The Plant Doctor's LANDSCAPE TIPS

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

THE "ROUNDUP"/GLYPHOSATE CONTROVERSY

INTRODUCTION

Roundup is a brand of herbicide currently marketed by Bayer AG. Roundup originated as a name for the active ingredient glyphosate, originally marketed by Monsanto, but that brand may now contain a variety of other chemicals. Roundup, uh glyphosate, has been an extremely valuable tool to control unwanted plants (weeds) in the nursery and landscape industry (Photos 1, 2 & 3). Based on all the television advertisements and other news outlets, the herbicide product sold as "Roundup" has become quite a controversial matter. I hope this article may provide a little insight into the issue(s) surrounding the popular herbicide known as "Roundup."

BACKGROUND

According to my findings, glyphosate was first patented in the U.S. in 1961 by The Stauffer Chemical Co as a descaling and chelating agent. It was apparently marketed as a descaling product to clean out calcium and other mineral deposits in metal pipes and boilers. In 1970, Monsanto scientist John Franz discovered that glyphosate possessed herbicidal (weed killer) properties. Subsequently, the chemical was patented as such. Glyphosate was first brought to the market by the Monsanto Corporation as a non-selective, broad spectrum, systemic herbicide and sold under the trade name Roundup in 1974. By 1980, Roundup became one of the bestselling herbicides on the market. Also, by the early 1980's Monsanto was working on GMOs (Genetically Modified Organisms or GM=Genetically Modified). Many of us know the eventual outcome of this GM research in conjunction with Asgrow and DuPont as the development of Roundup Ready crops. Monsanto's patent on glyphosate expired in 2000. According to several sources, glyphosate has become the most used pesticide (and hence, herbicide) used in the world. Glyphosate is the number one herbicide used in the U.S. A deal was set in motion in 2016 for Bayer AG, a German company, to buy Monsanto for $66 billion. In April 2018, the deal was approved by the U.S. Department of Justice.

CONTROVERSIES SURROUNDING ROUNDUP (GLYPHOSATE)

To be forthright, the attention paid to the brand name "Roundup" by the media and public is not fair. Because Monsanto's patent on glyphosate expired in 2000, numerous companies are now producing glyphosate-containing herbicides under their own brand names. One source on the web suggested that there are over 800 products currently offered with glyphosate as an active ingredient. Regarding the brand name "Roundup", Monsanto has expanded the Roundup product line over the years, especially after its patent expiration of glyphosate, to a variety of products, some of which do not even contain glyphosate (Photos 4A, 4B, 4C, 4D and 4E). Apparently, Monsanto has tried to capitalize on the stellar "Roundup" brand in recent years.

As is to be expected in many cases, the controversies surrounding a product increase the more successful a product becomes and the more it is used. Currently, some of the controversies surrounding "Roundup" (glyphosate) include human health concerns, Genetically Modified Organisms (GMO) including plants, development of "weed" resistance to glyphosate, the detection of glyphosate in food products, and confusion by the public and professional applicators about various herbicides including the Roundup brand. The reason the media and public, including me in this

Continued on page 14

Photos 1, 2 and 3: These three different "landscape" locations demonstrate the benefits of excellent weed control with products such as Roundup, or more appropriately termed glyphosate. Glyphosate is relatively safe to use around landscapes containing trees, shrubs, annuals, perennials and turf if used correctly according to label directions . . . because it becomes inactive upon contact with soil and organic matter.

The Plant Doctor's LANDSCAPE TIPS

THE "ROUNDUP"/GLYPHOSATE CONTROVERSY

Continued from page 13

article, devote so much attention to the brand name "Roundup" is likely due to its immediate name recognition by the public and professional applicators whether they are farmers, landscapers or Joe Q. Public. Again, it is unfair to single out Monsanto's (now Bayer's) "Roundup" brand when so many other companies are now producing glyphosate, which should be the focus of attention . . . except perhaps for the Genetically Modified/ Roundup Ready crops.

