

# Power up your pre-emerge program

**You can control most of the factors that lead to successful weed control — now go out and do it!** BY DAVID GARDNER, PH.D.

**P**re-emergence herbicides continue to be our best choice for the control of annual grassy and broadleaf weeds. Depending on where you live, it may be time to be thinking about applying them very soon.

Pre-emergence herbicides are effective only for a finite period of time after application, weeks or in some cases a few months. Factors that influence the overall performance of a pre-emergence herbicide and how long it will remain effective following application include: timing of application, product chosen, application rate (and whether the application is split),

climate (and weather post application) and the amount of thatch and organic matter in the turf/soil profile.

Climate and weather cannot be controlled. The warmer the temperatures or the higher the rainfall, the faster the product will degrade or leach and lose effectiveness. Similarly, the amount of thatch and organic matter can usually only be slowly altered over time. Higher amounts of thatch and organic matter

will cause the product to degrade more rapidly. Unlike these two factors, however, you do have a choice of product selection, application timing and the application method.

## Why timing is critical

Proper application gives you the maximum chance of season-long control with your pre-emergence product. In a typical year the earliest germinating crabgrass may be killed by subsequent frosts. However, in order to be effective, the pre-emergence herbicide must be applied before the first crabgrass that germinates following the last frost. It must also be ac-

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**FIGURE 1.** Expected dates of crabgrass germination. While crabgrass can germinate earlier, it is often killed by late spring frosts. However, to ensure good control, preemergence herbicides are usually applied about three weeks prior to the dates listed in this figure.

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tivated by either rainwater or irrigation after application. Figure 1 shows a map of expected dates after which crabgrass would germinate and there would be no more killing frosts. Pre-emergence herbicides must be applied before this date. Typically, they are applied two to three weeks earlier, when an indicator plant, such as forsythia in the northern United States (see figure 2) or dogwoods in South are in bloom.

Some of the products released during the 1990's had claims that they could be applied the prior fall. However, subsequent university research showed that, because of pesticide degradation dynamics (more on this later), best control is achieved by waiting until forsythia bloom or soil temperatures reach around 50°F.

**Choices, choices, choices**

Pre-emergence herbicides vary greatly in their duration of effectiveness. Table 1 lists the products currently on the market. Products that contain either pendimethalin, prodiamine or dithiopyr usually give the longest control. The other materials on the chart also have advantages. Formulations that contain benefin or bensulide, for example, tend to be less expensive. The trade off is shorter duration of residual activity and slightly less effective control. Consult the label for specific usage recommendations.

There tends to not be a significant difference in crabgrass control whether the same active ingredient is applied as a liquid or as a granular formulation. Both require light irrigation for activation. One note of caution, however — pre-



**FIGURE 2.** In the northern United States, the best time to apply a pre-emergence herbicide for the control of crabgrass is when *Forsythia x intermedia* is in bloom (shown). The blooming of either dogwoods or azaleas is often used to indicate proper timing in the South.

emergence herbicide formulated on an excessively large granule can be a problem because this may result in sporadic distribution of the herbicide around the particles. The granule does not need to be "greens grade" but it should not be excessively large either.

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**TABLE 1.** Turf tolerances to preemergence herbicides. Consult the pesticide label for specific usage recommendations.

† Dormant bermudagrass only. \* ‡ Fairway and tees height bentgrass only. \*  
 § Seaside, Highland, Astoria, and C-7 creeping bentgrass only. \*  
 ¶ Use restrictions on putting greens vary among formulations. \*  
 \* Consult label for specifics.

