

## Pyridine Herbicide Carryover: Causes and Precautions

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In certain situations, livestock manure, compost, hay, and grass clippings used as mulch or a soil amendment can cause plant injury.

Due to their persistence, pyridine carboxylic acid herbicides (aminopyralid, clopyralid, fluroxypyr, picloram, and triclopyr) may injure sensitive plants if not properly managed. The active ingredients of most concern are aminopyralid, clopyralid, and picloram. These herbicides eventually break down due to heat, exposure to sunlight, moisture, and microbial action. However, the primary factor in their degradation is aerobic microbial action. Breakdown is particularly slow in manure and compost piles, due to lack of oxygen. These compounds may persist for as long as several years in certain situations.

### *Background Information:*

The active ingredients listed above are found in products registered for use on pastures and forage crops, grain crops, nonresidential turf, certain fruits and vegetables, wildlife and habitat management areas, and roadsides. In these settings, they are used to control broadleaf weeds. They are used on pastures and fencelines because they control weeds that reduce forage quality and quantity. They also manage some weeds that produce toxins that can, in turn, sicken or kill animals that graze them in pastures or eat them in hay. Several products can be used on seasonally dry wetlands (including ditchbanks, dry ditches, and dry canals), and can be applied up to the edge of aquatic areas. These products are ideal for controlling weeds along creeks and streams in natural areas and around stock ponds. The pyridine carboxylic acid herbicides target many troublesome broadleaf weeds, including many that are exotic and/or invasive. When formulated in a product combining several active ingredients, they broaden the product's control spectrum.

Toxicity and environmental fate data submitted to EPA to support the registrations of products containing these active ingredients show that livestock, including animals raised for meat or other products destined for human consumption, can safely consume hay and/or graze in treated pastures. These herbicides pass through an animal's digestive tract and are excreted in urine and manure. They are very low in mammalian toxicity.

Some products containing these active ingredients were registered under EPA's Reduced Risk Pesticide initiative. In order to qualify for this registration track, a compound must demonstrate lower risk to humans and the environment than other available alternatives. Some of the factors that contribute to a product being registered via the "reduced-risk" track include having low toxicity to mammals and other animals, being offered as a nonvolatile formulation, and having low label use rates. Many carry a CAUTION signal word. Most are not classified as restricted-use pesticides, which means that users do not have to be Virginia-certified applicators.

As noted above, in some situations, these herbicides can remain active for long periods of time. They can move, in solution, with rainfall, irrigation, and dew—and remain active in soil contaminated by leaching and/or runoff. They do not pose a problem when label directions are followed and they remain

on the intended/treated site. However, they can harm sensitive plants if transported elsewhere by drift, runoff, or leaching. These herbicides may also be a problem when moved intentionally, as is the case when treated plants (ex. grass clippings) or manure from livestock consuming treated forage are used for mulch or composted.

Many pyridine carboxylic acid herbicides have label restrictions regarding subsequent plantings/crop rotations and moving livestock from treated to untreated areas. Although restrictions for moving grazing animals may be only a matter of days, rotational crop restrictions may be as long as several years. Note that restrictions on moving livestock are (relatively) short because livestock will metabolize residues of pyridine herbicides they ingest by eating treated plants. The treated forages and manure from animals that graze them will be exposed to air, heat, light, and aerobic microbes—which will cause these herbicides to break down. The half-lives for these herbicides may be much longer than expected if they end up in anaerobic (no or low oxygen) situations—such as manure piles or unworked compost. The same is true if treated forages are dried and baled. Hay and straw are purposely cured (dried), baled, and stored in a way that minimizes or eliminates microbial action (decomposition).

*Plant Injury Symptoms:*

- poor seed germination
- twisted growth
- twisted, cupped, and elongated leaves
- misshapen fruit
- reduced yields
- mortality (especially that of seedlings and young plants)

(Note that these symptoms can also result from disease, insects, and herbicide drift.)

