Herbicide-treated Mulches Address Some Environmental Concerns

Editor's Note: Note that herbicide-treated mulches are experimental and are not registered products.

By Hannah Mathers

Weed control with mulch is the main reason cited for mulch use. In this article, we will discuss our research with herbicide-treated mulches.

A variety of organic mulches have been advocated for weed suppression in ornamentals. Organic mulches control weeds in two ways: inhibition of germination and suppression of weed growth (Skroch et al., 1992, Borland, 1990 and Duryea et al., 1999). The effects of mulches on weed control are greatest when the mulch is fresh (Duryea et al., 1999). The most commonly used mulches in ornamentals are barks. This article will focus on the research I did while at Oregon State University.

A study of three bark mulches and two pine needle mulches found that even when applied at a depth of 3.5 inches the mulches only reduced weed counts by 50 percent over untreated controls. This level of control was well below commercially acceptable levels.

As a result of increasing financial and environmental concerns, reducing the amount of herbicide used in ornamental weed control while still maintaining profitable maintenance has been the recent focus of considerable research.

Beyond suppression

Mulching with products such as bark, hazelnut shells and corn gluten meal or oyster shells has been advocated for suppression of serious weed problems. The most commonly used mulches in ornamentals are still barks. The level of weed control provided by bark mulch alone, however, is well below commercially acceptable levels.

Mulches that have been pretreated with pre-emergent herbicides may offer extra advantages for weed control over untreated mulches. The only calibration required would be monitoring the mulch depth to ensure the optimum rate of application. Herbicide treated mulches could be added as a top layer to landscape beds in the spring. Depending on the herbicide mulch combination used, it could provide weed control for more than 250 days after treatment (Case and Mathers, 2003).

Preliminary studies have shown excellent control of certain weeds with a layer of pine bark mulch containing pre-emergent herbicides. One study observed increased efficacy with pine bark mulch treated with pre-emergent herbicide vs. mulch alone. Waste paper mulch pre-treated with Casoron and covered by an additional layer of waste paper mulch, which sealed in the Casoron, gave excellent control of several weed species with no observed phytotoxicity in nursery field plantings of deciduous trees (Hogue).

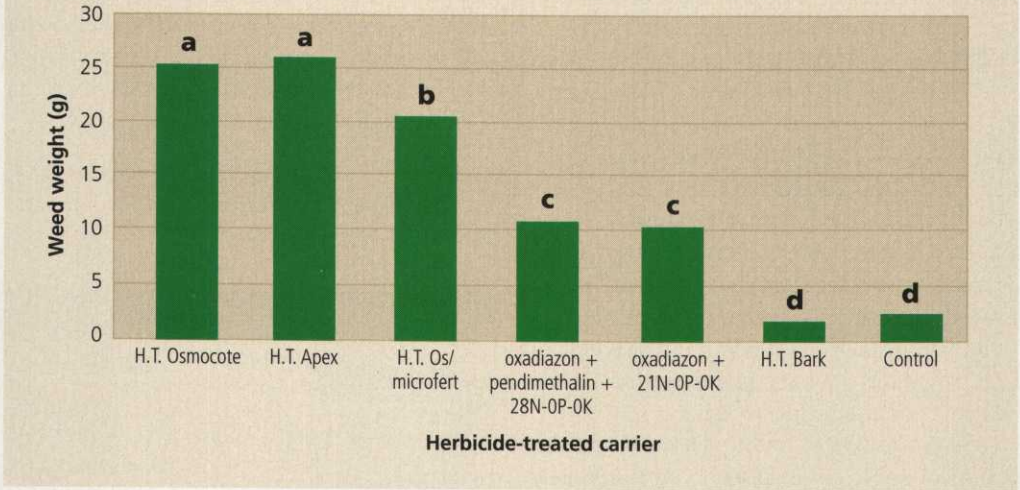
Regardless of whether you are selecting the herbicide for weed control, for application on bare soil or on to mulch, the key selection criteria remain the same. These criteria are:

- matching the weeds to be controlled against the weeds listed on the product label;
- choosing a material that is labeled for application to both the turf and site; and
- choosing the right herbicide formulation (either sprayable or granular).

The sprayable formulations can be liquids (L), dry flowables (DF), wettable dispensable granulars (WDG), wettable powders (WP) or emulsifible concentrate (EC). Many container stock nursery growers prefer pre-emergent granular materials that are applied with cyclone spreaders or belly grinders. Granulars work well when treating rectangular areas. In container production, three to five applications of pre-emergent herbicides may be required to keep the chemical barrier on the container surface because of the large amounts of water that are applied each season.

Many landscapers, however, who work with irregular shaped beds of flowers, shrubs or ground covers, prefer to use a sprayable herbi-

TABLE 3



Efficacy of various pre-emergent carriers (1998) expressed as grams of weed weight. Different letters signify the LSD P=0.05. Bars represent the means of five replicates averaged over three herbicides and two evaluation dates, 70 and 150 DAT. The control received no fertilizer or pre-emergent. The control bar represents five replicates averaged over two evaluation dates. Abbreviation is H.T. = herbicide treated, os/microfert = Osmocote microfertilizer.

cide. In landscape culture, two applications of pre-emergent herbicides are recommended: one in fall and one in spring. Supplemental hand weeding during the growing season will be required to provide commercially acceptable weed control in landscape beds.

