Background

- It is possible for some herbicides to end up in hay, silage, animal manure, compost used for soil amelioration, mushroom substrates, plant mulches and animal bedding. Through product stewardship, Dow AgroSciences strives to minimise the potential for herbicide residues in treated crops to transfer through animals to composites and mulches. This stewardship is done either with potentially affected industries and/or the product label.

- Experience with pyridine herbicides over the past 30 to 40 years has demonstrated that triclopyr and fluroxypyr have very little, if any, soil activity. Nor do they remain active when released from decaying plant tissue or manure generated by animals feeding on herbage treated with these herbicides, unlike picloram, clopyralid, and aminopyralid. This difference in behaviour is because these chemistries represent two different families of pyridine herbicides, the pyridinloxyacetic acid herbicides which include triclopyr and fluroxypyr and the picolinic acid herbicides which include aminopyralid, clopyralid and picloram. The activity of these two herbicide families is different because the pyridinloxyacetic acid herbicides, triclopyr and fluroxypyr, have different behaviour for movement and degradation in plants and soil resulting in little herbicidal activity through soil uptake.

- For further information on herbicide carryover in hay, manure compost and grass clippings refer to articles from the North Carolina State University and University of Minnesota. Or review the document history of past incidents.

- The picolinic acid herbicides containing, picloram, clopyralid and aminopyralid can remain in plant residues through senescence and; therefore, have the potential to be present in animal manure, compost, mushroom substrate, plant mulches and animal bedding.

- However, the risk of such residues occurring and causing damage to subsequent crops will vary between countries and products depending upon the way products are used, animal husbandry, crop agronomy and collection of treated plant residues or animal manures for use as soil ameliorants.

- The picolinic acid herbicides are widely used in Australia and New Zealand on pastures, cereals, canola, and fodder brassicas as well as some other crops, forestry, fallow and in non-crop situations because they provide excellent control of broadleaf weeds and poisonous plants that reduce pasture forage and crop production and quality and interfere with non-crop vegetation management objectives.

- Regulatory agencies in Australia, New Zealand and elsewhere around the world, have assessed the use of products containing clopyralid, picloram and aminopyralid for dietary risk resulting from likely residues and concluded that treated food, or animal feed, is safe for human and animal consumption.
PYRIDINE RESIDUE MANAGEMENT
HERBICIDE CARRYOVER POTENTIAL IN ANIMAL MANURE, COMPOST, PLANT MulCH, MUSHROOM SUBSTRATE, ANIMAL BEDDING, HAY AND SILAGE.

How to prevent herbicide damage to non-target plants.

On the farm
• The labels of recently registered Dow AgroSciences’ products (Grazon™ Extra and Hotshot™) contain instructions on the management of manure from animals that have grazed treated crops/pastures, and the use of cut-material from treated crops.

Note: Older Dow AgroSciences brands and generic products that copy Dow AgroSciences’ labels may not contain such information.

<table>
<thead>
<tr>
<th>Foliar applied Woody weed Herbicides registered in Australia that contain aminopyralid, clopyralid or picloram</th>
<th>Dow AgroSciences brand products</th>
<th>A non-exhaustive list of products that copy Dow AgroSciences labels.</th>
</tr>
</thead>
<tbody>
<tr>
<td>aminopyralid</td>
<td>Grazon™ Extra, Hotshot™</td>
<td>None</td>
</tr>
<tr>
<td>clopyralid</td>
<td>Lontrel™</td>
<td>Archer®, Clock®, Corsair®, Kentrel®, Rally®, Sylon®, Transit®, Victory®</td>
</tr>
<tr>
<td>picloram/triclopyr</td>
<td>Grazon™ DS, Tordon™ DSH</td>
<td>Agcare®, Allgraze®, AW Woody®, Conqueror®, Fightback®, Gallop®, Grassup®, Hatchet®, Kenzon®, Picker®, Pickout®, Trichloram®, Triclozon®, Tri-pick®</td>
</tr>
<tr>
<td>picloram/2,4-D</td>
<td>Tordon™ 75-D</td>
<td>AW Pulverise®, Commander® 75-D, Enforcer®/75-D, Ricochet®, Towelup® 2,4-D, Trooper® 75-D</td>
</tr>
</tbody>
</table>

On the farm
Producers using the picolinic acid herbicides (aminopyralid, clopyralid or picloram) should not send animal waste, or cut plant material that may contain residues off-farm unless they also pass on the herbicide use history to the recipient. – An example form is available on this website.

