The Plant Doctor's LANDSCAPE TIPS

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THE IMAZAPYR HERBICIDE EPIDEMIC

INTRODUCTION:

In the April 2015 Issue of the Landsculptor, I published an article entitled, "Roundup Is Glyphosate…Right?". This article garnered quite a bit of attention, and I have received many favorable comments over the last year or so about its apparently helpful content. Interestingly, some associations in other states and even Europe have requested the opportunity for its reprinting in their publications. Although I have been witnessing herbicide toxicity to desirable, non-target plants every year for my 40+ year career, there seems to be an increasing number of herbicide-related problems in Michigan landscapes and nurseries. There is great potential for a wide variety of herbicide issues, given all of the products available in today's arsenal for weed control. With the need for brevity in this article, however, I cannot be all encompassing in regards to all herbicide toxicity matters and non-target effects on trees and shrubs. The primary subject of this article, Imazapyr, is particularly costly and devastating to trees and shrubs, primarily because of its increased use and inclusion in mixtures with other herbicides.

Before delving into the Imazapyr issue, it might be prudent to cover some of the basic generalities about herbicides.

CLASSES AND ACTIONS OF HERBICIDES & THE ROOT CAUSES OF PROBLEMS:

Herbicides can be classified according to various criteria…. and there are many classes of herbicides with various modes of actions and/or with various effects on plants. For example, there are herbicides that are "photosynthetic inhibitors," there are herbicides that act as "growth regulators," there are herbicides that inhibit root development, and there are herbicides that inhibit shoot development, to name a few. Sometimes, herbicides are classified according to the type of damage they cause on plants; some of those symptoms include yellowing, leaf spotting, tissue distortion, leaf cupping, the inhibition of meristematic tissue, etc.

Systemic vs. Contact Herbicides: Initially, at least, we can surmise that herbicides can be placed into two major categories. Systemic herbicides are absorbed by plant tissues and distributed "systemically" throughout or to other portions of the plant. Such herbicides result in symptoms that affect the growth of plants: shoot/root elongation, tissue development, and so forth. Common systemic herbicides such as glyphosate, 2, 4-D, Dicamba and Imazapyr generally pose a greater risk to landscape plants than contact herbicides. Contact herbicides on the other hand do not move systemically but "stay put," to wherever they are applied or to wherever they might drift. The most common symptoms of contact herbicides include leaf or plant death (if application is fairly thorough) or far more commonly, leaf/stem spotting. Examples of contact herbicides include Paraquat and Diquat.

What Causes Herbicide Issues? One or more of the following factors generally cause herbicide toxicity issues on desirable plants: 1) Drift (application during windy periods), 2) Movement of the herbicide after application, as in water, various media such as mulch, and volatilization, 3) Misunderstanding of herbicide modes of actions, 4) Misunderstanding of the herbicide label, 5) Failure to thoroughly read the label or the fine print and, hence, precautions, and 6) poorly worded or confusing labels, among others.

Professional or Homeowner? Now, we might assume that it is common for homeowners to misapply or misunderstand herbicide use, so that mistakes by these individuals would be the most frequent… and they probably are. After all, many herbicides that are deadly to plants are sold in box or hardware stores without the requirement for an applicator's license. However, all but one of the examples presented in this article were associated with professionals in the plant industry.

THE "IMAZAPYR EPIDEMIC":

As related in the article, "Roundup is Glyphosate…Right,?" imazapyr is gaining momentum in its frequency of use and devastation to ornamental plants both in the nursery and landscape (Photos 1, 2A. 2B, 2C, 3A, 3B,). Imazapyr is a carboxylic acid herbicide that is classified as, and provides for, "total vegetation control." It has three very significant attributes that make it deadly: 1) very broad spectrum activity, 2) soluble in and transported by water (hence, leaching through soil or lateral movement by precipitation or irrigation), and 3) persistence for at least 9 months to a year in soil. In fact, the

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Photo 1: The mulch rings of these maples were treated with Imazapyr with apparent deadly consequences. Some of these trees re-leafed and recovered three years later.

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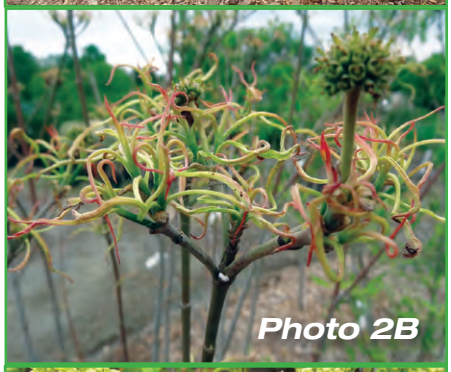

Photos 2A, 2B, 2C: Upon the recommendation of a chemical supplier, Imazapyr (Mohave) was applied to driveways and paths in this nursery for weed control. Precipitation and irrigation washed the herbicide into areas where plants were healed-in, such as these dogwoods (2A & 2B-note close up damage). The herbicide subsequently drained into a retention pond that was being used to irrigate many of the plants in the nursery (Photo 2C-note foliar yellowing and distortion of these potted plants). While many of these plants may eventually recover, they will likely be affected for at least two years.