Products	Kentucky bluegrass	Perennial ryegrass	Tall Fescue	Fine Fescue	Creeping Bentgrass	Bermudagrass	Zoysiagrass	St. Augustinegrass	Centipedegrass
Bensulide (Betasan, Bensusmec, Lescosan) - Controls P.annua, others	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ethofumasate (Prograss) - Controls P.annua, other weeds	✓	✓	✓		‡	†		✓	
Benefin (Balan, LESCO Benefin 2.5G)	✓	✓	✓	✓		✓	✓	✓	✓
Oryzalin (Surflan, XL – combination with benefin)			✓			✓	✓	✓	✓
Pendimethalin (Pendulum, LESCO Pre-M, PROTURF)	✓	✓	✓	✓		✓	✓	✓	✓
Prodiamine (Barricade)	✓	✓	✓	✓	‡	✓	✓	✓	✓
Trifluralin (Team) - Combination product with Benefin	✓	✓	✓	✓	‡	✓	✓	✓	✓
Dipeptides (Corn Gluten Meal)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Siduron (Tupersan) - Safe to turfgrass seedlings. Consult label	✓	✓	✓	✓	§				
Oxadiazon (Chipco Ronstar) - Controls goosegrass and other weeds	✓	✓	✓			✓	✓	✓	
Dithiopyr (Dimension) - Pre + Post-emergence	✓	✓	✓	✓	¶	✓	✓	✓	✓
Isoxaben (Gallery) - Broadleaf weed control	✓	✓	✓	✓	‡	✓	✓	✓	✓
Atrazine						✓	✓	✓	✓
Simazine (Princep)						✓	✓	✓	✓
Metribuzin (Sneacor)						✓			
Metolachlor (Pennant)						✓	✓	✓	✓
Napropamide (Devrinol)						✓	✓	✓	✓

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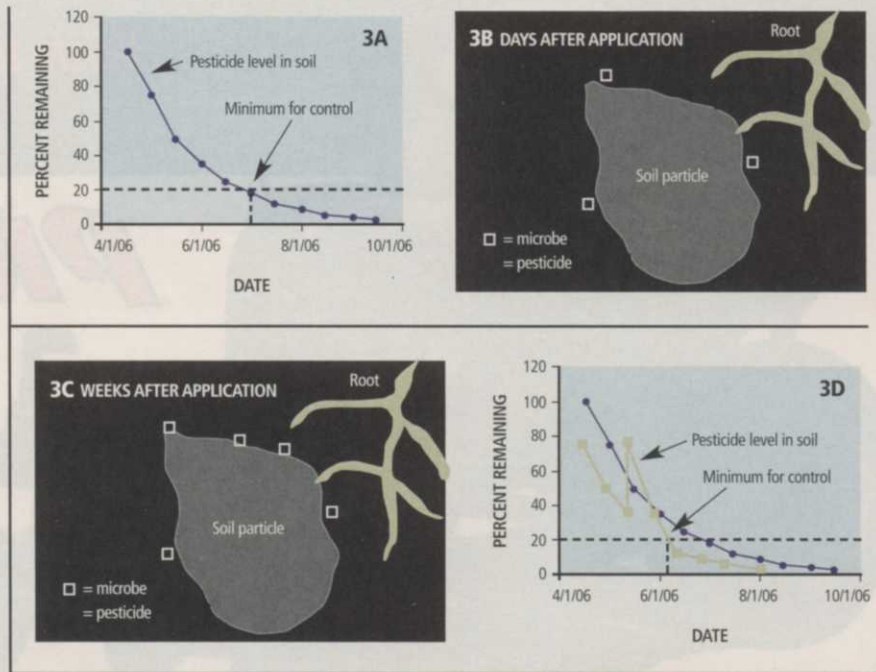
**Rates and frequency**

To be effective, a pre-emergence herbicide barrier must last for about four months in the northern United States and up to seven months in the South. After application, these herbicides are subject to numerous processes that act to degrade the product. To discuss all of the processes that govern how long a pesticide will persist after application is beyond the scope of this article. However, one of the most important factors that governs the effectiveness of pre-emergence herbicides is microbial degradation, which is summarized briefly in Figure 3.

The amount of time it takes for 50% of a product to degrade in the soil is referred to as its half life. If, for example, a product's half life is 50 days, then 50 days after application about 50% of the product will remain and 100 days after application about 25% of the product will remain. Once the level of product in the soil falls below a certain minimum concentration then crabgrass will be able to germinate through the herbicide barrier (See Figure 3). As long as you are within the label limits, you can increase the duration of effective control by increasing the initial application rate. In other words, if your pesticide has a half life of 50 days and you wish to get an additional 50 days of control, you would double the application rate.