Defenders of glyphosate believe the chemical to be very safe. They declare that glyphosate has been evaluated for more than 40 years. They also state that glyphosate is environmentally sound because it represents a tool for sustainability. It produces higher yields to feed a hungry planet. It makes harvests easier by reducing weed seed and other contaminants in our crops. And with the current concern for climate change, the use of glyphosate purportedly reduces Carbon Dioxide emissions in minimum/no till operations; traditional crop cultivation requires far more tillage and use of fossil fuels for weed control and other food production practices.

HUMAN HEALTH CONCERNS

If anyone watches television, listens to the radio or cruises the world wide web, it would be impossible to escape the plethora of advertisements by law firms regarding "Roundup." Generally, the language is very carefully worded when human health concerns are presented. For example, "may cause" or "linked with" Non-Hodgkin's Lymphoma are common qualifiers. Nevertheless, Monsanto was previously ordered to pay $189 million for a cancer case. More recently, Bayer AG was ordered to pay about $2 billion in damages to a California couple. Most of these cases are likely to be appealed.

An estimated 6.1 billion kilograms (about 13.4 billion pounds) of glyphosate has been applied around the world in the last decade; it is imperative we understand its risk to applicators, consumers and the environment. According to many sources, glyphosate has been one of the most scrutinized and researched chemicals when human health matters are concerned. It has been studied for over 40 years. In fact, according to some sources, a marketed chemical must undergo periodic review (every 10 years) to confirm its safety to humans and the environment. All chemicals undergo testing by various agencies in many countries. Following are some examples:

> **"The draft human health risk assessment concludes that glyphosate is not likely to be carcinogenic in Humans . . . the Agency's scientific findings are consistent with the conclusions of science review by a number of other countries . . ."** - U.S. EPA, Draft Risk Assessment for Glyphosate

Photos 4A, 4B, 4C, 4D and 4E: Monsanto (and now Bayer AG) have tried to capitalize on the stellar Roundup brand by expanding upon its line of products beyond the Roundup product that initially contained the active ingredient glyphosate. Roundup in Photo 4A contains glyphosate plus diquat dibromide, which is a contact herbicide. Roundup in Photo 4B contains glyphosate plus pelargonic acid, a contact fatty acid herbicide. Roundup Extended Control in Photo 4C contains glyphosate plus Imazapyr, a very toxic, persistent herbicide that leaches with water and is very harmful to landscape plants. Roundup 365 in Photo 4D contains glyphosate and Imazapyr at a slightly higher concentration. Roundup in Photo 4E contains broadleaf weed killers but no glyphosate and can be used on lawns. Are we confused yet?

"Glyphosate use was not associated with overall cancer risk" - National Institute of Health, 2018 Agricultural Health Study

"EFSA-in line with the scientific opinion of 27 out of 28 Member State experts – concluded that glyphosate is unlikely to be carcinogenic to humans" - European Food Safety Authority, Statement on Glyphosate

"No pesticide regulatory authority in the world currently considers glyphosate to be a cancer risk at the levels which humans are currently exposed" - Health Canada

"Glyphosate is unlikely to pose a carcinogenic risk to humans from exposure through the diet." - Joint FAO/WHO Meeting on Pesticide Residues

However not all agree with the above assessments. A lively debate started in 2015 when the World Health Organization's International Agency for Research on Cancer (IARC) concluded that glyphosate was "**probably carcinogenic**." There are many other groups and individuals who question the safety of glyphosate.

On a personal note, my father farmed most of his life. In the mid 1970s, like most of his neighboring farmers, he readily adopted the new magical herbicide technology known as Roundup. He applied Roundup every year and similar to many other farmers, probably did not assume recommended precautions for Personal Protective Equipment and other preventative practices to reduce his exposure to Roundup. He even had a jug of Roundup on hand for broad-spectrum weed control after he retired from farming, as many homeowners do today. My dad lived to age 95, and, as far as we know, his relatively long and productive life was not adversely affected by glyphosate. Please bear in mind that in my relating this anecdotal experience, I am in no way suggesting that glyphosate is completely safe from the standpoint of human health or safety to the environment.