Hay producers and dealers
• Hay producers should ensure that they follow the label advice on the management of post-treatment residues given on Dow AgroSciences product labels while noting that similar products containing clopyralid and picloram may not contain similar advice even though the risks for residues in manure and composts are similar.
• Hay dealers should ensure that they have a process in place to trace the history of herbicide use on hay and straw.

Livestock and Horse Owners
• Should ask the hay/straw supplier for the herbicide history and check the product label for residue management information.

Compost, plant mulches and mushroom substrate makers
• Should ask for the herbicide history of plant materials used to, make mushroom substrate, composts or plant mulches.
• Should be suspicious of plant material sourced from municipal recycling depots and animal manure from an unknown source.

Confidence in a drum

Dow AgroSciences
Solutions for the Growing World
Many farmers and home gardeners have reported damage to vegetable and flower crops after applying horse or livestock manure, compost, hay, or grass clippings to the soil. The symptoms reported include poor seed germination; death of young plants; twisted, cupped, and elongated leaves; misshapen fruit; and reduced yields. These symptoms can be caused by other factors, including diseases, insects, and herbicide drift. Another possibility for the source of these crop injuries should also be considered: the presence of certain herbicides in the manure, compost, hay, or grass clippings applied to the soil.

**The Herbicides of Concern**
Aminopyralid, clopyralid, fluroxypyr, picloram, and triclopyr are in a class of herbicides known as pyridine carboxylic acids. They are registered for application to pasture, grain crops, residential lawns, commercial turf, certain vegetables and fruits, and road-sides (Table 1). They are used to control a wide variety of broadleaf weeds including several toxic plants that can sicken or kill animals that graze them or eat them in hay. Based on USDA-EPA and European Union agency evaluations, when these herbicides are applied to hay fields or pasture, the forage can be safely consumed by horses and livestock—including livestock produced for human consumption. These herbicides pass through the animal’s digestive tract and are excreted in urine and manure. They can also remain active in the manure even after it is composted. The herbicides can also remain

<table>
<thead>
<tr>
<th>Pasture and hayfields</th>
<th>Commercial turf and lawns</th>
<th>Commercial vegetables and fruits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curtail (2,4-D + clopyralid)</td>
<td>Confront (triclopyr + clopyralid)</td>
<td>Clopyr AG (clopyralid)</td>
</tr>
<tr>
<td>Forefront (aminopyralid + 2,4-D)</td>
<td>Lontrel (clopyralid)</td>
<td>Stinger (clopyralid)</td>
</tr>
<tr>
<td>GrazonNext (aminopyralid + 2,4-D)</td>
<td>Millennium Ultra Plus (MSMA + 2,4-D + clopyralid + dicamba)</td>
<td></td>
</tr>
<tr>
<td>Grazon P + D (picloram + 2,4-D)</td>
<td>Millennium Ultra and Ultra 2 (2,4-D + clopyralid + dicamba)</td>
<td></td>
</tr>
<tr>
<td>Milestone (aminopyralid)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Redeem R&amp;P (triclopyr + clopyralid)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surmount (picloram + fluroxypyr)</td>
<td>(fluroxypyr)</td>
<td></td>
</tr>
</tbody>
</table>

All products listed are manufactured by Dow Agrosciences, LLC with the exceptions of the Millennium products by Nufarm Americas Inc. and Clopyr AG by United Phosphorus, Inc. Herbicide product names and formulations change; always check labels for active ingredients.
active in hay, straw, and grass clippings taken from treated areas. The herbicides leach into the soil with rainfall, irrigation, and dew. As with many other herbicides, they can remain active in the treated soil.

