

LANDSCAPE MANAGEMENT

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Post-emergence warm-season turfgrass weed control

One of the keys: the tolerance of warm-season grasses to post-emergents decreases in hot weather, drought and/or high humidity.

by Tim R. Murphy, Ph. D.
University of Georgia

Unlike pre-emergence herbicides, which must be applied at certain times of the year, post-emergence herbicides provide the turfgrass manager with viable options to control weeds over the entire year.

A complete chemical weed control program can be based on post-emergence herbicides. However, most post-emergence herbicides usually cause temporary

injury to turfgrasses. Therefore, the primary use of post-emergence herbicides is to supplement the level of weed control obtained with the use of pre-emergence herbicides.

Post-emergence herbicides offer several advantages relative to the use of pre-emergence herbicides. This group of herbicides can be applied on a spot treatment or as-needed basis directly to a weed infestation. Pre-emergence herbicides are usually applied to the entire turfgrass area. Spot treatments of post-emergence herbicides are less expensive than broadcast applications of pre-emergence herbicides. Post-emergence herbicide control may be used on newly sprigged or sodded warm-season turfgrasses. In areas that are scheduled to be overseeded or renovated, the majority of post-emergence herbicides can be used prior to renovation.

Problem weed management—Here are some effective ways of controlling the more persistent weeds which you, as a landscape manager in the southern part of the U.S., will come in contact with:

Common bermudagrass: Unless it is the desired turfgrass, common bermudagrass is an aggressive, competitive weed in southern turfgrass-

es. Multiple applications of Vantage can be used to suppress bermudagrass in centipedegrass. In zoysiagrass, repeat applications of Acclaim at three-week intervals during the summer months will suppress common bermudagrass growth. Prograss has recently been registered for the suppression of actively-growing common bermudagrass in St. Augustinegrass.

Bahiagrass: Repeat application so MSMA or DSMA at 7- to 10-day intervals will control bahiagrass in MSMA/DSMA-tolerant turfgrasses. In labeled warm-season turfgrasses, DMC will effectively control "Pensacola" bahiagrass. In centipedegrass, repeat applications of Vantage at 10- to 14-day intervals will suppress bahiagrass growth and seedhead development.

Dallisgrass: A difficult-to-control warm-season perennial. In bermudagrass or zoysiagrass, two to four repeat applications of MSMA or DSMA will be necessary to control this weed. Also, a non-ionic surfactant should be used with MSMA or DSMA to control dallisgrass. Stay on the application schedule (two to four applications, each at a 5- to 10-day interval) for proper control.

Nutsedge: Basagran T/O will provide good control of yellow nutsedge, but not purple nutsedge. Monthly applications of MSMA or DSMA in tolerant turfgrasses during the late spring and summer months can be used to suppress the growth of both species.

With the exception of bahiagrass and carpetgrass, Image can be used in warm-



Winter weeds are at home in dormant bermudagrass.



Virginia buttonweed remains the most tenacious of warm-season weeds.

season turfgrasses for yellow and purple nutsedge control. The addition of MSMA to Image generally improves nutsedge control in MSMA tolerant turfgrasses. A repeat application, six to eight weeks after the first application of Image or Image + MSMA will be required to control nutsedge during the summer months.

Prostrate spurge: Repeat applications of two-way or three-way broadleaf herbicides can be used to control this summer annual. In bermudagrass, low rates of Sencor will effectively control emerged prostrate spurge. Research conducted in Florida has shown that DMC will effectively control prostrate spurge in bermudagrass.

Virginia buttonweed: Still probably the most difficult to control. Monthly applications of a two-way or three-way herbicide will be needed during summer months. Recent research in Alabama and Mississippi has shown that a tank mix of 2,4-D + metsulfuron has potential for control.

—The author is an extension agronomist specializing in weed science at the University of Georgia.

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Post-emergence suggestions

- Apply post-emergence herbicides to small, actively-growing weeds. Perennial and annual weeds that are growing under good soil moisture conditions at moderate air temperatures (60°-90° F) are easier to control with post-emergence herbicides than weeds that are stressed due to adverse environmental conditions.

- Do not use when turf and weeds are under stress. The tolerance of warm-season turfgrasses to post-emergence herbicides decreases at air temperatures greater than 90° F, when turfgrasses are drought stressed or when they are growing under high soil moisture and high relative humidity conditions. Herbicides that contain 2,4-D, dicamba, mecoprop, dichlorprop, imazaquin, MSMA and DSMA should not be applied at high air temperatures since there is an increased risk of unacceptable turfgrass injury. Always

follow the most restrictive warning that is shown on the label.

