

Clearfield[®] Sunflower Stewardship Guidelines

General Guidelines

1. To avoid severe crop injury, only use **Clearfield** sunflower herbicides on **Clearfield** sunflower hybrids. Note that **Clearfield** seed bags feature the suffix “CL.”
2. Growers are required to apply **Beyond**[®] herbicide from BASF at label rates on **Clearfield** sunflower. Use of other imidazolinone or other group 2 (ALS – acetolactate synthase inhibiting) herbicides may cause severe injury to **Clearfield** sunflower.
3. Always follow local good agricultural practices. Use an integrated weed management program that includes herbicides and mechanical (tillage) and cultural practices before seeding **Clearfield** sunflower crops.
4. Always comply with all applicable laws and follow herbicide label instructions to achieve best possible weed control.
5. Promote good agronomics by reducing disease and insect pressure in sunflower. Healthy sunflower plants compete better with weeds and tolerate herbicides more than weak sunflower plants.
6. Minimize harvest crop seed losses in the field through close attention to timeliness of harvesting and correct setup of harvest equipment. Cover crop seed loads during harvest and transport to avoid dispersing seed.
7. Follow specific management practices that prevent or delay the development of herbicide resistance in weeds and preserve the usefulness of this technology.

Resistance Management

Rotate crops

1. Avoid continuous cropping of **Clearfield** sunflowers on the same acre(s). This practice may reduce the threat of crossing between **Clearfield** and wild sunflowers. Always grow **Clearfield** sunflowers in rotation with other non-Clearfield or non-Clearfield Plus crops.
 - a. This breaks the cycle of continuous sunflower production and allows the use of alternate mode-of-action (non-IMI) herbicides.
 - b. Crop rotation is recommended to reduce disease and insect pressure in sunflower fields.
2. Don't rotate consecutively with another **Clearfield** crop.

3. Properly manage weeds in sunflower-fallow-sunflower rotations. In the fallow year, control weeds before they set seed. Control should be obtained through the use of burndown (non-ALS-inhibiting) herbicides and/or tillage.

Rotate herbicides with the crop rotation

1. To reduce selection pressure, use herbicides with a different mode of action than IMI herbicides, which are AHAS or ALS-inhibitors (WSSA Group 2 or HRAC Group B*).
2. Avoid application of herbicides with the same site of action more than twice a season.
3. Do not use solely ALS herbicides on the same field more than two out of four years.
4. Use sequential or tank mix partners with multiple modes of action to reduce the probability of resistance development among weed species in any given field.

Herbicide Use & Weed Control

1. Do not apply **Beyond**[®] herbicide to non-**Clearfield** sunflowers.
2. Always use a certified adjuvant with **Beyond** herbicide per label directions. On **Clearfield** sunflower hybrids, use a non-ionic surfactant (NIS at 0.25% v/v) with at least 80% active load (ex., 80/20) with **Beyond** herbicide.
3. Always apply **Beyond** herbicide with a nitrogen fertilizer, such as liquid or dry spray-grade AMS, 28%N, 32%N or 10-34-00.
4. Clean spray tank thoroughly before spraying **Beyond** to avoid **Clearfield** sunflower injury due to residue of herbicides from previous spray. This also helps avoid herbicide drift to **Clearfield** sunflower from herbicide spray of adjacent fields.
5. Don't spray **Beyond** if rain event is expected within one hour after the spray.
6. Use preemergence, non-ALS-inhibiting herbicides such as **Prowl H₂O** that provide soil residual control of broadleaf and grass weeds at planting of **Clearfield** sunflower to reduce early season weed competition.
7. Scout fields before herbicide application to ensure herbicides and rates will be optimum for the weed species and weed sizes present.
8. Scout the field after **Beyond** application. Rogue seed production fields for **Clearfield** sunflower hybrid off-types and survived weed plants.
9. Control weed escapes with herbicides possessing a different site of action or use a mechanical control measure. Weed escapes should not be allowed to reproduce by seed or to proliferate vegetatively.
10. Thoroughly clean equipment used to plant, harvest, transport and condition **Clearfield** sunflower to avoid the spread of weed seed.
11. Manage weed seed at harvest and post-harvest to prevent a buildup of the weed-seed bank.

Wild Sunflower Control

Follow stewardship practices to minimize outcross populations, which can occur when the herbicide-tolerant trait in **Clearfield** sunflowers moves into a wild sunflower population (resulting offspring may then exhibit resistance to IMI herbicides).

1. Do not cultivate **Clearfield** sunflowers on land with a history of heavy infestation of wild (common or prairie) sunflower to reduce the threat of pollination of **Clearfield** sunflowers with wild sunflower.
2. Where possible, avoid growing **Clearfield** sunflower in fields adjacent to other non-**Clearfield** sunflower.
3. Whenever **Clearfield** sunflower is planted, always apply **Beyond** herbicide to control any wild sunflower in the field and to prevent hybridization of **Clearfield** and wild sunflowers and gene outcrossing.
4. Control wild sunflowers in areas adjacent to **Clearfield** such as road ditches, field borders or fence rows with mechanical means or by using a herbicide with a non-ALS mode of action. This also aids in reducing vectors of disease and damaging insects harbored by nearby wildflower species.
5. Control emerged wild sunflowers prior to planting **Clearfield** sunflowers with a non-ALS-inhibiting burndown herbicide and to eliminate any emerged naturally- occurring biotype that may already be resistant to ALS-inhibiting herbicides.
 - a. This reduces the reliance on ALS herbicides for weed control, thereby reducing the selection pressure for weed resistance.
 - b. It also can eliminate any wild sunflower biotypes that may already be resistant to ALS herbicides.

Volunteer Control

After growing **Clearfield** sunflower crops, volunteer **Clearfield** sunflowers may appear within the field and neighboring fields. It may be the result of normal agricultural practices or from pollination within neighboring sunflower crops. Cross-pollination from volunteer plants is problematic because it increases the risks of herbicide tolerance spreading. Volunteer plants also act as competitive weeds in following crops and may lead to the build-up and spread of major diseases. To control volunteers, employ good field hygiene and proper use of herbicides.

1. Control weeds in the sunflower crop.
2. Avoid field-to-field mechanical movement of seed within seeding or harvesting equipment.
3. Stimulate germination of volunteer sunflower plants post-harvest so that such plants can be controlled with herbicides or mechanical tillage.
4. Use appropriate non-Group 2 herbicides.

* Group 2 herbicides, i.e. ALS inhibitors, are products based on the imidazolinone chemical family. Visit http://www.hracglobal.com/pages/classificationof_herbicidesiteofaction.aspx for more information on herbicide groups.

Visit www.clearfield-stewardship.com for additional information, including specific herbicide recommendations to control volunteer **Clearfield** sunflower.