DETECTION OF GLYPHOSATE IN FOOD PRODUCTS

Glyphosate has been detected in some food products. This is to be expected. Glyphosate is known to become inactive on contact with soil/organic matter. Nevertheless, glyphosate is believed to be somewhat resistant to degradation. With its application over millions and millions of acres in the U.S. and worldwide, its detection in food products should not be unexpected. A real concern is whether its presence in food at such low levels (parts per billion, parts per trillion) could present a health hazard to humans and animals.

It is significant that much of the current focus on human health is due to the use of glyphosate by professional applicators . . . and not due to the detection of glyphosate or its breakdown chemicals in food products. We might expect that focus to change with time. Because glyphosate has been detected in processed food products, it is understandable that the herbicide will come under greater scrutiny.

GLYPHOSATE RESISTANT "WEEDS

Mother Nature is recalcitrant if not outright stubborn. What is the definition of a weed? When the plant grows in an undesirable place, according to we humans. Mother Nature doesn't exactly see matters that way. When her beloved plants are subjected to artificial, unnatural forces such as the widespread application of glyphosate, she tends to rebel. She has all the means at her disposal to deal with these pesky humans and their inventions. Through gene manipulation and environmental efforts, plants that are subjected to severe stress or death change through a process commonly known as Evolution. With the use of glyphosate over millions of acres, "weeds" and perhaps crops are bound to change and adapt.

As of 2018, glyphosate resistance has been confirmed scientifically in 41 species of weeds worldwide. In the U.S., 18 species of weeds have been confirmed as glyphosate resistant. Some of the glyphosate resistant weeds in the United States include rigid ryegrass, horseweed (Marestail), Italian ryegrass, common ragweed, Palmer amaranth, and waterhemp. Elsewhere around the world, Goosegrass, Hairy fleabane, Broadleaf Plantain, Johnsongrass and Wild Poinsettia are reported to be resistant to glyphosate.

From 1996 to 2006, the increase of the use of Roundup Ready Crops rose from practically zero in 1996 to over 70 million acres of soybeans and to over 30 million acres of corn in 2006. Obviously, in the interim, the acreage of Roundup Ready crops has increased even more dramatically. The concern for development of glyphosate resistance in many other cultivated crops is of grave concern.

GMO CONCERNS

Genetically Modified Organisms (GMO=Genetically Modified) has become a raging controversy the world over. Some health organizations claim that GM foods are bad for our health, affecting our organs and other tissues. Some organizations declare GM sources of food completely safe. Who do we believe?

GM crops are currently grown in more than 26 countries while dozens of other ban them. Many countries will import GM feed products for livestock but will not allow the cultivation of GM plants in their country. In 2015, a majority of the European Union nations blocked the cultivation of GM crops while importing more than 30 million tons of GM corn and soy-based feed for livestock. Other countries such as Canada, China and Japan restrict GMO products but only until they pass regulations. Only Russia blocks the importation of GM products and the cultivation of GM organisms (plants or animals).

Into this melee falls glyphosate and Roundup Ready crops. Obviously, these issues are quite complicated. With the intersection of politics, science, environmental groups and business interests, things are bound to become controversial. There are advantages and disadvantages to GM organisms, which is a conflict beyond the scope of this article.

Continued on page 16

THE "ROUNDUP"/GLYPHOSATE CONTROVERSY

Continued from page 15

PRODUCT MISUNDERSTANDING/ PUBLIC CONFUSION

A relative recently told me that he had just applied Roundup to control the dandelions in his lawn. I asked him which Roundup he had used; he didn't know for sure. Upon examination of the package, Roundup QuikPro, we discovered he had applied glyphosate and diquat to his lawn. Furthermore, the front of the package spelled out "Non-Selective". I replied, "Well, you'll know in couple of weeks where you applied the Roundup".

Glyphosate is considered relatively safe as a herbicide around plants because we tend to see very little non-target effects . . . except perhaps from drift or misapplication (Photo 5). It is much safer plant-wise (environmentally?) than Imazapyr which exhibits activity for more than a year, and which may move in water or soil from its initial site of application.