Because landscapers are accustomed to using mulch and sprayable formulations, herbicide-treated mulches could be easily integrated into most operations.

Research findings

The application of pre-emergent herbicide-treated bark nuggets resulted in increased efficacy in 1998 (Fig. 1) and 2000 (Fig. 2) compared to the herbicides or mulches applied alone. Efficacy was also extended from 35 days after treatment (DAT) to 130 DAT in 1998 and in 2000. The pre-emergent herbicide-treated bark nuggets resulted in increased and extended herbicide efficacy regardless of whether oxyfluorfen, oryzalin or isoxaben were applied to the bark.

The herbicide-treated Douglas fir represented four of the six most efficacious treatments in 2000 at 130 DAT (Fig. 2), specifically — little (less than 1 inch in diameter) Douglas fir nuggets treated with oryzalin at the one-time rate, large (more than1 inch in diameter) and little douglas fir nuggets treated with oryzalin at the .5-time rate, little douglas fir nuggets treated with oryzalin at the .5-time rate, and large Douglas fir nuggets treated with flumioxazin WDG at the one-time rate. The corresponding phytotoxicities of these four top efficacious treatments were commercially acceptable (Fig. 3).

In our experiments in 1998 and 2000, the herbicide-treated mulches were superior in reducing phytotoxicity, increasing efficacy and extending efficacy. We have found that the herbicide-treated bark provides a 1.5 time increase more efficacy compared to the herbicide applied alone, a 1.8 fold increase compared to the bark alone, a 2.8 times increase in duration of efficacy, and a 2.2 times reduction in phytotoxicity compared to the herbicide alone treatments.

Even though greater efficacy is achieved with the herbicide-treated bark, phytotoxicity is reduced, probably because the herbicide is never directly applied on or near the plant material.

Bark nuggets and herbicides

Present data indicates that the bark nuggets may bind the herbicides and possibly act as slow release carriers for the herbicides or reducing their leaching potential. Recent studies indicate that the application of pre-emergent herbicides onto organic mulches reduced herbicide leaching by 35 percent to 74 percent compared with bare soil pre-emergent herbicide applications (Knight et al., 2001).

Recent studies have also indicated that the controlled release of herbicides using lignin as the matrix offers a promising alternative technology for weed control (Oliveira et al., 2000).

Weed control has become a leading issue in ornamentals for four reasons. First, the increase in irrigation water restrictions and necessity of recirculation ponds means fewer and fewer her-

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bicides are being registered because of chemical company fears of reapplication onto stock.

Second, with the Food Quality Protection Act (FQPA) of 1996 becoming law, two existing acts were amended — the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Federal Food Drug, and Cosmetic Act (FFDCA). These amendments changed the way the Environmental Protection Agency (EPA) regulates pesticides. As a result of these changes, the industry faces the loss of pesticide registrations. The loss of herbicide registrations will have a greater impact on the industry than fungicide or insecticide losses.

Third, the cost of traditional weed control, chemical applications plus hand-weeding, is already the largest pest-management cost that superintendents encounter. In fact, weed control costs far surpass any other form of pest control.

Fourth, the EPA recently announced the new Storm Water Phase II (SWII) regulations (1999) that will regulate quantity and quality of storm water. SWII will have an impact on superintendents. The SWII regulations may make it necessary for all golf courses to have catchment ponds. The impact of these new SWII regulations is not completely known. Each state and county will deal with the regulation in different ways.

With increased run-off restrictions, superintendents are interested in better managing their irrigation practices and in optimizing their herbicide applications. New weed control methods that are effective and economical and which exhibit reduced environmental impact are needed.

Mathers is an assistant professor of extension specialist in nursery and landscape crops at The Ohio State University in Columbus, Ohio.

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SECTION STAFF

Managing Editor
Curt Harler
440-238-4556; 440-238-4116 (fax)
curt@curtharler.com

Golfdom Staff Contact
Frank H. Andorka Jr.
440-891-2708; 440-891-2675 (fax)
fandorka@advanstar.com

Online Editor
Lynne Brakeman
440-826-2869; 440-891-2675 (fax)
lbrakeman@advanstar.com

Senior Science Editor
Dr. Karl Danneberger
614-292-8491; 614-292-3505 (fax)
danneberger.1@osu.edu

Production Manager
Jill Hood
218-723-9129; 218/723-9223 (fax)
jhood@advanstar.com

Art Director
Lisa Lehman
440-891-2785; 440-891-2675 (fax)
llehman@advanstar.com

Publisher
Patrick Jones
440-891-2786; 440-891-2675 (fax)
pjones@advanstar.com

Group Publisher
John Payne
440-891-3126; 440-891-2675 (fax)
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Corporate & Editorial Office
7500 Old Oak Blvd.
Cleveland, OH 44130-3369

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