- Single applications at high rates generally cause more turfgrass injury than repeat applications at low rates. Additionally, single, high-rate applications often do not control perennial weeds. The repeat application is usually made at an interval of 7 to 14 days after the first application, or when re-growth of the weed is noted.

- Coordinate mowing schedules. Generally, mowing should be delayed three to four days prior or after a post-emergence herbicide application.

- Do not apply immediately before rainfall or irrigation.

- Use surfactants and crop oil concentrates according to label directions.

- Calibrate all spray equipment and train the operator.

—Dr. Murphy



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Table 1.

POST-EMERGENCE HERBICIDES, WARM-SEASON TURFGRASS

Common name	Trade name	Uses
asulam	Asulox	Grassy weed control in St. Augustinegrass
atrazine	Aatrex, others	Pre- and post- broadleaf and grass weed control
bentazon	Basagran T/O	Primarily used for yellow nutsedge control
bromoxynil	Buctril	Broadleaf weed control on seed or sod farms only
2,4-D	numerous formulations	Broadleaf weed control
2,4-D + dicamba	Eight-One; Phenabane 801	Broadleaf weed control
2,4-D + dichlorprop	Weedone DPC Amine; Weedone DPC Ester	Broadleaf weed control
2,4-D + mecoprop	Lescopar; 2 Plus 2	Broadleaf weed control
2,4-D mecoprop + dicamba	Trimec Classic; Trex-san; Three-Way	Broadleaf weed control
2,4-D + mecoprop + dichlorprop	Weedestroy Triamine; Weedestroy Tri-Ester	Broadleaf weed control
dicamba	Banvel	Broadleaf weed control
diclofop-methyl ¹	Iloxan	Goosegrass control in bermudagrass
diquat ²	Diquat	Winter annual weed control in dormant bermudagrass
DSMA	numerous formulations	Grassy weed control in bermudagrass and zoysiagrass
ethofumesate	Prograss	Pre- and early post- annual bluegrass control in overseeded bermudagrass. Common bermudagrass suppression in St. Augustinegrass.
fenoxaprop	Acclaim	Annual grass control and suppression of bermudagrass in zoysiagrass
glyphosate	Roundup	Winter annual weed control in bermudagrass
imazaquin	Image	Purple nutsedge and wild garlic control in warm-season turfgrasses (except bahiagrass) and certain broadleaf weeds
mecoprop	Mecomec; Lescopex	Broadleaf weed control
mecoprop + 2,4-D + dichlorprop	Southern Trimec	Broadleaf weed control
MCPA + mecoprop + dicamba	Weedestroy Triamine II; Weedestroy Tri-Ester II	Broadleaf weed control
metribuzin	Sencor Turf	Goosegrass control in bermudagrass, and prostrate spurge and numerous winter annual broadleaf weeds
metsulfuron	DMC	Controls 'Pensacola' bahiagrass, wild garlic, prostrate spurge and numerous broadleaf weeds
MSMA	numerous formulations	Grass weed control in bermudagrass and zoysiagrass
MSMA + 2,4-D + mecoprop + dicamba	Trimec Plus	Grass and broadleaf weed control in bermudagrass and zoysiagrass
pronamide	Kerb	Annual bluegrass control in bermudagrass
sethoxydim	Vantage	Annual grass control and suppression of bahiagrass in centipedegrass

¹ Diclofop-methyl has a state label for use in Alabama, Florida, Georgia, Mississippi, North Carolina and South Carolina.

² Diquat has a state label in Arkansas, Louisiana, Mississippi, Oklahoma, Tennessee and Texas for winter annual weed control in dormant bermudagrass.

Source: Dr. Murphy

Table 2.

WARM-SEASON TURFGRASS TOLERANCE TO POST-EMERGENCE HERBICIDES

HERBICIDE/TURF	BAHIA	BERMUDA	CENTPEDE	CARPETGRASS	ST. AUGUSTINE	ZOYSIA
asulam	NR-S	T ¹	NR-S	NR-S	I-T	NR
atrazine	NR-I	S(D)	T	NR-T	T	I
bentazon	T	T	T	NR-T	T	T
bromoxynil	T	T	T	NR-I	T	T
2,4-D	T	T	I	I	S-I	T
2,4-D+dicamba	T	T	S-I	I-T	S-I	T
2,4-D + dichlorprop	T	T	I	I-T	S-I	T
2,4-D + mecoprop	T	T	I	I-T	S-I	T
2,4-D + mecoprop + dicamba	I-T	I-T	S-I	I-T	S-I	T
2,4-D + mecoprop + dichlorprop	T	T	I	I	I	T
dicamba	T	T	I-T	T	S-I	T
diclofop-methyl	NR	T	NR	NR	NR	NR
DSMA, MSMA	NR-S	T	NR-S	NR-S	NR-S	I
fenoxaprop	NR-S	NR-S	NR-S	NR	NR-S	T
glyphosate ²	S(D)	S(D)	S	S	S	S
imazaquin	NR-S	T	T	NR-I	T	T
MCPA + mecoprop + dichlorprop	T	T	I	I	I	T
mecoprop	T	T	S-I	I	S-I	T
metribuzin	NR-I	T	NR-S	NR-S	NR-S	NR-S
metsulfuron	NR-S	T	T	NR	T	I-T
pronamide	NR	T	NR	NR	NR	NR
sethoxydim	NR-S	NR-S	T	NR-I	NR-S	NR-I

