

PRE-EMERGENCE WEED CONTROL

(COOL-SEASON)

Prasanta C. Bhowmik, Ph.D., University of Massachusetts

Common Name, Trade Names, Formulations, and Rate of Pre-Emergence Herbicides

Common Name	Trade Name(s)	Formulation	Recommended Rate (pound active per acre)	Company	
Benefin	Balan	2.5G	2.0-3.0	Elanco	
		2.5G	"	Lesco	
Benefin & Trifluralin	Team (1:2)	2G	1.5-3.0	Elanco	
		1G	"	Lesco	
Bensulide	Betasan	4E, 7G, 12.5G	7.5-10.0	ICI	
		Pre-san	4E, 7G, 12.5G	"	Sierra
		Lescosan	4E, 7G, 3.6G	"	Lesco
		Betamac	4E	"	PBI Gordon
		Weedgrass Preventer	8.5	12.5	Scotts
DCPA	Dacthal	75WP	10.5	Fermenta	
		5G	"	Lesco	
Oxadiazon	Ronstar	50WP, 2G	3.0-4.0	Rhone Poulenc	
Oxadiazon + Bensulide	Goosegrass/ Crabgrass Control	6.56G	7.5	Scotts	
Pendimethalin	Lesco Pre-M Weedgrass Control	60DG	1.5-3.0	Lesco	
		60WDG	"	Scotts	
		Halts Crabgrass	2.45G	"	Scotts
		Turf Weedgrass Control	1.71G	"	Scotts
Siduron	Tupersan	50WP	2.0-6.0	Du Pont	

Minimum Time Necessary for Reseeding after Various Pre-Emergence Herbicide Application

Common Name	Trade Name(s)	Formulation	Recommended Rate (pound per acre)	Minimum Time Before Reseeding (Weeks)
Benefin	Balan	2.5G	2.0-3.0	6
Benefin & Trifluralin	Team (1:2)	2G	1.5-3.0	6
Bensulide	Betasan	4E, 7G, 12.5G	7.5-10.0	16
DCPA	Dacthal	75WP	10.5	8
Oxadiazon	Ronstar	50WP, 2G	3.0-4.0	16
Oxadiazon + Bensulide	Goosegrass/ Crabgrass Control	6.56G	7.5	16
Pendimethalin	Lesco Pre-M	60DG	1.5-3.0	16
Siduron	Tuperson	50WP	2.0-6.0	N/A

(WARM-SEASON)

Clyde Elmore, Ph.D., University of California-Davis

Directory of Turfgrass Pre-Emergence Herbicides

Common Name	Trade Name	Formulations	Company
Atrazine	Aatrex	80W,90DG,4L	Ciba-Geigy
	Purge	4L	Security
Benfen	Balan	2.5G	Elanco
	2.5 Benfen Granular	2.5G	Lesco
Benfen + oryzalin	XL	2G	Elanco
Benfen + trifluralin	Team	2G	Elanco
Benfen + oxadiazon	Regaistar		
Bensulide	Betasan	2.9E,4E,7G,12.5G	ICI
	lescovan	4E,7G,12.5G	Lesco
	Pre-san	4E,7G,12.5G	Sierra
	Bensumec 4LF	4E	
Bensulide + Oxadiazon	Goosegrass/Crabgrass Control	5.25G + 1.31G	Scotts
DCPA	Dacthal	75W	Fermenta
	Dacthal	5G	Lesco
Ethofumsate	Prograss	1.5E	Nor-Am
Fenarimol	Rubigan	50W	Elanco
Napropamide	Devrinol	50W,5G	ICI
Oryzalin	Surflan	4AS	Elanco
Pendimethalin	Southern Weedgrass Control	2.5G	Scotts
	Turf Weedgrass Control	1.71G	Scotts
	Weedgrass Control	60DG	Scotts
	Pre-M	60DG	Lesco
	Pendimethalin	60DG	Clean Crop
Pronamide	Kerb	50W	Rohm-Haas
Siduron	Tupersan	50W	Du Pont
Simazine	Princep	80W,90DG,4L,4G	Ciba-Geigy

Tolerance of Warm-Season Turf to Pre-Emergence Herbicides

Herbicide	Bahia	Bermuda	Centpede	St. Augustine	Zoysia
Atrazine	NR	I	T	T	I
Benfen	T	T	T	T	T
Benfen*oryzalin	T	T	T	T	T
Benfen*trifluralin	T	T	T	T	T
Bensulide	T	T	T	T	T
Bensulide*oxadiazon	NR	T	NR	NR	T
DCPA	T	T	T	T	T
Ethofumsate	NR	I	NR	NR	NR
Napropamide	T	T	T	T	TR
Oryzalin	T	T	T	T	T
Oxadiazon	NR	T	NR	T	T
Oxadiazon*benfen	NR	T	NR	NR	T
Pendimethalin	T	T	T	T	T
Pronamide	NR	T	NR	NR	NR
Siduron	NR	NR	NR	NR	NR
Simazine	NR	T	T	T	T

