The Plant Doctor's LANDSCAPE TIPS

By Dr. David L. Roberts, The Plant Doctor LLC a.k.a. The Tree Doctor

DISTINGUISHING IMAZAPYR TOXICITY FROM OAK WILT AND OTHER LANDSCAPE MALADIES

INTRODUCTION

Herbicide misapplications can be catastrophic for trees and other plants in the landscape. And herbicide mistakes can be very difficult to diagnose (Photo 1). While a plethora of herbicides can cause non-target impacts on desirable plants in our landscapes and nurseries, Imazapyr seems to be the most common denominator involved in much of the confusion, at least regarding the most devastating cases witnessed by the author in recent years/decades. Some of the confusion with Imazapyr-containing products can be attributed to packaging (Photo 2), vague labels, our poor understanding of the various chemical herbicides and their modes of action, and, well, our propensity to not read the fine print in labels. I continue to encounter misunderstandings and misdiagnoses of herbicide toxicity, especially Imazapyr, even among arborists and professional applicators alike. Oak Wilt and Imazapyr toxicity are among the most confusing conundrums arborists encounter. Hence, I thought it might be useful for readers of this column to examine one particular site (among many) where widespread confusion occurred among various arborists and the property owners.

Photo 1: Several companies had already diagnosed Oak Wilt as the cause of tree death at this couple's property by the time I arrived in July 2022. The diagnosis of Oak Wilt and proposed implementation of the DNR/Bruhn Model would have devastated this property many magnitudes more with the sacrifice of so many healthy trees if Oak Wilt was indeed the problem. The reason I was asked by an arborist (Pat) for assistance was because he was skeptical of the diagnosis . . . and for good reason.

Photo 2: Labels of various pesticides, especially herbicides, can be rather vague if not downright misleading. This jug of Roundup 365 contains Glyphosate and Imazapyr, advertising year-long control of weeds. The wording on the container advises the herbicide's use on driveways, patios, sidewalks, and gravel areas . . . where weeds often grow but where trees roots also exist.

THE SITUATION

I was contacted by an arborist to help him investigate a site where several other tree companies had already determined that many trees there were devastated by Oak Wilt (Photo 1). The diagnosis of Oak Wilt at this site may seem plausible because so many oaks had apparently been killed, and because many experts believe Oak Wilt is likely the numero uno killer of oaks in Michigan. What made this site in western Michigan even more potentially alarming is that remediation of Oak Wilt often entails implementation of the destructive and costly DNR/Bruhn Model by well-intentioned but ill-informed individuals. In this situation, the arborist (Pat) who contacted me was not convinced the problem was Oak Wilt, largely because he had attended some of my lectures and read some of my publications detailing my warnings about Imazapyr. According to the property owners, the trees appeared in great health in 2021, but many suddenly died in 2022. I visited the site in July 2022 in the company of Pat who, fortunately for the property owners, questioned the prevailing beliefs. And I revisited the site just last August (2023) to ascertain if my diagnosis and recommendations were correct.

IMAZAPYR VS. OAK WILT

Although herbicide toxicity may affect any landscape, this particular landscape happened to a large population of oak trees as well as a variety of other woody plants. "Dead Oak Trees" may lead us or mislead us to the conclusion of Oak Wilt due to the significant prevalence of the disease around the state and our preoccupation with the disease (and for good reason). Oak Wilt can sometimes be difficult to diagnose; so can herbicide issues. With more than 40 years' experience regarding Oak Wilt and other landscape/nursery maladies, I am sometimes befuddled by trees and their health challenges. So, please follow along as I detail some of the clues I utilized to diagnose the cause of so many apparent tree deaths in as accurate a manner as possible.

1. **Location, Location, Location: Where are the afflicted trees located?** Answer: At this site, all affected trees resided on either side of the long driveway into the property. That's a very important clue. Trees located farther from the drive did not typically exhibit any symptoms, or if they had symptoms of dieback, those symptoms were not as severe as symptoms on trees directly adjacent to the drive. In other words, the severity of the death or dieback depended largely on proximity of the trees to the driveway.

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2. **Leaf Drop?** Initial symptoms of Oak Wilt are usually expressed as leaf shedding. There was no leaf shedding on any of the trees when I first visited the site in 2022. In fact, it appeared that the most drastically afflicted trees did not even produce leaves that season (Photo 1). It would be an exceedingly rare situation for Oak Wilt to have affected so many trees so devastatingly that some would not have pushed some new growth in 2022. Knowing the mode of action of carboxylic acid herbicides such as Imazapyr and Triclopyr, these herbicides kill plants by inhibiting cell division and, hence, growth. Score another point for herbicide toxicity and deduct a point for Oak Wilt as a causal factor for dead trees at this site.
3. **Tree Injury?** Because all trees were reported to have been healthy in 2021 and because no Oak Wilt had not been previously reported on this property and nearby properties, in order for Oak Wilt to have spread overland to these trees, significant injury to all afflicted trees would have occurred. In examining many of the trees, no injury from pruning or storm was evident (Photo 3). Score another point against Oak Wilt as the culprit of declining/dead trees in this landscape.

Photo 3: Recalling that all trees were reported to be healthy the prior year, for Oak Wilt to have affected so many trees via overland spread, there would have had to be abundant injuries to the trees, likely from pruning or storm damage. There were no conspicuous injuries to any of the trees.