The chemicals of greatest concern are picloram, clopyralid, and aminopyralid because they can remain active in hay, grass clippings, piles of manure, and compost for an unusually long time. These herbicides eventually break down through exposure to sunlight, soil microbes, heat, and moisture. Depending on the situation, the herbicides can be deactivated in as few as 30 days, but some field reports indicate that complete deactivation and breakdown can take several years. Hays have been reported to have residual herbicide activity after three years’ storage in dry, dark barns. Degradation is particularly slow in piles of manure and compost. When mulches, manures, or composts with residual herbicide activity are applied to fields or gardens to raise certain vegetables, flowers, or other broadleaf crops, potentially devastating damage can occur (Table 2).

### Table 2. Crops known to be sensitive to picloram, clopyralid, or aminopyralid

<table>
<thead>
<tr>
<th>Beans</th>
<th>Carrots</th>
<th>Compositae family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton</td>
<td>Dahlias</td>
<td>Eggplant</td>
</tr>
<tr>
<td>Flowers, in general</td>
<td>Grapes</td>
<td>Legumes</td>
</tr>
<tr>
<td>Lettuce</td>
<td>Marigolds</td>
<td>Mushrooms</td>
</tr>
<tr>
<td>Peas</td>
<td>Peppers</td>
<td>Potatoes</td>
</tr>
<tr>
<td>Roses, some types</td>
<td>Spinach*</td>
<td>Sugar beets*</td>
</tr>
<tr>
<td>Strawberries*</td>
<td>Sunflowers</td>
<td>Tobacco</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>Umbelliferae family</td>
<td>Vegetables, in general</td>
</tr>
</tbody>
</table>

*Applies to aminopyralid and picloram only.

This information was obtained from product labels of many of the herbicides listed in Table 1, the DowAgriSciences article for cattlemen: (http://www.dowagro.com/PublishedLiterature/dh_02a6/0901b803802a69fd.pdf?filepath=/PublishToInternet/InternetDOWAGRO/range/pdfs/noreg/010-57689 and the DowAgriSciences Manure Matters Web site (http://manure-matters.co.uk).

### How to Prevent Herbicide Damage to Non-Target Plants

The label on every herbicide contains detailed instructions, including animal feeding restrictions and safe use of manure or crop residues. When used as directed on the labels, these herbicides should not cause the problems noted above. The manures and plant residues are safe to apply to grass pastures and grass hayfields, effectively recycling them. Most of these herbicides have a crop rotation restriction of at least 12 months before certain vegetable or forage legume crops can be planted in treated land.

The problems arise when the hay, manure, grass clippings, or other affected materials are sold or given to others who have no knowledge of the herbicides used or of the adverse effects their residues can have on other plants. The information about the herbicide persistence and effects on broadleaf plants does not always follow the hay, manure, compost, or other materials. Every individual in the chain of use of products treated with these herbicides should provide detailed information on the herbicide restrictions to prevent potentially catastrophic problems for other farmers, gardeners, and for themselves (including possible liability).

### Hay Producers and Dealers

If you raise hay, make sure you know if any herbicide used has the potential to remain active in the manure or urine after consumption. Communicate — verbally and in writing— if manure is not suitable for use as a fertilizer, soil amendment, or compost for broadleaf plants. Landowners should know and have a written record of the herbicides applied to their fields.* Custom applicators must use all registered herbicides in a manner consistent with their labeling and should communicate what products are applied to customers’ fields and provide a copy of the herbicide label(s). The labels provide all the information on restrictions.

The herbicides of concern can also remain active on the hay itself. Do not sell or give away treated hay (even if it is several years old) for use as mulch or for making compost. The hay can be sold for consumption by livestock and horses, but be sure the purchaser is aware that the herbicide may pass through into the manure. Advise people feeding this hay to their animals to spread the manure on grass pastures or grass hayfields, being sure to follow all safety guidelines and regulations.

