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.

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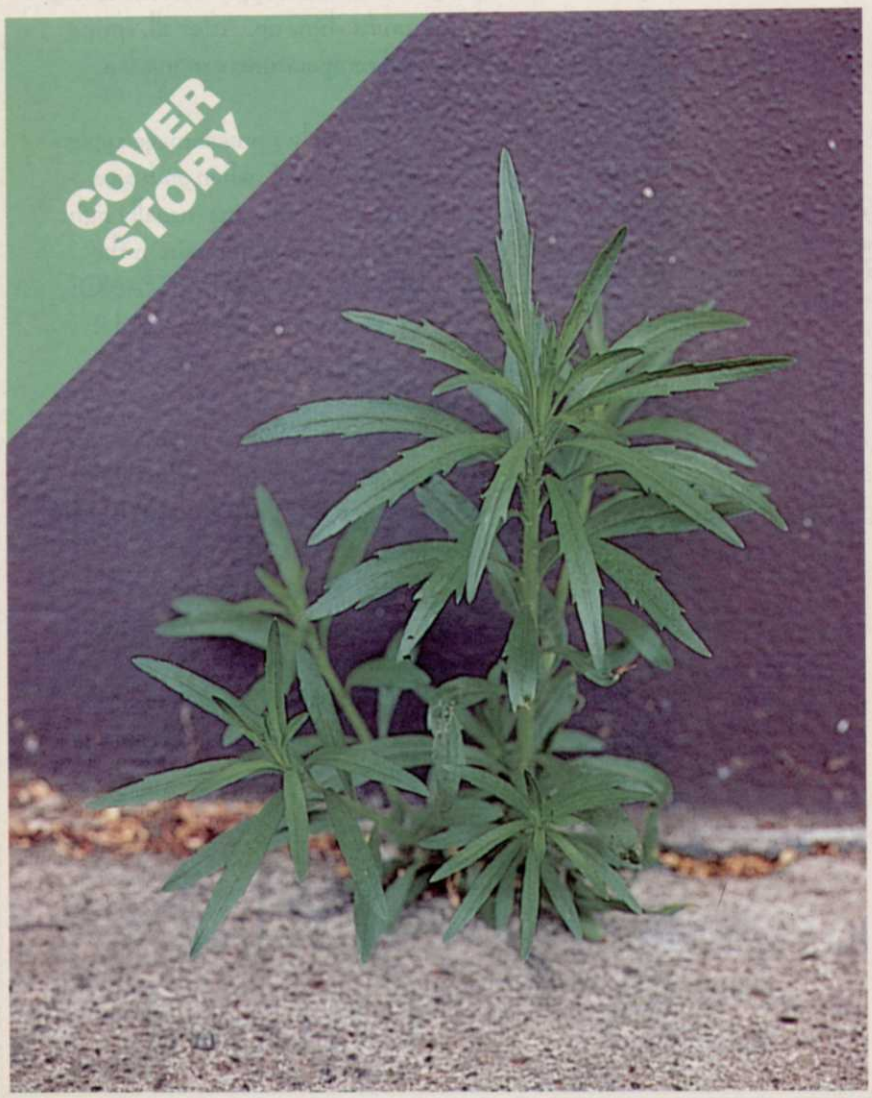

Post-emergence weed control is the application of a herbicide to an established weed to achieve control. It is fundamentally different from pre-emergence weed control in several ways. First, the herbicide is applied directly to the weed which permits the use of spot applications. Second, environmental 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
2, 4-DP
MDPP
MCPA
dicamba
triclopyr
clopyralid

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 + diacamba
Trimec Encore (1.0/0:46/0.1) [amine] Gordons

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

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 LD_{50} 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, but they can cause non-target plant injury; so caution must be used when employing ester-formulated herbicides.

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

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 ½x 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

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 flexibility, 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-emergence herbicide had dissipated, resulting in tremendous crabgrass populations.

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

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**

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