**Split or not to split?**

In a split application you apply a portion of the pesticide initially followed by a subsequent application around six to 15 weeks later. This practice is widely followed in the South due to the extended season. However, research conducted in the 1990s suggests that with some products this can actually decrease control. The reason for this is that the initial application results in an increase in the soil



**FIGURE 3.** After a pre-emergence herbicide is applied, it dissipates, primarily due to microbial degradation. **Figure 3A** shows a model of hypothetical degradation following an application made April 15. Once the pesticide is degraded to below a certain minimum (in this example 20% of application just prior to July 1), crabgrass will begin to break through. **Figure 3B** shows a diagram of a soil particle with a hypothetical distribution of pesticide and soil microbes that degrade the pesticide. The microbial population then may increase, such as what is modeled in **Figure 3C**. **Figure 3D** shows a hypothetical example of a split application where a 75% rate is applied two times about six weeks apart. The first application degrades normally. However, the second application of the herbicide may degrade more rapidly due to the increased microorganisms. The result could be an actual decrease in the duration of effectiveness of the product (as modeled by the red line in **Figure 3D**). You should consult the pesticide label and your state's extension literature for specific recommendations if you are going to make split applications.

microbial populations that degrade the pesticide. This increase in microbial activity then can result in subsequent applications of the pesticide being degraded more rapidly (See **Figure 3**). Many studies have showed that, at best, splitting the application of certain herbicides is not more effective than the single application and in some cases, can result in significantly less control of crabgrass. However, this is not the case with all pre-emergence herbicides.

Generally speaking, in the northern

United States you should make one application and increase the duration of control by increasing the application rate. If you are in the South and you're going to make split applications, wait 60 to 90 days (or according to label directions) before making the second application. Also, consult your state's extension literature, because some products benefit from sequential applications and some do not.

Since the introduction of quinclorac in 2000 the industry has had a tool to reli-

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ably control crabgrass post-emergence during mid and late season. However, pre-emergence herbicides continue to be our best option, especially in areas with moderate or heavy infestations of crabgrass. And, with the recent cancellation of the arsenical herbicides MSMA and DSMA,

the use of pre-emergence herbicides becomes more important for the control of weeds such as dallisgrass and goosegrass. Pre-emergence herbicides can be very effective for controlling crabgrass, other annual grasses, and even some annual broadleaf weeds. Taking into consideration the proper product choice, applica-

tion timing, and the effects of application rate and frequency will assist you in maximizing the potential control afforded by these products. **LM**

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## What happens if **MSMA** bites the dust?

BY BERT MCCARTY

On August 9, 2006, the US Environmental Protection Agency (EPA) issued a ruling disallowing reregistration of the organic arsenical herbicide family. Important members of this family include MSMA, DSMA, and CMA (Table 1). The organic arsenical herbicides have been used in turf since the 1950s and are the backbone products for post-emergence grass weed control, especially in warm-season turfgrasses. These herbicides provide good broad-spectrum post-emergence weed control including crabgrass, goosegrass, sandspur, annual nutsedges and annual broadleaf weeds. With repeat applications, they eventually control perennial weeds such as dallisgrass, yellow nutsedge, bull (or thin) paspalum, johnsongrass, bromesedge, carpetgrass, crowfootgrass, St. Augustinegrass, centipedegrass, kyllinga species and various perennial broadleaf weeds.

These herbicide formulations are termed "organic arsenical" as carbon is attached to the basic molecule as a methyl (CH<sub>3</sub>) group. The EPA contends that through the process termed demethylation, the organic forms of arsenic from pesticides are degraded into the more toxic inorganic (or without the methyl group) form.

When the EPA cancels a product, a 60-day public response period is allowed for interested parties to voice their opinions or concerns about the pending action. For the organic arsenicals, due to overwhelming response, the EPA extended this deadline from October 2006 to January 19, 2007. Once the public response period expires, the EPA will consider these and



Control of certain weeds without MSMA will become more challenging and probably more expensive. This is especially true for perennial weeds such as dallisgrass (shown), which currently has no comparable control substitute.