According to the labels, plant materials treated with these herbicides should not be considered safe for growing sensitive crops until the plant materials are completely decayed. Breakdown of the herbicides is most rapid in sunlight under warm, moist conditions and may be enhanced with irrigation. Accelerate breakdown of plant residues by incorporating them evenly into the surface soil.

### Livestock and Horse Owners

If you buy hay for your animals, ask the farmer or seller which herbicides, if any, were used in producing the hay. Consult a copy of the herbicide label. A simple indicator that these herbicides were likely not used in the production of hay is the presence of legumes such as lespedeza, clovers, or alfalfa. If the hay has legumes in it, it has probably not

* EPA’s Office of General Counsel recently interpreted section 12(a)(2)(G) of the Federal Insecticide Fungicide and Rodenticide Act (FIFRA), “It shall be unlawful for any person to use any registered pesticide in a manner inconsistent with its labeling” as it relates to a grower hiring an applicator to apply a pesticide and whether the grower can be held liable under FIFRA if there is not compliance on the grower’s treated land with post application label requirements such as pre-harvest intervals, plant back restrictions, crop rotation restrictions, and restricted entry intervals. The Office of General Counsel believes a grower can be held responsible for any violations associated with these post application requirements.
been treated with any of these herbicides. The absence of legumes in hay, however, does not mean that these herbicides are present. If you do not know the herbicide history of the hay, do not sell or give away the manure from animals who consumed the hay for use in growing plants or to make compost, as it may contain one of the herbicides of concern. Manures that contain these herbicides can be safely spread on grass pastures or grass hayfields. Contact your local Extension agent or NRCS office to develop a manure management plan. Note: It takes three to seven days for most animals' digestive tracts to clear and the manure produced to be free of any herbicide residue.

Farmers and Gardeners Wanting to Use Manure or Compost

Before acquiring or using manure—fresh, aged, or composted—ask what the animals were fed, the origin of the hay, and what, if any, herbicides were used on the hay or pasture. Some livestock owners can tell you this, but many might not know the products used or origin of the hay they purchased. They may suggest the manure is “safe” because their animals have not been affected. If you don’t know which, if any, herbicides were used, use the bioassay described below to test for the presence of these herbicides. Do not use the manure or compost to grow sensitive crops without knowing its herbicide history or testing to see that it is safe. If you find yourself with a small quantity of contaminated manure or compost, spread it on a grass pasture, grass hayfield, or nonsensitive, non-food crop area.

Take great care in using contaminated manure or compost to grow nonsensitive commercial food crops. Consult the herbicide product label to determine if the pesticide is registered for use (legally permitted to be applied) to that crop. If the product has already been applied to the soil, tilling it several times during the growing season, irrigating the area, and planting it into a non-sensitive cover crop for a year or two will help the herbicides break down. Conduct a pot or field bioassay, as described below, before planting any sensitive crops in the area.

Farmers and Gardeners Wanting to Use Hay or Grass Clippings

If you want to use hay or grass clippings as mulch or in your compost pile, find out what, if any, herbicides were used on the field or turf area. Be particularly careful about obtaining grass clippings from golf courses and other commercial turf fields where these herbicides are commonly used. Most homeowners do not use these herbicides because they are not labeled for use on residential lawns. Be careful about obtaining hay or grass clippings from sites where herbicides of concern may be commonly used. For instance, clopyralid-containing products have not been registered for use in residential lawns since 2002, so if pesticide applicators have followed label directions, clippings from residential lawns should not present a problem to use as mulch around vegetables and ornamentals.

As previously mentioned, the safest practice in residential lawns is to return grass clippings to the lawn. If you find yourself with contaminated hay or grass clippings, spread them on non-sensitive, non-food crop areas, burn them, or arrange to have them disposed of safely. If the hay or grass clippings have already been applied to the field or garden, remove them if possible, till the soil (multiple times will enhance degradation), sow a non-sensitive cover crop, and let it grow for a year or two to help the herbicide break down. Conduct a pot or field bioassay, as described below, before planting any sensitive crops in the area.

