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Sevimol® can be used to protect your trees and ornamental plantings, as well.

Chipco® Ronstar® brand herbicide tackles more than 20 of the toughest broadleaf and grassy weeds—including goosegrass and crabgrass—for up to 120 days from a single pre-emergence application.


And Chipco® Weedone® brand DPC herbicide gives you unmatched post-emergence control of more than 65 annual broadleaf weeds.

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As with any crop protection chemical, always read and follow instructions on the label.

EVENTS

MARCH

13-14: Metropolitan Detroit Landscape Association's trade show and convention, Michigan Mart Building, State Fairgrounds, Detroit. Contact: Dan Bywalec, (313) 534-5515.

15: "Managing Landscape Dollars—Commercial and Multi-Housing," Clarion Hotel, Ontario, Calif. Contact: University of California, Riverside; (714) 787-4105 or (800) 442-4990.

16-18: Controlling Tree Use Seminar, Tampa, Fla. Contact: American Society of Consulting Arborists, 700 Canterbury Rd., Clearwater, FL 34624; (813) 446-3356.

19-22: Florida Agribusiness Computer Short Course, St. Petersburg Junior College,

Clearwater Campus. Contact: Agribusiness Computer Short Course, IFAS Conferences Office, 551 IFAS, University of Florida, Gainesville, FL 32611; (904) 392-5930.

25-29: American Society of Golf Course Architects annual meeting, Spanish Bay Golf Course, Pebble Beach, Calif. Contact: ASGCA, 221 North LaSalle St., Chicago, IL 60601; (312) 372-7090.

24-25: Louisiana Cooperative Extension Spring Garden Show, New Orleans Botanical Garden. Contact: Nannette Simmons or Severn Doughty, (504) 486-4054.

27-28: 31st Annual Conference, University of California at Riverside Department of Entomology. Contact: University Entomology Dept. at (714) 787-3718.

28-29: "Perennials in the Landscape" University of Minnesota, Waseca, Horticulture Dept. Contact: Joan Barrett at (507) 835-1000 or Ainie Busse, (612) 286-2654.

APRIL

6-8: Associated Landscape Contractors of America Student Field Days, Colorado State University, Fort Collins, Colo. Contact: Elizabeth Mogen, Horticulture Department, C.S.U., Fort Collins, CO 80523; (303) 491-7089.

9-11: American Society of Landscape Architects annual conference, Washington D.C. Convention Center. Contact: ASLA, 1733 Connecticut Ave. N.W., Washington, DC 20009; (202) 466-7730.

LETTERS from page 28

serve, conserve and restore our resources?

The 1990s bring new threats from old problems that have grown out of scale. We must all look back at our mistakes to protect our future. We must all work together to correct the mistakes made out of greed and ignorance. The lawn care industry is no exception.

As an environmentalist, I will be watching PLCAA and the whole green industry. I will take issue with anyone who demonstrates by their actions that I or the legislatures I support are competitors.

As a landscaper, I will strive to preserve, conserve or restore every resource on this precious Earth.

To all my colleagues in the green industry: Support a local environmental organization with your time, knowledge or money. It will be worth it.

Jeff Caster

Caster Landscape & Design
Tallahassee, Fla.

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PTO Powered
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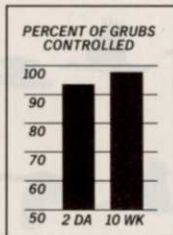


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When it comes to grubs, it's not enough just to suppress them.



Compiled from 18 university trials, 1985-86.

You want to squash them. Pulverize them. Grind them into dust. Send the little buggers to the root zone eternal.

And who could blame you?

After all, this one creature has probably baffled more turf professionals, made a mockery of more chemical company claims, than all other turf

