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FOR332

Metsulfuron-Methyl-Containing Herbicides Potentially Damaging Ornamentals when Applied to Turfgrass[1]

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Introduction

Over the past few years, there have been numerous inquiries regarding damage to ornamental plants growing near turfgrass areas that have been treated with metsulfuron-methyl-containing herbicides. Most of the inquiries are in regards to stem die-back, brown "fried" or "scorched" foliage, delayed leaf appearance, and patches of necrosis (dead tissues) in the phloem (plant's vascular tissues) (Figure 1). Injury symptoms are typically reported two to four weeks following applications made during hot and dry weather (although not exclusively).

Figure 1. Phloem necrosis shown as streaking brown sections of wood exposed by peeling the bark back in a live oak (Quercus virginiana) branch affected by metsulfuron-methyl.
Credits: Jason Smith, UF/IFAS

Metsulfuron-methyl, also known as MSM, is a sulfonylurea herbicide (WSSA group 2) that is used to control broadleaf weeds and certain grass weeds (including bahiagrass) postemergence in bermudagrass, St. Augustine, and other warm season turfgrasses. Metsulfuron-methyl is a very popular herbicide because it provides effective control of some of the most problematic turfgrass weeds, such as wild garlic (*Allium vineale*), Florida betony (*Stachys floridana*), dollar weed (*Hydrocotyle umbellata*), and small Virginia buttonweed (*Diodia virginiana*). It is usually formulated as a dispersible granule containing 60% of the active ingredient. The use rates are much lower than for most turf herbicides, ranging from 0.25 to 1 ounce of formulated product per acre, depending on the weed species to be controlled.

Metsulfuron-methyl is a systemic herbicide (meaning that it is translocated and moves throughout the plant) that inhibits the production of three essential amino acids that plants need in order to survive. When susceptible weeds are treated, injury symptoms like chlorosis (yellowing of foliage) and necrosis (brown or black dying foliage) usually appear within one to two weeks after application (Figure 2). Metsulfuron-methyl is absorbed by plant foliage, so if ornamentals come into contact with the spray or drift, injury is likely to result. However, metsulfuron-methyl has low drift potential when label precautions are followed, and

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off-target movement does not appear to be the primary cause of injury on ornamental plants.

Figure 2. Live oak injury following a metsulfuron application to the root zone at a 1 oz. per acre rate.
Credits: Jason Smith, UF/IFAS

Potential Problems With Metsulfuron Herbicides

In addition to foliar absorption, metsulfuron-methyl is also rapidly absorbed by plant roots. Because it is systemic, it can move throughout the plant and accumulate in meristematic tissues. Trees planted in the landscape can have roots that extend well into areas covered with turfgrass, with surface roots co-mingling with turf root systems. When applications are made to bermudagrass, St. Augustine grass, or other types of turfgrass, injury can occur in trees, palms, or shrubs that have roots extending into treated areas. Suspected metsulfuron injury has been observed most commonly in oak species such as live oaks (*Quercus virginiana*), Nuttall oaks (*Q. texana*), Shumard oak (*Q. shumardii*), willow oak (*Q. phellos*), ligustrum (*Ligustrum* spp.), and several species of palm trees. Damage from soil-applied metsulfuron-methyl has been documented experimentally on foxtail palm (*Wodyetia bifurcata*) (Broschat and Busey 2010).

What Areas Are Most Susceptible To Damage?

While injury has been reported across a wide range of landscape situations, it usually involves oak species, notably live oaks growing in irrigated turf areas. Injury has been most commonly reported following spring applications in hot, dry weather when trees are beginning to start new growth.

Why is this a problem now?