T= Tolerant at labeled rates I= Intermediate tolerance; use at reduced label rates S= Sensitive; do not use this herbicide D= Dormant applications recommended NR=Not registered for use on this turfgrass ¹Labeled only on 'Tifway' (419) bermudagrass and St. Augustinegrass

² Bahiagrass and bermudagrass are tolerant to glyphosate when completely dormant.

Source: Dr. Murphy

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Post-emergence control of cool-season weeds

Contact or systemic? Selective or non-selective? Ester or amine? The astute turfgrass manager can make the proper herbicide choices after identifying problem.

■ The best way to control annual weeds is through a careful cultural program, producing a dense, healthy stand of turfgrass. By paying close attention to proper mowing height and frequency, fertilization and irrigation, annual weeds can be kept to a minimum.

Specific weed problems, then, can often be indications of unfavorable environmental conditions for turfgrass growth, according to Dr. Al Turgeon of Penn State University. In his book "Turfgrass Management," Dr. Turgeon gives instances:

"Large infestations of knotweed frequently occur where severe soil compaction limits turfgrass growth. Ground ivy often invades under trees where insufficient sunlight results in the decline of Kentucky bluegrass and other shade-intolerant turfgrasses. The presence of red sorrel is usually indicative of acid soil conditions."

According to Dr. Prasanta Bhowmik of the University of Massachusetts, a good weed control program consists of the following steps:

- 1) knowing whether the specific problem is a grassy or broadleaf weed;
- 2) knowing whether the weed's lifecycle

Table 1.

POST-EMERGENCE GRASS AND SEDGE CONTROL

COMMON NAME	TRADE NAME	MANUFACTURER	COMMENTS
DSMA	DSMA liquid	Riverdale, Drexel	Controls crabgrass and nutsedge. Repeat applications are needed for nutsedge control. Discoloration may occur in fescue and bentgrass.
	Methar 30	W.A. Cleary	
	Broadside, DSMA 81%	Vertac	
MSMA	Daconate 6	ISK Biotech	Controls crabgrass, nutsedge. Repeat applications needed for nutsedge control.
	Drexar 530	Drexel	
	MSMA 6.6	Drexel	
fenoxaprop	Acclaim	Hoechst-Roussel	Can be tank-mixed with residual pre-emergence and post-emergence broadleaf herbicides.
bentazon	Basagran	BASF	Controls only sedges. Repeat applications are necessary.
dithiopyr	Dimension	Monsanto	Can be tank-mixed with Acclaim. Apply to crabgrass with three tillers or less. Can be applied with fluid fertilizer or other registered pesticides.

Source: Dr. Prasanta Bhowmik, Univ. of Mass.

is annual or perennial; and

- 3) selecting the most effective herbicide.

Post-emergence herbicides can be either contact or systemic. Contact herbicides enter and destroy the parts of the weed plant in which they come in contact. Systemic herbicides are translocated through the plant following absorption and are, therefore, more effective than contact herbicides for controlling perennial weeds, according to Turgeon.

Grassy weeds—Annual grassy weeds, most commonly crabgrass, are probably the biggest weed problem facing landscape managers. The preferred method of crabgrass control is with pre-emergence herbicides. However, when this method does not completely work, post-emergence herbicides must be used.

Post-emergence control of annual grassy weeds is becoming popular because of inte-

grated pest management programs which include scouting for weed presence.

For turfed areas that have not had a history of crabgrass invasion, skipping the pre-emergence application and spot-treating with a post-emergence product could be employed. The advantage of this approach is flexibility and potential cost savings; the drawback is that you must tolerate a certain level of crabgrass before treating.

Until 1987, the only available post-emergence crabgrass material was MSMA. According to Dr. Bruce Branham of Michigan State University, two applications 10 to 14 days apart are required for effective control. In addition, MSMA products can be phytotoxic under summer's hot, humid conditions.

However, a product called Acclaim (fenoxaprop) is now on the market. On young crabgrass (two tillers or smaller), you

can often get 95 percent or higher control, Branham observes.

