a second mode-of-action to control grass that may be resistant. By using a different mode-of-action, the resistant grass will hopefully be controlled before it has a chance to establish and produce seed leading to additional resistant plants. This also results in smaller populations of weeds to be controlled with over-the-top herbicides and allows seedling sorghum to establish with less weed competition.



2 Control grasses when they are small, preferably less than 3 inches tall.

Grasses are much easier to manage when plants are small, which lessens the potential to escape control and produce seed.



B Do not use if grasses are present that are known to be resistant to the herbicide technology being planned. These biotypes will not be controlled and will only get worse unless controlled by other weed control options.

If johnsongrass or shattercane are present in the field following herbicide application these plants must be controlled prior to flowering. It is very important that johnsongrass and shattercane plants are not flowering at the same time as the HT sorghum in order to prevent cross-pollination (Ohadi et al. 2017).

- If grain sorghum flowering is uniform, pollen shed will occur for approximately 10 days, but longer if late tillers are present.
- Because of a proliferation of tillers, johnsongrass can flower and be susceptible to cross pollination from flowering sorghum for a much longer period of time. Shattercane flowering typically ranges from 6 to 22 days.



6 Manage johnsongrass and shattercane growth in road ditches, fence rows and nearby places so that flowering does not coincide with flowering of the HT sorghum.

 Pollen from grain sorghum can travel hundreds of feet. The Texas Department of Agriculture requires certified seed production fields to be isolated from other sorghum fields or off-type sorghum plants by at least 660 feet to avoid cross pollination.

- There is no set distance that johnsongrass and shattercane should be controlled from HT sorghum fields. However, the greater the distance the better, especially downwind in the prevailing wind direction.
- The goal is to prevent johnsongrass or shattercane from flowering at the same time as the sorghum. Simply mowing the weeds just prior to sorghum flowering will accomplish this goal.



6 Control all volunteer sorghum/offtypes in the following year prior to flowering. This prevents both crosspollination to nearby johnsongrass and shattercane and the establishment of resistant volunteer/feral sorghum in and near the field.

Scout for grass escapes. If resistance is suspected, treat the escaped grass with a herbicide with a different mode-ofaction (or tank mixes) from that used in the initial application and/or use nonchemical methods to achieve control where possible. An indicator of possible resistance is a failure to control a grass species known to be susceptible to the herbicide used, especially if other adjacent grass of the same species and size were controlled.

If grasses are not controlled as expected following herbicide treatment, contact the seed company or crop protection company immediately. Develop a strategy for controlling suspected resistant grass.

Utilization of a desiccant at the end of the season can help to control escapes and minimize viable grass seed production.

Consider tarping grain trucks. Following harvest, care should be taken to avoid spills of HT grain along roadsides that could lead to HT sorghum the following year.



In addition to those stewardship practices that are specific to sorghum, the following guidelines are accepted for reducing herbicide resistance development in all weeds regardless of the crop and herbicide technology being used (Norsworthy et al. 2012).

GENERAL STEWARDSHIP GUIDELINES:

Understand the biology of the weeds present.

Use a diversified approach toward weed management focused on preventing weed seed production and reducing the amount of weed seed in the soil seedbank.



Plant into weed-free fields and then keep fields as weed-free as possible.

Plant weed-free crop seed.



Scout fields routinely.

b Use multiple herbicide mechanisms of action (MOAs) that are effective against the most troublesome weeds or those most prone to herbicide resistance.



Apply the labeled herbicide using the rate recommended for specific weed sizes.

B Emphasize cultural practices that suppress weeds by using crop competitiveness.

Use mechanical and biological management practices where appropriate.

Prevent field-to-field and within-field movement of weed seed or vegetative propagules. Clean plant residue from equipment before leaving fields suspected to contain resistant weeds.

Manage weed seed at harvest and after harvest to prevent a buildup of the weed seedbank.

Prevent an influx of weeds into the field by managing field borders.

CROP ROTATION CONSIDERATIONS

In the crop following igrowth or Inzen sorghum, avoid solely depending on SU or IMI herbicides (both are Group 2/ALS herbicides). Likewise, in the crop following Double Team sorghum, do not depend on ACCase herbicides (Group 1), especially FOPS, to control grass. If an ACCase herbicide is used it should be from the DIM subclass. Examples are Select (clethodim) and Poast (sethoxydim). If wheat is to be rotated with Double Team sorghum, it is important to know that any volunteer CoAxium wheat, or any wheat with the AXigen trait, will not be controlled with FirstAct herbicide. Similarly, growers should also be aware that volunteer Enlist corn will not be controlled with FirstAct. Likewise, any volunteer Clearfield wheat, sunflowers or Canola will not be controlled by ImiFlex in igrowth sorghum.

Planting sorghum the following year after a HT sorghum hybrid has been used is NOT recommended for any of the technologies and is currently not allowed on the ImiFlex label. However, if sorghum is rotated with sorghum, use a hybrid with a different herbicide technology in the following year.

If Inzen or igrowth hybrids were planted in year one, then plant Double Team sorghum in year two. Conversely, if a Double Team hybrid was used in year one, either Inzen or igrowth technology should be used during the following year.

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OTHER INFORMATION

The guidelines set forth in this guide are meant to supplement and not replace stewardship guidelines stated on the herbicide label or other instructions set forth by the specific seed or crop protection company. Visit with these seed company and crop protection representatives for more information.

Advanta/UPL igrowth Grain Sorghum Hybrids ImiFlex Herbicide

cloud.upl-naconnect.com/sorghum-potential

S&W/ADAMA Double Team Sorghum Cropping Solution

sorghumpartners.com/double-team/

Corteva Trait Stewardship

corteva.us/Resources/trait-stewardship.html

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Ohadi, S., G. Hodnett, W. Rooney & M. Bagavathiannan. 2017. Gene flow and its consequences in sorghum spp., Critical Reviews in Plant Sciences, 36:5-6, 367-385, DOI: 10.1080/07352689.2018.1446813.

Norsworthy, J.K., et al. 2012. Reducing the risks of herbicide resistance: Best management practices and recommendations. Weed Science 2012 Special Issue: 31-62.

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