Metsulfuron-methyl was introduced by Du Pont and became available for use in certain crops in the 1980s and 1990s and was later labeled for use on turf. Until recently it was protected by a patent and was much more expensive than other similar products, so it was usually only applied to well-maintained commercial properties or golf courses. When the patent expired, it became more affordable and instead of being applied once or twice per year in highly managed turf sites, some applicators began making applications several times per year on a wide range of properties. As metsulfuron-methyl is marketed and sold by many different manufacturers, sales data are difficult to obtain. However, conversations with professional applicators and homeowners combined with personal observations indicate that its use has increased in recent years, which may explain increasing injury reports on certain species (Goncalves et al., 2019).

Diagnosing Metsulfuron-Methyl Injury

Oaks

Oak species are susceptible to injury following improper metsulfuron-methyl applications. Unpublished research by Jason Smith and Edward Gilman at the University of Florida has shown significant injury when metsulfuron-methyl-containing herbicides were applied to the root zone of live oaks in accordance with labeled rates. In this study, metsulfuron-methyl was detected in leaf tissues of affected trees.

Injury in the landscape appears as scattered stem dieback, chlorotic (yellow) leaves that turn brown (appearing "fried" or "scorched"), patches of necrotic tissues in the phloem, and delayed leaf development. In some cases, trees may appear bushy due to stem and leaf growth at the base of old stems, while the upper portions of the stems do not leaf out. Often the damage is reported as occurring "suddenly"; healthy green trees with vigorous growth quickly turn into trees with significant portions of the canopy becoming necrotic. The demarcation between green and brown portions of the crown can be quite distinct.

Symptoms of metsulfuron injury on oaks have led many to suspect sudden oak death, a fungal disease caused by *Phytophthora ramorum*. In addition to oaks, the pathogen

also affects over 100 species of woody plants. Symptoms vary from host to host, but commonly include leaf lesions (that may appear water-soaked), bleeding cankers that may ooze foul-smelling sap, and shoot tip blight that includes the formation of a "Shepard's crook." More information on sudden oak death is available from *Sudden Oak Death and Ramorum Blight*, Pest_Alert_-_Phytophthora_ramorum,_Sudden_Oak_Death.pdf (fdacs.gov).

Ligustrum

Injury seen on ligustrum includes scattered chlorotic foliage that slowly turns brown. Eventually stems will begin to die back in different areas of the canopy.

Palms

Compared with many different woody plants, palm trees grow much more slowly and thus, injury may not be noticeable for 6 months or more following metsulfuron-methyl application. Research has shown that metsulfuron-methyl causes leaflet puckering and necrosis of the central part of the rachis (stem) (Broschat and Busey 2010). The distal portion of the leaf will drop down and may become necrotic. Metsulfuron-methyl, like most systemic herbicides, affects only one or two newly emerging leaves of palms, with subsequent leaves showing no symptoms. Broschat and Busey (2010) reported that treatment with half the label rate was just as toxic to foxtail palms as four times the label rate. Currently, it is unknown if other palm species are susceptible to metsulfuron-methyl injury.

Other Possible Causes of Plant Injury

It is important to note that environmental factors and stresses (drought, heat, etc.), nutritional deficiencies or toxicities, insects, and diseases all regularly cause damage on ornamental plants that may resemble herbicide injury or exacerbate herbicide injury symptoms.

One of the best ways to rule out pest damage, nutritional deficiencies, or soil issues is to have a soil and/or tissue analysis conducted. Information on analytical labs in your area can be obtained by contacting your local UF/IFAS Extension office (https://sfyl.ifas.ufl.edu/find-your-local-office/). It is also critical to keep impeccable herbicide application records. If herbicide injury is suspected, you will need to be able to show what products were applied, when they were applied, and how much product was used. This will help to eliminate other possibilities of injury such as other pesticides, abiotic stresses, or pest damage.

What Can Be Done to Reduce Damage?

The most important step in pesticide application is to read the label in its entirety before beginning any application. In most cases, off-target damage from herbicide use can be completely avoided by following the manufacturer's label. One can search the Crop Data Management Systems (CDMS) (http://www.cdms.net/Label-Database) for herbicide labels and material safety data sheets (MSDS) using trade names. A more advanced herbicide search according to various criteria (including active ingredient) is available from the CDMS Label Search following a free registration.

