

# Identifying and Preventing Injury to Landscape Plants and Vegetables

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*This information sheet examines the different causes of injury to desirable vegetation, focusing on herbicide injury, and provides recommendations on preventive measures to avoid such injuries.*

## **Causes of plant injury**

Plants exhibit injury symptoms when they are subjected to stress. Stress could be caused by biotic or abiotic factors.

Biotic factors typically include such pests as plant pathogens, insects, and vertebrates. Abiotic factors include extreme weather conditions, such as drought, excessive soil moisture, heat, frost, and salt. Apart from environmental factors, pesticides, especially herbicides, may cause plant injury. Injuries are usually characterized by symptoms readily apparent to the trained eye. In certain instances, it may be difficult to discern the actual causal agent without performing additional laboratory analyses. In other instances, abiotic factors or multiple plant stresses may predispose a plant to biotic factors, further complicating diagnosis. Regardless, it is useful to have a thorough



*Fig. 1a, 1b. Symptoms expressed by potato and pepper plants exposed to herbicide-contaminated grass clippings.*

knowledge of the conditions to which an injured plant was exposed before making credible deductions.

## **Herbicides can impact nontarget plants**

Despite one's efforts to apply herbicides properly or follow the label as closely as possible, plant injury related to herbicide use happens occasionally.

**Herbicides may find their way to nontarget plants in gardens or the landscape through air, water, mulch, compost, or manure.** Certain herbicides applied to control weeds in lawns may move through water or drift to nontarget plants in the landscape. Grass clippings from lawns treated with such

herbicides, when used as mulch during the current or following year, may also cause injury to vegetables. In some cases, residues may persist in affected composts even into the following growing season and cause injury to susceptible plants. Similarly, certain herbicides applied in pasture or hayfields may persist in the harvested hay or manure derived from the animal that ate the forage.

Herbicides exhibiting such carryover characteristics belong to the pyridine class of herbicides generally considered as growth regulators. Growth regulator herbicides mimic the naturally occurring auxins that regulate plant growth. As

a result of exposure to such herbicides, the plants initially undergo unregulated growth and the symptoms manifest as cupping, twisting, and curling of stems and leaves (Fig. 1a, 1b). The leaves may appear to be strapped or cup-shaped. Such symptoms are collectively termed “epinasty.”

Injury may be exhibited by trees or shrubs subjected to drift or water movement through runoff or leaching to the root zone. Ash, pine, and spruce species have been reported to be sensitive to certain lawn herbicides. In conifers, the needles appear to exhibit twisting, curling, yellowing, and browning symptoms, followed by entire branches exhibiting necrotic (burn-down) symptoms (Fig. 2). Injury from drift appears initially to parts exposed to the herbicide. Herbicide absorbed through roots that have come into contact with water carrying traces of the herbicide shows up initially on current year-growth or younger branches and subsequently on lower limbs.

Although herbicide injury to trees can occur within two to three weeks of exposure or uptake by roots, some trees may often recover over time, depending on the extent of damage. Trees with minor browning or injury restricted

only to current-year growth will likely be able to push new growth in the next year and eventually recover within one or two growing seasons. However, apical growth may be affected and the usual shape of the tree can be compromised.

In some instances, entirely different levels of injury may be expressed by trees belonging to the same species growing side-by-side. This may be due to differences in the root architecture of individual trees, allowing their roots to come into contact with different levels

of herbicide concentrations in soil. Proper handling, keeping adequate buffer zones, not spraying when the environmental conditions are not favorable, and following other instructions as indicated on

the label, will reduce the instances of such injury. In vegetables, such an injury is irreversible, and the affected plants either die or remain stunted as a result of a single exposure. The active ingredients (trade names within parentheses) of herbicides in the pyridine class that have the potential to cause such carryover effects



Fig. 2. Symptoms expressed by Norway spruce adjacent to lawn treated with a growth regulator herbicide.

include clopyralid (Lontrel, Confront, Curtail, Millennium Ultra, Stinger, Redeem R&P); aminopyralid (Milestone, Forefront R&P, Chaparral); aminocyclopyrachlor (Imprelis, currently discontinued in turf); and picloram (Grazon P+D, Surmount, Tordon). Recent changes in product labels containing the active ingredient aminopyralid prohibit the transfer of treated plant materials or manure derived from such materials off the farm in several states, including West Virginia.

### Herbicide Persistence

Composting the herbicide-treated hay, grass clippings, and manure from animals fed this treated hay for extensive periods (>200 days) may break down the active ingredients by more than 50%. However, it would be better not to use any of these contaminated organic materials to produce finished compost for horticultural or vegetable production. Other susceptible plants include those in the legume family



(peas, beans, clover, etc.); composite family (sunflower, lettuce, etc.); and the nightshade family (tomato, potato, pepper, eggplant, etc.). Among landscape plants, ash, spruce, pines, and other coniferous plants are highly sensitive to such herbicides.

## Bioassays

Simple bioassays may be performed to detect the presence of herbicide residues in suspected materials. To perform a simple bioassay, such materials may be placed in containers and planted with sensitive species such as beans or tomatoes and compared to that from untreated material (control). Symptoms characteristic of the herbicide in question reveal its presence (methodology for more detailed bioassays can be obtained from Washington State University's website (<http://whatcom.wsu.edu/ag/aminopyralid/Bioassay2011.pdf>)).