Broadleaf weeds—Some control of annual broadleaf weeds is obtained from pre-emergence herbicides used for annual grass control. However, complete control is not possible, Dr. Turgeon says; therefore, some post-emergence applications may be required whether pre-emergents are used or not.

A successful post-emergence weed control program for broadleaves is contingent on proper herbicide selection, uniform application and proper dosage. The herbicide selected should depend on the weeds to be controlled and the turfgrass which is to be treated. Mixtures of two to three herbicides are commonly used because the combinations are more effective than any single herbicide.

With the exception of MCPP, 2,4-D is the primary component of most multiple-herbicide mixes. And there are differences in efficacy among the different mixtures. However, the most important factor controlling efficacy is the type of formulation used.

Choose a formulation best suited to your needs. Ester formulations, which are oil soluble, tend to penetrate the leaf better than amines, which are water soluble. So esters are generally better weed control products than are corresponding amines.

According to Dr. Branham, amines should always be used in the spring when

plant material is breaking dormancy, actively growing, and very susceptible. Esters can and should be used in the summer when weeds are starting to harden off and are less susceptible; and in the fall when non-target plants are hardening off for the winter and are much less susceptible to injury from volatile broadleaf herbicides.

Most hard-to-control weeds are perennials: wild violet, woodsorrel and ground ivy, for instance. These weeds have extensive root systems, which must be killed. In general, spring herbicide application is standard; but post-emergence herbicides can also be applied in the fall for certain weed species like ground ivy, hawkweed, plantain, wild strawberry and thistles. The fall treatment also controls many seedlings of winter annuals (like common chickweed, corn speedwell and henbit) that germinate in late August or early September.

Non-selectives—Non-selective herbicides are used to control all vegetation and therefore are not normally used in a turf weed control program.

They are, however, useful for edging around trees and for controlling weeds in the cracks of sidewalks and driveways where they are often combined with a pre-emergence herbicide like Surflan to provide long-term residual weed control.

Non-selective herbicides can also be used to control weeds in mulched planting beds or gardens by directing the spray only on the weeds present.

Table 3.

SUGGESTED TREATMENTS FOR HARD-TO-CONTROL BROADLEAFS

Ground ivy (*Glachoma hederacea*): Use Turflon D, Super Trimec or Weedone DPC. Very difficult to control in summer. Fall application is desirable.

Prostrate knotweed (*Polygonum aviculare*): Same post-emergents as ground ivy. Summer control difficult.

Creeping speedwell (*Veronica filiformis*): Use Turflon D, Weedone DPC or Trimec. Several other speedwell species are also difficult to control. Can be controlled with pre-emergence application of Dacthal 6F.

Spurge (*Euphorbia supina*): Use Turflon D, Trimec or Weedone DPC. Spring or summer application desirable. Can also be controlled with pre-emergence spring application of Dacthal, PreM, Team or Dimension.

Wild violets (*Viola spp.*): Use Turflon. Usually requires follow-up application in one to four weeks.

Yellow woodsorrel (*Oxalis stricta*): Use Turflon D, Super Trimec, Weedone DPC, Pre-M, Team or Dimension. Spring application of pre-emergents will control oxalis.

Source: Dr. Bhowmik

Table 2.

BROADLEAF HERBICIDE MIXTURES FOR POST-EMERGENCE WEED CONTROL

HERBICIDE	TRADE NAME	RATIO	MANUFACTURER
2,4-D + MCPP	2 Plus 2	1:1	ISK Biotech
	Lescopar	1:2	Lesco
	2,4-D + MCPP	2:1	W.A. Cleary
2,4-D + 2,4-DP	Chipco Weedone DPC Ester	1:1	Rhone-Poulenc
	Chipco Weedone DPC Amine	1:1	Rhone-Poulenc
	Turf D + DP Ester	1:1	Riverdale
2,4-D + dicamba	8-1 Selective Herbicide	8:1	Lesco
	Riverdale 81 Selective Weed Killer	8:1	Riverdale
	Riverdale 101 Weed Killer	10:1	Riverdale
2,4-D + 2,4-DP + MCPP	Weedestroy Triamine	1:1:1	Riverdale
	Weedestroy Triester	1:1:2	Riverdale
MCPA + MCPP + 2,4-DP	Weedestroy Triamine II	1:1:1	Riverdale
2,4-D + MCPP + dicamba	Three-Way Selective Herbicide	1.5:0.009	Lesco
	Trimec Classic	1.5:1	PBI Gordon
	Bentgrass Selective	0.5:1.5:0.2	Lesco
	Triplet	2.44:1.3:0.22	Riverdale
2,4-D + triclopyr	Turflon D Ester	2:1	DowElanco
	Turflon II Amine	2.6:1	DowElanco
triclopyr + clopyralid	Confront Amine	3:1	DowElanco

Source: Dr. Bhowmik