4. **Differential Growth?** Some of the trees of intermediate distance from the drive exhibited growth of an intermediate nature: some branches had normal growth and/or stunted, gnarled growth while other branches appeared dead (Photo 4). Oak Wilt kills trees very quickly and it is unusual for some branches to remain apparently healthy for any length of time. Again, the symptoms in Photo 4 are abnormal for Oak Wilt but could be consistent with herbicide injury or Two-Lined Chestnut Borer, etc.

Photo 4: Oak Wilt typically results in tree death rather quickly. Some of the trees farther from the landscape adjacent to the drive exhibited branches with healthy foliage while other branches appeared dead. Also, some branches had stunted, distorted foliage, which is a symptom of herbicide injury and not Oak Wilt (Inset).

5. **Cambium Health?** The cambium of trees includes the xylem, phloem, and cork associated with the tree's functioning vascular system. Trees infected by the Oak Wilt fungus often die very quickly with the cambium (vascular system) of infected trees becoming brown and rather dry. There are exceptions however, the reason why we sometimes observe the production of epicormic shoots on some Oak Wilt-infected trees a year or more after the trees became infected by the Oak Wilt fungus. Typical of the carboxylic acid class of herbicides, of which Imazapyr is a member, the cambium of affected plants may remain alive and appear viable for several years after exposure to the herbicide even though no foliage may develop during those years (Photo 5). At the site in question (Photos 1, 3, 4, & 5), the cambium of these oaks appeared perfectly healthy indicating Oak Wilt was not likely the cause of the problem.

Photo 5: Oak Wilt usually results in rapid cambium death, which is exhibited as brownish, dry tissue. In this case, the cambium was green, succulent and healthy, typical of carboxylic acid herbicides such as Imazapyr. With Imazapyr, the cambium would remain viable for several years after application of the herbicide.

6. **Other Plants Affected?** Oak Wilt only affects oak trees (*Quercus* sp. Note: there may be some exceptions). Most diseases are rather specific for their host plants. However, herbicides are often designed to be broad spectrum, impacting many species of plants. In examining several other species of plants in the landscape, I discovered the following observations. A Kousa Dogwood appeared practically dead (Photo 6, arrow); however, the plant was trying to push new growth (Photo 6 Inset). A spruce exhibited stunted shoots and needle loss (Photo 7). A white pine pushed several stunted shoots from its apex (Photo 8). These symptoms on multiple species of plants are more aligned with herbicide toxicity, especially Imazapyr, than Oak Wilt and other diseases and pests.

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Photo 6: The Kousa Dogwood (arrow) next to the home appeared dead from a distance. However, when viewed up close, the plant was trying to push new growth as evidenced by the stunted green shoots (Inset). This dogwood was still alive in August 2023, more than a year after my first visit, but had not yet recovered.

Photos 7 and 8: Plants other than the Kousa dogwood were also affected. Two examples are a spruce (Photo 7) and a white pine (Photo 8). In both instances growth is stunted and "proliferated".

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7. **Weeds Present?** The targets of herbicide application are weeds. I always look for weeds in the landscape where I suspect herbicide toxicity to non-target plants. Weeds were sparse if nonexistent in this landscape (Photo 9).

CONCLUSION

While following this "Seven Step Program" to enlightenment, I was able to conclude that Oak Wilt was not likely involved in the decline and apparent death of so many oak trees at this western Michigan location. These steps would enable practically anyone to determine if Imazapyr or other herbicide is involved in plant problems whether oak trees are present or not. The couple that lived at this residence bought the property because of the seclusion afforded by the surrounding woodland. However, one "spouse" loved to garden and admitted to using an Imazapyr-containing herbicide; the spouse was entirely unaware of the dangers of Imazapyr, which is not an uncommon reaction. Similarly, they were unaware of the destructive disease, Oak Wilt. There is little wonder that these property owners were confused! Arborists and landscapers should be aware that denial of "chemical use" is commonly proffered by property owners who may not want their companion to know what extracurricular activities they've been up to. Another important tidbit of information is that herbicide toxicity symptoms may not be exhibited until the year after application. This is especially true of the Carboxylic Acid herbicides such as Imazapyr. Another important tidbit of information is that some plants may recover to good health after a year or two of apparent death as the herbicide is gradually metabolized in the plant tissues. In other cases, reapplication of the herbicide the same year of symptom expression from a previous year's application will likely doom afflicted plants to death.

Photo 9: Another clue I always look for is the presence of weeds in herbicide-affected landscapes. Sometimes however, when property owners are queried about herbicide use, they often reply that they hand-weed. Don't necessarily believe them if symptoms of herbicide toxicity suggest otherwise. In many cases, I have found outright denial of the application of herbicides even though I know they have been used. A potentially confusing aspect is that because Imazapyr symptoms usually do not manifest themselves until the year after application, weeds may start to reinvade treated areas as the herbicide activity dissipates, meaning the herbicide probably wasn't reapplied early in the year symptoms appeared on affected woody plants.

Big problems such as herbicide misapplication or Oak Wilt demand accurate diagnosis. Imagine the additional destruction if the couple who lived at this residence (Photos 1 and 6) had believed the problem was actually Oak Wilt. In a moment of commiseration, I told the couple that it could have been much worse if Oak Wilt had been the problem because so many more trees would have been destroyed. Perhaps that was of little consolation, given the probable large expense to remove all affected trees and consequential damage to property value.

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