## Other causes of plant injury

Many biotic and abiotic diseases or stresses can cause symptoms similar to herbicide injury. Careful observation and diagnosis are warranted on

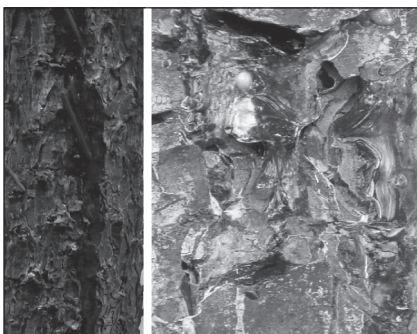


Fig. 3. Resin exudation on the stem caused by fungal infection.

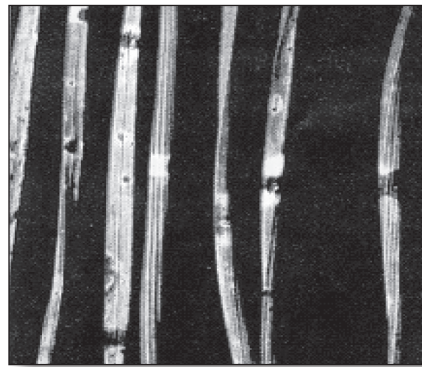


Fig. 4. Pine needles exhibiting spot and girdling from a fungal infection that causes needle cast.

a case-by-case basis. Conifer diseases, such as *Diplodia* tip blight and *Cytospora* canker, can be misdiagnosed if not examined carefully. Close inspection of affected trees will reveal a resinous substance being exuded from infected new shoots if the symptom is caused by any of these diseases (Fig. 3). Other foliar diseases, such as needle casts caused by a few species of fungi, will always cause yellow to brown spots or girdling on the needles. Needle tips usually die, starting from the girdled areas (Fig. 4). Eventually, small black fruiting structures develop on dead needles. A hand lens or magnifying glass can help you see these structures. In herbicide damage, no such spots or black structures appear on the affected areas. Other signs of diseases to evaluate include (but are not limited to) mushrooms around the trunk and tree base, hyphal growth/mat underneath the bark, brown discoloration of the cambium, or even insect boring on the trunk.

Other important observations, such as the distribution of affected plants/trees in the

garden or landscape, will help you make a proper diagnosis. For example, needles on one side (roadside) of trees exhibiting browning symptoms while trees away from the road are fine, could be an indication of salt injury. Usually, diseases occur randomly or in patches, whereas damage resulting from abiotic causes or herbicides occurs in a pattern around the application site or from the side of exposure. Also, progression of symptoms due to such causes is typically faster than disease.

## Record-keeping and proper communication will help prevent herbicides from reaching nontargeted plants

It is imperative to keep records of fields or lawns treated with herbicides. If there is potential for treated plant material to be transferred as grass clippings, hay, manure, or compost, proper lines of communication should be in place from the source to the end user. Often, lawns or pastures may be treated by a commercial pesticide applicator and managed subsequently by the owner or someone else. Transfer of herbicide records among the parties involved is a good practice. Gardeners who use manure from a local farm may need to ask the owner about the source of all hay and bedding material. If confirmation is not available, one may need to exercise caution (e.g., performing a bioassay). Maintaining a dedicated sprayer to apply herbicides is also a good practice to avoid injuring

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sensitive plants while applying other pesticides.

The herbicide label includes a precautionary statement warning the user about any potential crop injury if the treated crop is used as hay or manure. Some labels recommend that a sensitive bioassay be performed to determine if there are any harmful traces in crop residues or compost derived from such residues or manure. Failure to follow the label, inadvertent transfer, or gaps in communication between the applicator and the end user may result in crop damage or crop failure.

### **Plant Diagnostic Clinic at West Virginia University Extension Service**

You may contact your county WVU Extension agent to assist

you with troubleshooting. If conclusions cannot be derived on site, send samples to WVU Plant Diagnostic Clinic for an in-depth analysis. It is important to identify the plant species because all species are not equally susceptible to diseases or chemical injury. Other relevant information, including the first date of symptom appearance, part of plant showing injury, a brief history of fertilizer or other chemical application, age of foliage, etc., is always helpful in getting the correct diagnosis in the shortest possible time. Proper diagnosis will indicate whether any corrective measure (pruning of affected branches, fungicide application) will be required or if recovery may take place without taking any measures.

### **References**

Sullivan, D. 2011. The Aminopyralid Challenge Continues. *BioCycle*, Vol. 52, No. 6, p. 28.

Bioassay Test for Auxinic Herbicide Residues in Compost: Protocol for Gardeners in Washington State, March 8, 2011 Web document, <http://whatcom.wsu.edu/ag/aminopyralid/Bioassay2011.pdf>

The Compost Gardener, Residues of Picloram, Clopyralid or Aminopyralid Herbicide Create Web Document, <http://www.the-compost-gardener.com/picloram.html>

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