*Sensitive plants include:*

- cotton
- eggplant
- grapes
- legumes (beans, peas)
- lettuce
- peppers
- potatoes
- spinach
- strawberries
- tobacco
- certain flowering ornamental/bedding plants, including dahlias, marigolds, and some varieties of roses
- members of the Compositae (daisies, sunflowers) family
- members of the Umbelliferae/Apiaceae family, which includes *Angelica* spp., some herbs (anise, chervil, coriander, cumin, dill, fennel), and some vegetables (carrots, celery, parsnips, parsley)

*Precautions/Stewardship Tactics:*

For gardeners...

If you obtain grass clippings, compost, or manure, ask your supplier if his/her pastures, grass stands, or crops were treated with an herbicide—and if so, which one(s). Ask the supplier what active ingredient(s) these products contain. (If he or she doesn't know, consult the product labels or your local Extension agent.)

If you get your manure from horse owners, realize that they may not know where the hay they fed their horses came from, or what it was treated with. Even if they do know their source, they may not have asked about herbicide treatments.

If you don't know the history of plant matter or manure you intend to use:

- don't put hay, straw, grass clippings, manure, or compost on or near sensitive plants.
- do a bioassay by planting beans in pots with a mix of the manure (or plant material) and a commercial potting soil.
- use compost, hay, straw, or grass clippings with unknown "pedigrees" only on or near nonsensitive crops—and wait several years before planting sensitive crops in that soil.

For growers and ornamental turf managers...

If you use any of the pyridine carboxylic acid herbicides (especially aminopyralid, clopyralid, or triclopyr), be sure to tell anyone who wants to use treated plant material or manure from animals that grazed treated forages that they may risk carryover injury. Be sure to provide information about herbicide use to people who obtain grass clippings, hay, manure, or compost from you.

*For more information, contact:*

- Scott Hagood, Extension weed scientist (field crops and forages)
- P. Lloyd Hipkins, Extension weed scientist (noncrop and aquatics)

*Sources:*

- **Crop Protection Handbook**, MeisterPro, 2009
- DowAgrosciences website: <http://www.dowagro.com/>
- Environmental Protection Agency - Pesticide website: <http://www.epa.gov/pesticides/>
- ExtToxNet website: <http://extoxnet.orst.edu/>
- *Herbicide Carryover in Hay, Manure, Compost, and Grass Clippings*, North Carolina State University factsheet (07/09), prepared by Jeanine Davis, NCSU Extension specialist, Department of Horticultural Science, and Sue Ellen Johnson, NCSU forage specialist, Department of Crop Science
- **Herbicide Handbook** (9<sup>th</sup> edition), Weed Science Society of America, 2007
- **The Pesticide Manual** (14<sup>th</sup> edition), British Crop Production Council, 2007

**Virginia-registered pasture/forage and turf products\*  
containing selected pyridine carboxylic acid herbicides  
(as of September 2009)**

Aminopyralid

- Chaparral
- Opensight
- Forefront R&P
- Milestone
- Milestone VM
- Milestone VM Plus

Clopyralid

- Andersons Golf Products Turf Fertilizer with Millennium Ultra
- Andersons Professional Turf Products 15-0-8 with Millennium Ultra
- Brazen
- Clean Slate
- Clopyr Ag
- Clopyralid 3
- Confront
- Curtail
- Cody
- Hornet
- Howard Johnson's Weed & Feed with Millennium Ultra 15-03-05
- Lebanon Proscap Homogenous Fertilizer 19-2-9 w/ Confront
- Lebanon Proscap Homogenous Fertilizer 19-3-9 w/ Confront + Team
- Lontrel Turf and Ornamental
- Millennium Ultra 2
- Prescott
- Redeem R & P
- Refute
- Stinger
- Surestart
- Transline

Picloram

- Grazon P&D
- Gunslinger
- Hiredhand P + D
- Outpost 22K
- Picloram + D
- Picloram 22K
- Surmount
- Tordon 101 Weed and Brush Killer
- Tordon 22K
- Trooper 22K
- Trooper Extra Selective
- Trooper P + D

(\*Products labeled *only* for use on rights-of-way and industrial sites are not included in the lists above.)