How to Test for the Presence of Herbicides: Pot and Field Bioassays

Some laboratories can test for the presence of these herbicides, but the tests are expensive and may not be as sensitive as a plant bioassay that you perform yourself. This simple pot bioassay involves growing beans, peas, or tomatoes, which are very sensitive to the presence of these herbicides, in the aged manure or compost.

First, take a number of random, representative samples (small shovelfuls) from throughout the pile of aged manure or compost, being sure to get deep inside the pile. Mix thoroughly. If there are separate sources of manure or compost, conduct individual assays for each. Prepare three to six small (4- to 5-inch) pots with a 1:1 mix of the manure or compost with a commercial potting mix containing fertilizer. Fill several control pots with only the commercial potting mix. Put saucers underneath each pot, or position the pots far enough apart so that water running out of the bottom will not reach another pot. Plant three pea or bean seeds or a small tomato transplant in each pot, water, and let them grow for two to three weeks. There should be at least three sets of true leaves on the peas or beans.

If the plants in the control pots grow normally and the ones in the pots with manure or compost do not, you can assume the manure or compost is contaminated with an herbicide that will adversely affect sensitive plants. If they all grow normally, it would be reasonable to assume that the manure or compost is fine. Keep in mind, however, that the test will only be as good as the samples you take. It would be better to err on the side of too many samples than too few (at least 20 per pile). You can create a similar test for hay or grass clippings by filling the pot with commercial potting mix and spreading a thick layer of the hay or grass clippings on top. This bioassay is explained in detail on the DowAgrisciences Manure Matters Web site (http://www.manurematters.co.uk/) and on the Washington State University Web site at http://www.puyallup.wsu.edu/soilmgmt/Pubs/CloBioassay.pdf (it recommends two parts manure or compost to one part potting soil).

If a field or garden site has previously been treated with one of the herbicides of concern or been contaminated through the application of treated manure, compost, hay, or grass clippings, a field bioassay can be conducted. Plant peas or beans in short rows scattered throughout the af-
affected area. If herbicidal symptoms appear, do not plant sensitive plants; plant grasses. Test again the following year. If the test plants grow normally, it should be safe to grow broadleaf crops.

**Responsible Herbicide Use = Healthy Farms and Gardens**

Animal manures and composts made from them are excellent sources of nutrients and organic matter for growing food crops. Soils mulched or amended with manure and compost become dark, aromatic, fertile, and active with earthworms and beneficial microorganisms. Farmers and gardeners are encouraged to use these products but must exercise proper caution to prevent damage.

Herbicides are important tools that hay producers use to produce quality, weed-free hay. The use of these herbicides is no more likely in North Carolina than in any other state. Many North Carolina hayfields and pastures do not have herbicides applied on a regular basis. Hay and pasture acreage is among the “greenest” in North Carolina, delivering multiple environmental benefits.

Remember that each pesticide product label states, “It is a violation of Federal law to use this product in a manner inconsistent with its labeling.” Everyone should read an herbicide's product label instructions before use. All parties need to be aware of the possibility of residual herbicide activity. Hay producers should inform buyers about herbicides they have applied to their fields and provide them with a copy of the herbicide label with the restrictions. Likewise, livestock and horse owners who give or sell manure for composting or crop production should be aware of what they are feeding their livestock and horses and share that information. All parties should communicate with the end users of the hay and manure. Farmers and gardeners should ask about the herbicide history of manure, compost, hay, or grass clippings they acquire. Farmers and gardeners need to be fully informed about what they are applying to their soil because the results can be disastrous for a farm business or gardener if one of these herbicides has been applied.