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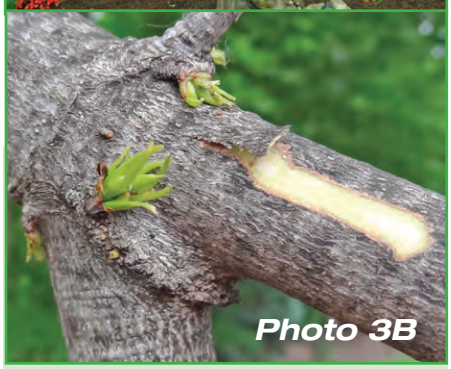
effects of Imazapyr typically last much longer than one year when concentrated within plant tissues (Photos 1, 2A, 2B, 2C). Imazapyr is sold as a stand-alone herbicide under a variety of trade names such as Assault, Arsenal, Sahara and Mohave, etc.; these trade names should reveal the true nature of this herbicide and their intended purpose: to destroy plant life and leave a desert-like environment!!! Regrettably, these standalone herbicides have occasionally been applied to landscapes and nurseries for long-term weed control with devastating results (Photos 1, 2A. 2B, 2C, 3A, 3B). However, far more confusing is the fact that Imazapyr is increasingly being included in mixtures of herbicides, especially with glyphosate. Some of these mixtures include Roundup Extended Control, Roundup 365, Barricade, and Ortho's Ground Clear, among others. Imazapyr is a carboxylic acid chemical in the same class as (remember?) Imprelis, the herbicide released by DuPont before the herbicide was properly vetted as a broad leaf weed control on turf. As we know, Imprelis caused severe harm to many plants, especially conifers and certain deciduous plants (Photo 4). Interestingly, another carboxylic herbicide that was on the market for some time (and still is marketed in some locations and in some countries) is Clopyralid, one of the components of Confront, used for broad leaf weed control in turf. Clopyralid tended to persist and build up in dead plant material (clippings and mulch) and caused severe, sometimes deadly, harm to ornamental plants (Photo 5). Another carboxylic acid type herbicide similar to Imazapyr, Clopyralid and Imprelis is Aminopyralid (Milestone-Photo 6).



Photos 3A, 3B: This landscape was mulched by a landscape company; professionals treated the mulch with Imazapyr to control weeds. Many large trees (oaks, conifers, etc.) and shrubs were severely affected. They may or may not recover. As is typical with carboxylic acid herbicides, the growth is prohibited or severely restricted while the cambium appears normal (3B), at least for some time.

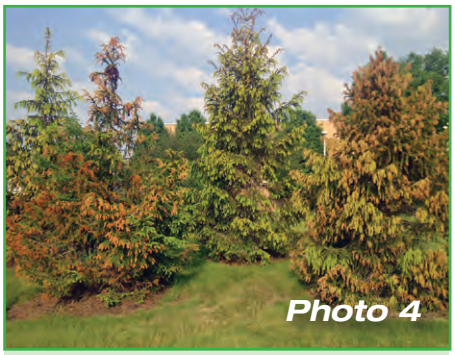


Photo 4: Imprelis, another carboxylic acid, caused severe harm to conifers and some deciduous species when applied to lawns. Like Imazapyr, Imprelis moved with water (downward or laterally) and was not readily tied up by soil or organic matter. Unlike Imazapyr, which has a broader range of activity, Imprelis was lethal on honey locust but did not have much toxicity effect on maples and oaks.

Photo 5: Trees and shrubs in this landscape were killed when herbicide-contaminated mulch was distributed there. Note that the (green) patch of sweet woodruff was unaffected.

OTHER COMMON HERBICIDES CAUSING TOXICITY TO ORNAMENTAL PLANTS:

Although the list may be very long, glyophosate and the phenoxy-growth regulator herbicides are very commonly applied herbicides and along with Imazapyr represent some of the more common toxicity issues to trees and shrubs in the landscape and nursery (Photos 7 & 8).

Glyphosate: The original Roundup was patented and initially brought to the market by Monsanto in 1974. It became "The Wonder Herbicide," perhaps the most significant herbicide of all time, even rivaling 2,4-D and Dicamba, which are used extensively not only in turf and ornamental arenas (Photo 7), but also in the humongous food production/agriculture market. Glyphosate is utilized for weed control in commodities ranging from traditional crops (field crops, vegetables, etc.) to weed control in ponds and lakes. As related in the article, "Roundup is Glyphosate…Right?" other chemicals and herbicides have been added to various labels of Roundup products that tend to alter or broaden glyphosate's activity.

Phenoxy growth regulators: There are a variety of herbicides that are used in the landscape, especially in turf for broad leaf weed control, that cause injury to non-target plants (Photo 8). Two of the most prominent ones are 2,4-D, and Dicamba.

Photo 6: Milestone herbicide was applied to cracks in the pavement and curb to control weed growth (it was not applied to the island area!) at this commercial site by a commercial applicator with deadly consequences to these honey locusts. This particular herbicide is deadly to legumes (locust, honey locust, redbud) but does not generally affect non-leguminous trees and shrubs. Upon recollection, the herbicide label did not warn about toxicity to legumes, but the company website did.

DIAGNOSIS OF HERBICIDE INJURY:

It is sometimes difficult to discern herbicide injury on plants from other issues such as diseases, pests and plant nutritional deficiencies. Some herbicide damage can especially mimic symptoms caused by plant viruses, phytoplasmas, insects such as aphids, and certain nutritional deficiencies whether macro or micro. Obviously, experience and familiarity with herbicide symptoms help us in our efforts to diagnose herbicide problems. In some cases, residue analysis may be necessary to elucidate whether an herbicide is causing the particular problem. Unfortunately, residue analysis can be quite costly. L

For more information, please feel free to email David Roberts at robertsd@msu.edu or contact a professional plant health care provider. The author, MSU and MGIA do not endorse any particular products. If using pesticides, be sure to read and follow label directions.

Photo 7: Like Imazapyr, glyphosate often affects trees and shrubs the year following application. This serviceberry exhibits stunted, strap-shaped foliage when glyphosate was applied to "root suckers" the previous year. The tree eventually recovered.

Photo 8: A mild case of phenoxy growth regulator herbicide (applied to the lawn) distorted the growth on this large white oak. This tree recovered when the "dandelion" herbicide application was discontinued.

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