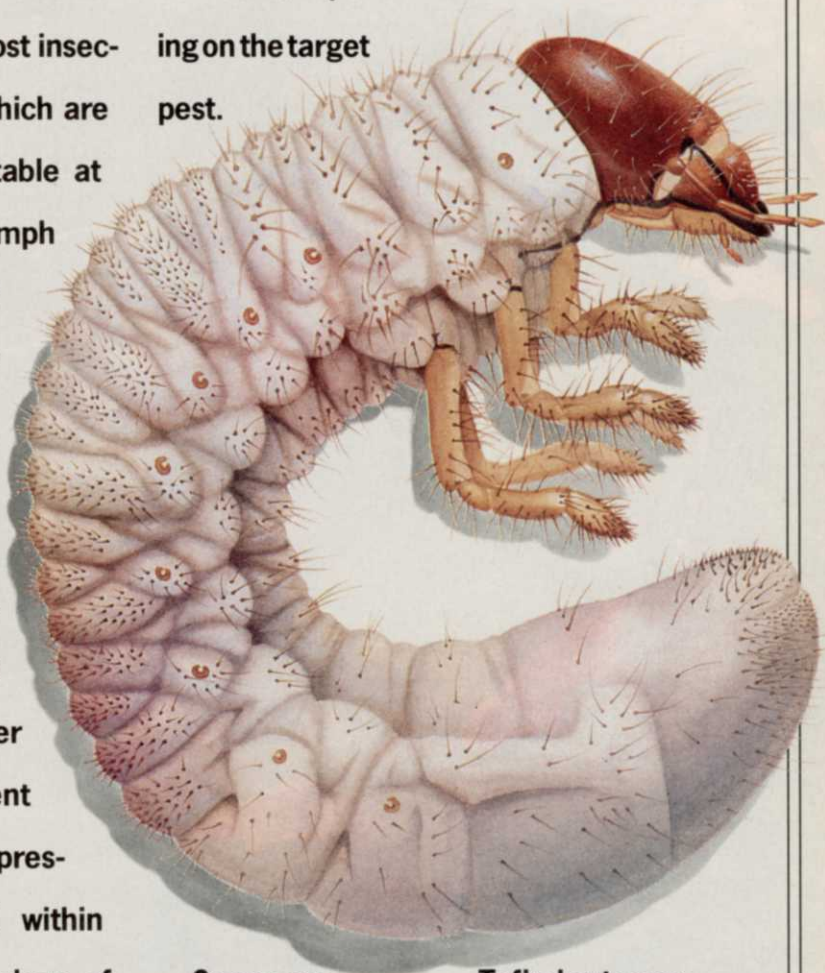
insects combined.

Triumph[®] is changing all that.

Unlike most insecticides, which are unpredictable at best, Triumph has been proven in over ten years of testing to consistently rid turf of over 90 percent of grubs present. And within just 2-3 days of application.

Better yet, once applied to the soil, Triumph keeps on working for up to 10 weeks, depending on the target pest.

grub damage. And protect you from losing what profits you have made to callbacks.



So one preventive application in late summer or early fall is all that's needed to protect turf from costly

To find out more, contact your turf products distributor or Ciba-Geigy representative.

TRIUMPH

HOW TO SQUASH A GRUB.

© 1990 CIBA-GEIGY Corporation, Turf and Ornamental Products, Box 18300, Greensboro, NC 27419. Always read and follow label directions. For retail sale to and use only by certified applicators or persons under their direct supervision, and only for those uses covered by the applicator certification.



For best results, thoroughly irrigate prior to treatment. Follow your application by watering in to a depth of 1 to 1½ inches.

When you have grub control this effective, you have grounds to celebrate.



DYLOX controls armyworms, bagworms, and stink bugs on your trees, shrubs, and flowers as well as controlling cutworms and sod webworms on your turf.

OFTANOL also controls billbugs, cutworms, chinch bugs, *Hyperodes* weevil, and sod webworms.

To identify grub populations, look for patches of wilted, dead or dying turf. Grub-infested turf has pruned roots which make it easy to pull back like carpet.

Some of the most celebrated courses in the country turn to Mobay products for grub protection.

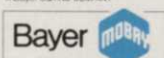
For preventative treatment, there's OFTANOL® Insecticide. It controls grubs longer than any other product available. Apply it in the spring before grubs show up. After all, spring rains and temperatures can mask a grub problem.

Or apply a pre-damage application of OFTANOL when grub eggs hatch and activity begins (usually right after a drought-breaking rain in the early fall). But only apply OFTANOL once a year. If you've already used it in the spring, treat with DYLOX® Insecticide.

Of course, if grub damage turns up, apply DYLOX followed by heavy watering. DYLOX controls grubs in as little as 24 to 48 hours.

For more information, contact your Mobay distributor or Mobay sales representative. They can help you make your turf look great. And that makes you look great. Which is cause enough to celebrate.