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**Much of the information for this article came directly from the herbicide product labels and the United Kingdom Dow-Agrisciences Web site devoted to this issue (http://manurematters.co.uk).**

**Resources for More Information**

Washington State University Web site on clopyralid carryover. Includes pictures of affected vegetables, research results, and the bioassay protocol: http://www.puyallup.wsu.edu/soilmgmt/Clopyralid.htm

Article from Minnesota Extension explaining the problem in hay and how to avoid it. The article is devoted to “ditch hay,” but the information is relevant to all hay: http://www.extension.umn.edu/distribution/livestock-systems/M1197.html

CDMS Agro-chemical database with access to all the herbicide labels: http://www.cdms.net/LabelsMsd/LMDefault.aspx?t

Dow Agrosciences United Kingdom Web site with information on aminopyralid: http://www.manurematters.co.uk/


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Published by

NORTH CAROLINA COOPERATIVE EXTENSION

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HERBICIDE CARRYOVER ADVISORY
Sample only. Hay producers and hay sellers should consult legal counsel.

THIS HAY WAS GROWN IN A FIELD TREATED WITH ___________________________ an
EPA LABELED AND APPROVED HERBICIDE for GRASS HAY PRODUCTION. THIS
HERBICIDE CAN KILL BROADLEAF PLANTS.

HAY and MANURE PRODUCED AFTER FEEDING HAY GROWN in a FIELD TREATED with
___________________________ SHOULD ONLY BE APPLIED TO GRASS HAYFIELDS AND
PASTURES.

DO NOT APPLY THIS HAY or the MANURE
PRODUCED AFTER FEEDING THIS HAY
TO ANY BROADLEAF CROP.

DO NOT USE COMPOST MADE with MANURE
PRODUCED AFTER FEEDING THIS HAY or HAY RESIDUES
on BROADLEAF CROPS or PLANTS.

The manure from livestock fed this hay will usually be clear of residual herbicides four days after
an animal stops eating this hay. Fresh or composted manure can then be used for broadleaf plant
production.

CONSULT the ___________________ LABEL for COMPLETE DETAILS on SAFE USE and
RESTRICTIONS.

PLEASE PROVIDE THIS INFORMATION TO ANYONE BUYING, ACCEPTING OR USING
THIS HAY or the MANURE PRODUCED AFTER FEEDING THIS HAY.

SELLER NAME ___________________________ DATE _____________

BUYER NAME ___________________________ DATE _____________
Harvesting ditch hay (grass and legumes growing alongside the roadways) is a common practice, especially in western Minnesota. Ditch hay provides livestock owners with forage suitable for beef cattle, dairy heifers and horses. However, in recent years, there have been several cases of significant soybean injury as a result of manure applications from livestock fed ditch hay that was treated with picloram or clopyralid. This injury has reduced grain yields, and in some cases, resulted in total yield loss.

Picloram (commonly sold as Tordon, Grazon, and Pathway) and clopyralid (commonly sold as Stinger, Curtail, and Transline) are used to control unwanted broadleaf weeds on cropland, rangeland, pastures, and along roadways. These herbicides are especially popular with local, county, and state highway departments because they control hard-to-kill noxious weeds like thistles and leafy spurge but do not kill beneficial or planted roadway grasses. Recently labeled herbicides containing the active ingredient aminopyralid (commonly sold as Milestone, Milestone VM, and ForeFront R&P) are beginning to replace picloram and clopyralid in many roadside treatment programs due to increased Canada thistle control with aminopyralid. Aminopyralid is in the same herbicide family as picloram and clopyralid, and poses the same potential to cause injury to broadleaf crops from contaminated manures. However, sensitive crop injury from aminopyralid contaminated manure has not yet been reported in Minnesota.

When animals are fed ditch hay that has been treated with either picloram or clopyralid, these chemicals pass quickly through the animal without significant degradation and end up in the manure via the urine, usually within a day or two. Manure application to agricultural production fields is a beneficial and common practice. However, if sensitive crops (i.e. soybeans, lentils, peas, legumes, potatoes, tomatoes or peppers) are planted in fields where contaminated manure has been applied, injury or crop death can occur. Injured plants can exhibit twisting (epinasty), leaf cupping, and loss of apical dominance, resulting in short plants and abnormal side shoots.