Recall that the original Roundup was glyphosate. After patent expiration Monsanto expanded the "Roundup" name into a "brand", which has become very confusing not only to the public but to professional applicators as well (Photos 6, 7, & 8). Currently, the expanded line of "Roundup" products often contains glyphosate plus other active ingredients such as imazapyr, diquat dibromide, pelargonic acid, 2,4-D, etc. (Photos 4A-4E). In fact, some Roundup products do not even contain the active ingredient 'glyphosate' (Photo 4E). Also, to be fair, since the expiration of Monsanto's patent in 2000, numerous companies have marketed their own glyphosate-containing products. Examples: Ortho's Ground Clear, RM 40, Gordon's Barrier, KnockOut, etc. among MANY others. In past articles published in The Landsculptor, I have documented the hazards of misuse of enhanced-glyphosate containing products, especially those containing Imazapyr (Photos 6, 7 and 8).

Photo 5: Many people do not understand that glyphosate is non-selective, meaning it has the potential to kill any plant in which it comes in contact. Nor do many people understand that glyphosate is systemic. This crabapple tree was killed when shoots emerging from the base of the tree (Inset) were sprayed with Roundup/glyphosate.

Photo 6: These two red oaks were killed after Roundup Extended Control was applied to the gravel driveway by a professional landscaper/lawncare company. Roundup Extended Control contains Imazapyr which should never be used in the vicinity of tree roots.

Photo 7: This large walnut tree was killed when Roundup 365 was applied by the homeowner to a nearby sidewalk and patio for weed control. Roundup 365 also contains the deadly Imazapyr.

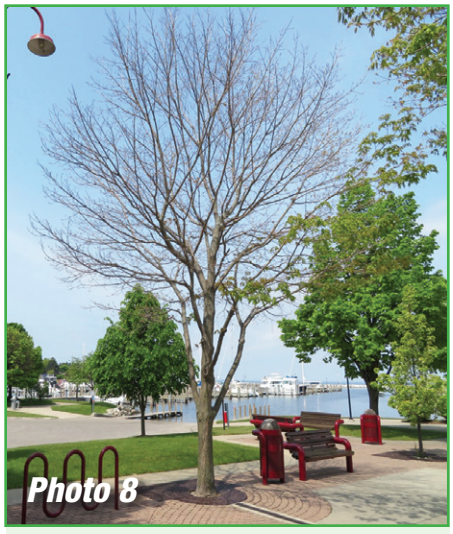

Photo 8: These trees in a park located in a city near Lake Michigan are declining from applications of Imazapyr by a licensed, professional applicator. Note that only trees in the brick paver area are affected while trees in the turf areas remain unaffected (because Imazapyr was not applied to the lawn).

Photo 9: This long, once beautiful hedge was severely affected by applications of both Roundup Extended Control and Roundup 365. The homeowner who applied the materials had no idea that her herbicide applications were the cause of the decline/death. Like many other people, she had previously used "Roundup" successfully without any problems. Her prior applications of "Roundup" were likely a product containing glyphosate but no Imazapyr.

ROUNDUP IN THE LANDSCAPE

One of the fundamental questions we may face in this industry is the safety and public concern for Roundup, actually glyphosate. Being in a service industry, what do we tell our clients when they ask us about the safety of glyphosate and if we use it? Obviously, not only by regulation but also by ethics we must be honest. What if our clients ask us not to use glyphosate on their property (this will probably happen)? Then, we must offer them the facts and/or alternatives to their weed management issues.

Dr. David Roberts has retired from Michigan State University but intends to remain active with the industry. He is CEO and CBW (Chief Bottle Washer) for The Plant Doctor, LLC. Contact information: 248/320-7124 and treedoctordave@gmail.com

Photos 10, 11 and 12: Much of the controversies surrounding glyphosate have been focused, perhaps unfairly, on "Roundup". Since Monsanto's patent for glyphosate expired in 2000, many other companies are now producing glyphosate under various trade names. Several examples are Gordon's Barrier (Photo 10), Ortho's Ground Clear (Photo 11), and Ragan & Massey's RM 40 (Photo 12). Unfortunately, these and many other products also contain Imazapyr.