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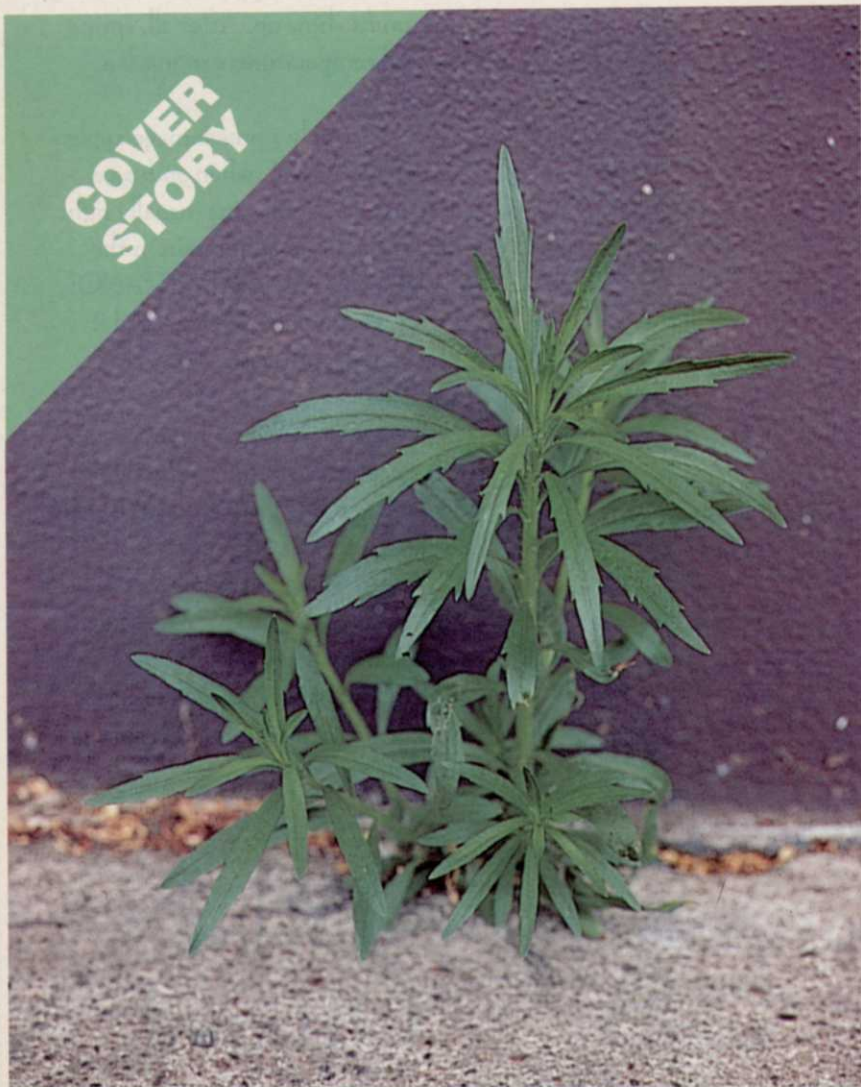
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Dylox Oftanol

POST-EMERGENCE WEED CONTROL IN COOL-SEASON TURFGRASSES

For effective post-emergence weed control, the plants should be actively growing and the herbicide sufficiently absorbed.

by Bruce E. Branham, Ph.D., Michigan State University



Post-emergence weed control is the application of a herbicide to an established weed to achieve control. It is fundamentally different from pre-emergence weed control in several ways. First, the herbicide is applied directly to the weed which permits the use of spot applications. Second, environmental conditions are important because they affect the amount of herbicide absorption which is ultimately related to control.

Principles of post-emergents

Effective post-emergence control depends on three simple principles. First, the growth stage of the plant is critical. In general, the younger the plant, the easier it is to control. This is most applicable to annual plants, however, even established perennials have growth periods where control is more easily achieved.

As an example, fall is an excellent time to control established perennials because they are storing food reserves in their root systems and the herbicide will be transported to the roots, killing the entire plant.

Second, the weeds must be actively growing in order to take up a sufficient dose of the herbicide for effective control.

When weeds are actively growing, they are translocating photosynthate to the plant's growing sites. The absorbed herbicide can be carried with the photosynthate to these growing sites which are often the site of the herbicide's action.

When weeds are actively growing, they tend to be more succulent and possess a thinner cuticle. The cuticle is the chief barrier to herbicide absorption, and when plants are actively growing the cuticle tends to be less well developed. As plants enter periods of high temperature and particularly drought stress they tend to develop thicker (i.e. waxier) cuticles.