For post-emergence crabgrass control in bermudagrass and zoysiagrass, quinclorac (trade name Drive) will become the main product of choice. Fenoxaprop-ethyl (trade name Acclaim Extra) will still be available in cool-season grasses along with quinclorac. Drive is an extremely fast acting and effective herbicide, if good soil moisture is present (in other words, the weed is actively growing) and works best on immature plants. Also, in warm-season grasses, pre-emergence herbicides will

issue a final ruling approximately 30 days later. The following Web site can be accessed to track the latest ruling or progress of this issue: <http://www.epa.gov/fe-drgstr/EPA-PEST/2006/August/Day-09/p12905.htm>

### Weed control without MSMA

What does this probable cancellation mean to lawn care operators who depend on the organic arsenicals? Unfortunately, post-emergence weed control is about to get more expensive and selective. For example, post-emergence dallisgrass control typically requires three to five MSMA applications (Figure 1). Three applications of MSMA cost \$18 to \$24 per acre and provide approximately 90% - 95% dallisgrass control. The next most effective material provides only about 65% suppression with two applications at a material cost of \$293 per acre.

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probably become increasingly important for crabgrass control as cost savings will become paramount.

For post-emergence control of annual sedge and yellow nutsedge, lawn care operators will choose between bentazon (trade names Basagran and Lescogran), halosulfuron (Sedgehammer) or sulfosulfuron (Certainty). Bentazon provides better yellow nutsedge control compared to purple nutsedge. Halosulfuron and sulfosulfuron provide good control of most sedges and kyllinga species assuming a repeat application is made three to five weeks following the initial. Sulfosulfuron is available in bermudagrass and zoysiagrass while halosulfuron can be used on most turfgrasses.

Unfortunately, selective post-emergence control of perennial grassy weeds such as dallisgrass or thin paspalum will not be available in warm-season grasses. Spot treatment or rope wicking with glyphosate (Roundup) followed by replanting, is an option. Otherwise, a shovel will be necessary to remove these weeds.

On a positive side, basic manufacturers have started exploring for MSMA replacements. However, this requires time and

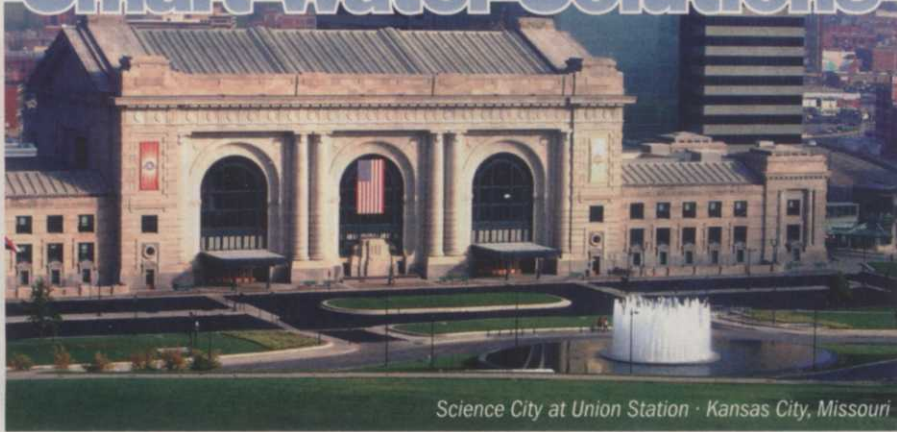
Trade name examples of various members of the organic arsenical herbicide family.

Common name	Trade name examples
MSMA	Bueno 6L, 120, Crab-E-Rad, Daconate 6, Daconate Super, Dal-E-Rad, Drexar 530, 912 Herbicide, Mesamate, MSMA 6.6L, MSMA Turf, Summer Crabicide, Target MSMA, Weed Hoe, plus others
DSMA	Ansar, DSMA 4, DSMA Liquid, Methar 30, Namate, Selective Crabgrass Killer, plus others
CMA	Calar, Ortho Crabgrass Killer - Formula II, Selectrol plus others

newer products will be more costly due to the expense in pesticide development, registration and marketing. Newer herbicides typically have a much narrower control spectrum than MSMA, thus, different herbicides are often needed for different weeds. Lastly, MSMA provided a unique mode of action with only limited weed resistance occurrence. Newer herbicides typically do not possess this characteristic. Proper timing and selection of pre- and post-emergence herbicides will become more critical as the organic arsenicals are phased out.

— Bert McCarty is a professor of Turfgrass Science at Clemson University

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