Labels of many products containing picloram and clopyralid list restrictions that ditch hay harvesters and feeders need to be aware of: 1. manure and urine containing these herbicides may cause injury to sensitive broadleaf plants, 2. since plant material containing these products does not break down more rapidly in compost, treated plant material containing these products should not be used in or for compost, and 3. picloram and/or clopyralid contaminated manure and/or compost should not be spread on land used for growing susceptible crops. Contaminated manure may be spread onto fields that will be planted to grass crops (i.e. corn, small grains, or sorghum sudan forage).

Herbicide labels for products containing picloram and clopyralid may have slightly different warnings or recommendations based on the product formulation and/or active ingredient concentration. Because of this, it is important to read and understand each herbicide label. Some examples of warning and recommendations for these products include: do not allow lactating dairy animals to graze treated areas within 7 days after application; meat animals should be withdrawn from treated fields at least 3 days before slaughter; do not harvest or cut the forage within 30 days after application; and do not plant sensitive broadleaf crops in treated areas until a sensitive bioassay shows that no detectable herbicide is present in the soil. Always refer to the label for specific restrictions and recommendations. If all directions on the herbicide label are carefully followed, sensitive crop injury from manure applications should not occur.

Both picloram and clopyralid are persistent and mobile in the soil, readily absorbed and translocated throughout the plant, and remain chemically stable and intact in plants. Both herbicides have been detected in the groundwater, but only picloram has been detected in Minnesota groundwater. Because of their persistence in the soil, products containing clopyralid and picloram often carry a crop rotation restriction of up to 18 months for sensitive broadleaf crops, or approximately two growing seasons in Minnesota. Researchers in other states who have dealt with treated ditch hay issues insist that relying solely on herbicide label restrictions is not enough to protect sensitive crops treated with contaminated manure or compost. They recommend soil analysis to detect clopyralid and picloram prior to planting sensitive crops.
Even though these products cause injury to sensitive crops, there is no documented history of human or livestock toxicity by picloram or clopyralid.

Composting or storing manure that contains clopyralid, picloram, and/or aminopyralid may not speed herbicide degradation, as these products do not break down quickly in compost. The concentration of these herbicides in relation to the organic matter can actually increase while the manure is initially stored or composted. Currently, it is believed that clopyralid can remain in manure, forage/feedstuffs or compost for several years. Therefore, composting contaminated manure is not a solution. However, you can spread contaminated manure/compost on fields that will be planted to a non-sensitive crop like corn, sorghum or small grains.

Better awareness and communication is needed between local, county, and state highway departments and farmers harvesting, feeding and selling ditch hay. If you are harvesting ditch hay, develop a working relationship with your county weed inspector or highway department to: 1) identify which herbicides are used in the roadside weed control program, 2) determine which roadsides are spot treated and if some areas have broadcast treatments, and 3) dates when roadsides will be treated. By working together with local, county, and state agencies, hay harvesters can reduce the risk of harvesting forages with unwanted herbicide residues. If the harvest and/or grazing restrictions for the herbicides are communicated to and followed by farmers harvesting ditch hay, the forage can be fed to livestock without contaminating manure.

Farmers need a permit to hay highway areas that MN Department of Transportation (MN DOT) owns. Permits are not needed on roadways where only an easement is owned by MN DOT. The permit is free, and by contacting MN DOT and obtaining the permit, the farmer will be notified of any cutting restrictions that are due to herbicide use, wildlife habitat designation and/or calendar date restrictions. For contact information regarding the permit, visit: www.dot.state.mn.us/tec sup/utility/files/permits_contacts.pdf. Roadways owned by county and local governments have their own regulations, and farmers should contact their County or Township to obtain any cutting restriction information prior to harvest.

Anatek Labs Inc (208-883-2839) in Idaho and Morse Laboratories Inc (916-481-3141) in California will test forage and soil samples for the presence of clopyralid to 1 part per billion (ppb) and will screen for the presence of picloram. It is important to contact the companies for instructions on correctly sampling forage and soil for these tests.