Absorption is critical

Third, the herbicide's absorption by

the plant is the controlling factor in getting sufficient herbicide activity.

It is estimated that, depending upon the herbicide, only 15 to 60 percent of the herbicide deposited upon the leaf is absorbed into the plant.

Thus, an area for fruitful research in the future is to examine methods to increase the absorption rates to 85 to 100 percent. Such advances would permit lower application rates to be used. In fact, significant advances are currently being made in the area of

additives to increase herbicide absorption.

These factors—plant growth stage, herbicide absorption and plant growth rate—control the effectiveness of post-emergence herbicides.

This preliminary discussion sets the stage for the five weed control areas.

Broadleaf weed control

Controlling broadleaved weeds is an

TABLE 1.

Broadleaf weed control herbicides for use in cool-season turf

2, 4-D	dicamba
2, 4-DP	triclopyr
MDPP	clopyralid
MCPA	

Some commonly used broadleaf herbicide mixtures and the ratio of each product in the mix:

2, 4-D + MCPP

2 plus 2	(1/1) Fermenta
Lescopar	(1/2) Lesco
2, 4-D-MCPP	(2/1) Cleary's

2, 4-D + dicamba

Phenaban 801	(8/1) Gordons
Eight-one selective herbicide	(8/1) Lesco
Riverdale 81 selective weed killer	(8/1) Riverdale
Riverdale 101 weed killer	(10/1) Riverdale

2, 4-D + MCPP + dicamba

Three way selective herbicide	(1/0.5/0.009) Lesco
Trimec	(1/0.5/0.1) Gordons
Trimec Bentgrass Formula	(0.3/1/0.13) Gordons
Trexsan	(1.0/0.53/0.13) (Sierra)
Trexsan Bent	(0.3/1.0/0.13) (Sierra)

2, 4-D + 2, 4-DP

Chipco Weedone DPC	(1/1) [ester] Rhone-Poulenc
Chipco Weedone DPC Amine	(1/1) Rhone-Poulenc
Turf D + DP	(1/1) [ester] Riverdale

2, 4-D + 2, 4-DP + MCPP

Weedestroy Triamine	(1/1/1) Riverdale
Weedestroy Triester	80.7/1.0/0.7) Riverdale

MCPA + MCPP + 2, 4-DP

Weedestroy Triamine II	(1/1/1) Riverdale
------------------------	-------------------

MCPA + MCPP + dicamba

Trimec Encore	(1.0/0.46/0.1) [amine] Gordons
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2, 4-D + 2, 4-DP + dicamba

Super Trimec	(1.0/1.0/0.25) [ester] Gordons
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2, 4-D + triclopyr

Turflon D	(2/1) [ester] Dow
Turflon II	(2.6/1) [amine] Dow

triclopyr + clopyralid

Confront	(3/1) [amine] Dow
----------	-------------------

TABLE 2.

Post-emergence grass and sedge control herbicides

Common Name	Trade Name	Manufacturer
MSMA + DSMA	Daconate	Fermenta
	Broadside, DSMA 81%	Vertac
	Ansar, DSMA liquid	Drexel
	Methar 30	W.A. Cleary
fenoxaprop	Acclaim	Hoechst
bentazone (sedges only)	Basagran	BASF

Special use situations

Sometimes we don't understand why things work the way they do, but we use them anyway. A good example of this is the control of creeping speedwell with DCPA (Dacthal).

Dacthal is a pre-emergence grass herbicide that effectively controls creeping speedwell (a difficult-to-control broadleaf weed) when applied after emergence of the speedwell. You figure it out.

Another special-use situation is the control of tall fescue in Kentucky bluegrass with chlorsulfuron (Lesco TFC).

This product will remove coarse-bladed tall fescue from Kentucky bluegrass with a single application. The product has a very long soil residual so be careful when using it.

It will also eradicate perennial ryegrass from Kentucky bluegrass, which opens up some interesting possibilities for golf courses and home lawns where a pure Kentucky bluegrass turf is desired but ryegrass was included in the seed mixture for establishment purposes.

It may be possible to gradually eliminate perennial ryegrass from a mixed Kentucky bluegrass and perennial ryegrass stand by using chlorsulfuron at low rates.