It is important not only to use a herbicide with the correct concentration of the correct active ingredient, but also the one labeled for a specific crop or site. For example, Nufarm's Manor® and Purestand™ both contain 60% of metsulfuron-methyl, but the former is labeled for turfgrass and the latter for pastures. Thus, applying Purestand™ to turf would be an off-label use. A web-wide search can yield equally suitable products (including generic options), like MSM Turf Herbicide Quali-Pro or Rometsol® by Rotam.

Injury from herbicide use is often simply a case of over application; therefore, it is always important to calibrate your equipment properly. Merely mixing the correct amount of product into a spray tank does not mean your equipment is calibrated. More information on calibration can be obtained by visiting https://edis.ifas.ufl.edu/entity/topic/herbicide_calibration_and_application. It is important to apply the correct amount of product per area and not to rely on the concentration of the spray solution. To reduce the chances of injury from drift, avoid making applications during periods of high temperature and low relative humidity. Never spray during windy conditions. Using nozzles that form larger droplet sizes and conducting applications at lower spray pressures can also help to reduce drift.

When metsulfuron-methyl injury has been reported, damage could be from drift or over-application (off-label) but is often the result of root uptake. To avoid damage from root uptake, trees and shrubs should not be planted in areas treated with metsulfuron-methyl for at least one year after the last application and bedding plants should not be planted for at least two years. Never rinse out spraying equipment or flush hoses near desirable plants. According to most label instructions, metsulfuron-methyl should not be applied near desirable ornamental trees or shrubs, on areas where their roots may extend, or in locations where the herbicide may be washed or moved into contact with their roots.

How do you determine how far tree roots extend? This is difficult to determine because it is species dependent. A general rule of thumb is that for established trees, the roots are likely to extend up to two or more times the width of the branches (drip line). Research at the University of Florida has shown that on average, tree roots spread close to three times the spread of the drip line and fine roots are concentrated in the top 12 inches of soil with many in the top 2 inches (Gilman 2011). For large palms, primary roots are often found 50 feet or more away from the trunk. This means that just because the herbicide is not applied near the base of the plant does not mean that roots will not be contacted by metsulfuron-methyl or other similar herbicides. In practice, as per the label instructions, many areas in residential lawns should not be treated with this herbicide because they are filled with tree roots.

Conclusion

Should people stop applying metsulfuron-methyl to control weeds in turfgrass? No. Metsulfuron is a very effective and economical herbicide that has low odor, low usage rates, a short, restricted entry interval (REI) of only 4 hours, and is safe on Bermudagrass, St. Augustine grass, and other warm season turfgrasses. It is one of the few herbicides available to selectively control bahiagrass in other lawn types and also controls other broadleaf weeds that are often difficult to manage. However, caution should be used when applications are made on sites containing trees and palms growing in or near turf areas, especially sites where oak trees are planted. Metsulfuron-methyl is effective for weed control at low usage rates and the lowest effective rate should be chosen for the target weed species. For a given species, a lower rate will be effective when the weeds are still small, less than 4 inches tall (McAfee and Baumann 2007). As per the manufacturer label, do not apply metsulfuron-methyl-containing products in close proximity to ornamental species or in areas where their roots can be contacted. In landscapes containing many trees, palms, and shrubs, it will be difficult to avoid making applications over the root zone of potentially sensitive plants. In these cases, a different herbicide should be selected to avoid potential injury in certain situations. If injury has already occurred, recovery time will be based on numerous factors and is difficult to predict. The most effective corrective measure, if any is available, should be determined on a case-by-case basis depending on the species affected, application rate, time of year, and other environmental factors. If you suspect injury from metsulfuron-methyl, contact your local UF/IFAS Extension office, where they can help you eliminate other potential causes and provide recommendations for your specific scenario.

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