Reviewers: Jeff Gunsolus, PhD and Carlyle Holen, PhD University of Minnesota.

References


PYRIDINE RESIDUE MANAGEMENT
Herbicide use advisory form

Sample only. If intending to use this form legal advice should be sought.

This hay/silage/straw (material) was produced from a paddock treated with (insert Product name)

Residues from this treatment may be present in harvested hay, silage or straw and may transfer to animal manure and compost giving the use of those materials potential to cause damage to sensitive crops.

Manure from animals fed this material and compost made from it or the treated crop material should only be applied to grass pastures.

Do not apply mulches containing this treated material, animal manure from feeding this material, or compost made from it or the material, to any broadleaf crop.

The manure from livestock fed this material will usually be clear of residual herbicide 4 days after an animal stops eating it. Manure produced after this 4-day period can then be used for broadleaf plant production.

Consult the (Insert product name) label for complete details on safe use and restrictions.

Please provide this information to anyone buying, accepting or using the hay or the manure produced after feeding this material.

Seller name: ____________________________ Date: ____________

Buyer name: ____________________________ Date: ____________

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• Clopyralid has been found in compost in New Zealand as a result of use on domestic turf. Use in domestic turf is no longer allowed according to controls imposed by the Environmental Risk Management Authority (ERMA). Clopyralid remains approved for use in amenity turf in New Zealand with warnings that prohibit composting the clippings or sending them to a recycling centre.

• Scientific studies have shown that clopyralid does breakdown during the composting process, however proper techniques must be followed, that include allowing complete decay of treated plant materials.
  • Clopyralid residues were also found in compost in the USA around 2000. These residues occurred because of improper composting of grass clippings coming from domestic or residential lawns treated with clopyralid. Residential lawn or turf uses were subsequently removed from clopyralid product labels. Few if any reports of damage from this source have been reported since this prohibition.
  • Products containing clopyralid are registered for use on domestic lawns in Australia, although Dow AgroSciences Australia in accordance with the company product stewardship policy has no products registered for this use.

• Clopyralid residues may occur in cereal or grass hay and may be of concern to some hay importing countries. Grass hay is not exported from Australia. The residue content of export cereal hay in Australia is managed by the hay export industry through vendor declarations that capture information about herbicide use history.

• Clopyralid residues may occur in cereal straw and be transferred to mushroom substrate. The use of cereal straw is managed by the mushroom industry through vendor declarations that capture herbicide use history.

• In the USA and UK picolinic acid herbicides have been found in animal manure, labels and supplementary information warn of this potential and provide use precautions and restrictions for plant residues and manure to avoid inadvertent crop injury.
  • Crop injury incidents have occurred in the UK involving aminopyralid. It is believed that this injury resulted from the use of manure from housed livestock fed grass hay or silage from herbicide treated pastures as a garden or soil amendment. Manure is commonly used for soil amelioration in the UK, the aminopyralid product labels and local stewardship program have been revised to minimise re-occurrence of crop injury. However, UK pasture and animal management conditions do not occur in Australia and New Zealand.
Where clopyralid, picloram or aminopyralid residue carryover is suspected and susceptible crops are to be planted, test the treated area as follows:

**Field bioassay** – where rain allows, plant a small area of the paddock, to which the compost or animal manure has been applied, with the susceptible crop 4 to 6 weeks before desired planting date and take note of any symptoms of injury. If any herbicide symptoms are observed, only plant a cereal crop (see the product label recommendations for plantback), or wait longer and test again.

**Pot bioassay** – where it is necessary to test compost or animal manure before use, plant a small number of seeds of the susceptible crop into pots containing soil mixed with the compost or manure. The compost or animal manure mixing rate with the soil should be the same as that intended in the field or garden. Herbicide symptoms should be evident within two weeks after emergence. If any herbicide symptoms are observed, do not use the compost or animal manure.

- Lentils, peas, tomatoes and clover are highly sensitive to picolinic acid herbicides and therefore are a good test species for a bioassay.