—Dr. Branham □

Using non-selective herbicides

Herbicides that kill all vegetation are called non-selective herbicides. These products have become widely used in turf renovation and for edging around trees, hard-to-mow areas, under fences, etc.

Although several non-selective herbicides are available, by far and away the most widely used product is glyphosate (Roundup). It is difficult to imagine a better herbicide for non-selective weed control than this product. It is irreversibly adsorbed to soil particles, and therefore has no soil residual. Therefore, renovation can begin also immediately after application, although time should

be given for the glyphosate to translocate throughout the entire plant before beginning any processes that will disturb the vegetation you're trying to control.

Another reason that makes this such a good herbicide is that it is readily translocated in most plants, thus controlling the entire plant-foliage, roots, rhizomes and stolons. It is also an environmentally safe product with very low mammalian toxicity (oral LD₅₀ of 5600 mg/kg for rats, which would be considered almost non-toxic).

—Dr. Branham □

important component in any turf weed control program.

Without exception, all of the herbicides used in general broadleaf weed control in turf have a similar mode of action. These herbicides, listed in Table 1, all concentrate in the meristematic areas of the plant and cause uncontrolled tissue growth, resulting in a bending and twisting of plant parts (called epinasty) and ultimately the plant's death.

In this category of herbicides is 2,4-D, the oldest organic herbicide known. It was discovered during World War II, has been in commercial use since the late 1940s, and is the most researched herbicide in existence.

The only other turf broadleaf herbicide which is not a growth regulator-type herbicide is bromoxynil (Buctril), which is a photosynthetic inhibitor.

However, bromoxynil was cancelled for use in turf by its manufacturer, Rhone-Poulenc, in 1989 and is currently only labelled for use on sod or grass seed production.

Broadleaf mixtures

With the exception of MCPP, these broadleaf herbicides are routinely sold in mixtures with 2,4-D being the primary component of most mixes (Table 1).

There are differences in efficacy among the different mixtures. However, the most important factor controlling efficacy is the type of formulation used.

All of the herbicides listed in Table 1 are organic acids and as such can be modified to other forms to improve herbicidal activity. The most common formulations are esters or amine salts. These formulations have a marked effect on the herbicidal activity.

Esters are better at penetrating the plant foliage but they are slightly volatile. The volatility can cause injury to non-target plants if conditions at application favor volatility.

Conditions favoring volatility would include high air temperatures, moderate winds and high relative humidities.

Evaluating amine salts

Amine salts, on the other hand, are essentially non-volatile but they don't penetrate the plant foliage as readily as esters. Therefore, ester-formulated herbicides are more efficacious than amines on an active ingredient basis,

One well-timed post-emergence application can result in season-long control, but only if delayed sufficiently to catch germinating plants.

but they can cause non-target plant injury; so caution must be used when employing ester-formulated herbicides.

As a general rule-of-thumb, amine formulated mixtures of 2,4-D, MCPP and/or dicamba will control 90 percent of the broadleaf weed problems found in cool season turf if used properly.

Use in summer will routinely result in reduced levels of control while use of herbicides on drought-stressed weeds can reduce control levels to zero. However, a small number of turf weeds require either an ester-formulated herbicide combination or a herbicide with a different spectrum of weeds controlled. These weeds would include creeping speedwell, ground ivy, prostrate spurge, creeping yellow woodsorrel, wild violets and wild garlic.

Many of the ester-formulated products such as Turflon D, Super

Trimec, Weedone DPC and Weedestroy Triester will control these weeds. Good to excellent control of these weeds often requires two applications spaced two to four weeks apart.

The loss of Buctril, a post-emergence broadleaf herbicide, for most turf situations means that on seedling turf, there really is no means of controlling broadleaf weeds.

Buctril could be applied to any size seedlings without injuring the desirable turf. The standard recommendation for controlling broadleaved weeds in seedling turf with phenoxy herbicides is to wait until the turf has been mowed one time before applying a 1/2x rate of the herbicide.

Annual grass weeds

Annual grass weeds, most commonly crabgrass, are probably the biggest weed problem most turf managers face.

Because of the large number of viable seeds in the soil and the ability of the grass weed seedlings to effectively compete in a turf stand, weeds such as crabgrass can be difficult to control.

The preferred method to control crabgrass is with a pre-emergence herbicide. However, when these do not adequately control crabgrass, post-emergence herbicides must be used.

Up until 1987, the only available choice to control crabgrass post-emergence was a formulation of methane arsonate such as MSMA or DSMA. These herbicides are sold under a variety of trade names as listed in Table 1. However, in 1987 a new herbicide was approved for use on cool-season turf. This herbicide, fenoxaprop (trade name Acclaim), provides a second option for post-emergence crabgrass control.

Checking conditions

While MAA compounds can provide effective crabgrass control, generally

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TABLE 3.
Applications for controlling crabgrass

Herbicide	Rate	Date of Application	% Crabgrass 8/27/87
Acclaim	0.04	5/15	41
Acclaim + PreM	0.04 + 1.5	5/15	0
Acclaim	0.06	5/15	34
Acclaim + PreM	0.06 + 1.5	5/15	5
Acclaim	0.06	5/30	40
Acclaim + PreM	0.06 + 1.5	5/30	2
Acclaim	0.08	5/30	23
Acclaim + PreM	0.08 + 1.5	5/30	1
Acclaim	0.08	6/15	32
Acclaim + PreM	0.08 + 1.5	6/15	15
Acclaim	0.12	6/15	55
Acclaim + PreM	0.12 + 1.5	6/15	5
Acclaim	0.12	6/30	3
Acclaim	0.12 + 1.5	6/30	1
Untreated			30

Source: Dr. Branham

two applications 10 to 14 days apart are required for effective control. In addition, these products can be phytotoxic under the hot, humid conditions of summer.

Because of these drawbacks, use of these herbicides was primarily limited to controlling crabgrass that was not controlled pre-emergence. That is, it would be uncommon to use MAA as your only method of controlling crabgrass.

Acclaim offers some interesting possibilities because it is a very effective crabgrass herbicide. On young crabgrass (two tillers or smaller), 95 percent or higher control is often seen.

This product, and others that may be available in future years, should cause turf managers to re-evaluate their crabgrass control strategy.

Serious crabgrass control

For those areas where crabgrass is a very serious problem, use of a pre-emergent will still be the best method of control. However, in the more northern parts of the cool-season region, alternative strategies can be developed.

Remember, a pre-emergence application is a preventative application that requires treating the entire area. A post-emergence application can be directed on the weedy areas only and thus less total area could potentially require treatment.

For turfs that have not had a history of crabgrass invasion, a strategy of skipping the pre-emergence application and spot treating with a post-emergence product could be employed with a potential for cost savings.

By using a "post"-only application the manager has more flex-

ibility, as was dramatically shown during the drought of 1988. Pre-emergence applications were essentially wasted in 1988 because there was no water available for crabgrass germination. However, once the drought was broken in July, the crabgrass germinated and the pre-

Pre- and post-emergence combinations exemplify the different control strategies that are available.

emergence herbicide had dissipated, resulting in tremendous crabgrass populations.

These populations had to be treated with a post-emergence application since practically no pre-emergence control was seen. Thus, if you had waited to see the crabgrass problem develop you would have saved the cost of the pre-emergence application and used the post-emergence product to get control.

The advantage of this approach is flexibility and potential cost savings while the drawback is that you must tolerate a certain level of crabgrass before treating.

Pre-, post- combos

The use of pre- and post-emergence combinations is another example of the different grass control strategies now available.

The data in Table 3 displays some of the results of using pre/post combinations and post-only applications for controlling crabgrass.

The data show that the pre/post combinations are effective and could result in either a lower rate of pre-emergent or elimination of the second pre-emergence application. Also, note that one well-timed post-emergence application can result in season-long control, but only if delayed sufficiently to catch all of the germinating crabgrass plants.

Nutsedge control

For control of yellow nutsedge, either MSMA or Basagran is effective. However, Basagran is usually preferred because the potential for phytotoxicity is reduced.

Because the root tubers of the yellow nutsedge are not killed by these herbicides, multiple applications are needed to kill the plants sprouting from the tubers.

In essence, you try to prevent the plants from getting enough growth to produce more tubers. Thus, as many as one to three applications per season could be required to eliminate a serious yellow nutsedge problem.

The above summarizes the major types of post-emergence weed control applications. With any post-emergence application, make sure the plants are actively growing and treat them at the proper weed growth stage to achieve effective control. As always, follow the manufacturer's label to assure consistent, safe results.

LM

Dr. Branham is an associate professor in the Crop and Soil Sciences Department at Michigan State University.