T = tolerant; I = Intermediate tolerance, apply only to dormant grass
NR = Not registered

Tim R. Murphy, University of Georgia

Tolerance of Warm-Season Turfgrasses and Tall Fescue to Pre-Emergence Herbicides

Herbicide	Turfgrasses					
	Bahia	Bermuda	Centipede	St. Augustine	Tall Fescue	Zoysia
Atrazine	NR	I	T	T	NR	I
Benefin	T	T	T	T	T	T
Benefin + Oryzalin	T	T	T	T	T	T
Benefin + Trifluralin	T	T	T	T	T	T
Bensulide	T	T	T	T	T	T
Bensulide + Oxadiazon	NR	T	NR	NR	T	T
DCPA	T	T	T	T	T	T
Ethofumesate	NR	I	NR	NR	NR	NR
Napropamide	T	T	T	T	T	NR
Oryzalin	T	T	T	T	T	T
Oxadiazon	NR	T	NR	T	T	T
Pendimethalin	T	T	T	T	T	T
Pronamide	NR	T	NR	NR	NR	NR
Siduron	NR	NR	NR	NR	T	NR
Simazine	NR	T	T	T	NR	T

T = Tolerant; I = Intermediate tolerance, apply to dormant grass;
NR = Not Registered for use.

Summer Annual Weed Control Ratings for Pre-Emergence Herbicides

Herbicide	Crabgrass spp.	Goosegrass	Sandbur	Prostrate Spurge	Prostrate Knotweed
Atrazine	P	P	P	E	E
Benfen	E	F	F	P	P
Benfen + Oryzalin	E	F-G	G	L	L
Benfen + Trifluralin	L	L	—	—	—
Bensulide	E	P	G	P	G
Bensulide + Oxadiazon	E	G	—	—	—
DCPA	E	F	F	P	G
Napropamide	E	G	G	—	L
Oryzalin	E	F-G	G	L	L
Oxadiazon	G	E	F	P	G
Pendimethalin	E	F-G	G	L	—
Siduron	G	P	—	P	P
Simazine	G	P	—	G	G

E = Excellent, \geq 90% control. G = Good, 80 to 89% control. F = Fair, 70 to 79% control. P = Poor, $<$ 70% control. L = Weed species is listed on the herbicide label, but has not been evaluated by the University of Georgia. — = Weed response is not known.

Winter Annual Weed Control Ratings for Pre-Emergence Herbicides

Herbicide	Annual Bluegrass	Common Chickweed	Henbit	Parsley-Piert	Spurweed	Corn Speedwell
Atrazine	E	E	E	E	E	E
Benfen	E	G	G	P	P	E
Benfen + Oryzalin	E	L	L	—	—	—
Benfen + Trifluralin	L	—	—	—	—	—
Bensulide	F	P	P	E	P	P
DCPA	G	E	F	P	P	E
Ethofumesate	G	L	—	—	—	—
Fenarimol	G	—	—	—	—	—
Napropamide	G	E	P	P	E	E
Oryzalin	G	L	L	—	—	—
Oxadiazon	G	P	P	E	P	G
Pronamide	E	E	P	P	P	E
Pendimethalin	G	L	L	—	—	—
Simazine	E	E	E	G	E	E

E = Excellent, \geq 90% control. G = Good, 80 to 89% control. F = Fair, 70 to 79% control. P = Poor, $<$ 70% control. L = Weed species is listed on the herbicide label, but has not been evaluated by the University of Georgia. — = Weed response is not known.

POST-EMERGENCE WEED CONTROL

(COOL-SEASON)

Bill Lewis, Ph.D., North Carolina State University

Susceptibility of Broadleaf Weeds to Turf Herbicides

Weed	Response of Weeds to Herbicides			
	Classification of Weed	2, 4-D	Mecoprop (or MCPP)	Dicamba (Banvel)
Bittercress, Hairy	WA	S	I	S
Black Medic	A	R	I	S
Buttercups	WA, B & P	S-I	I	I-R
Carolina Geranium	WA	S	S-I	S
Carpetweed	SA	S	I	S
Catsear	P	S-I	I	S
Chicory	P	S	S	S
Chickweed, Common	WA	R	S-I	S
Chickweed, Mouseear	WA, P	I-R	S-I	S
Clover, Hop	WA	I	S	S
Clover, White	P	I	S	S
Dandelion	P	S	S	S
Dichondra	P	S	I	S-I
Dock, Broadleaf & Curly	P	I	I-R	S
Garlic, Wild	P	S-I	R	S-I

A = annual; B = biennial; P = perennial; SA = summer annual; WA = winter annual; S = susceptible; I = intermediately susceptible, good control sometimes with high rates, however a repeat treatment 3 to 4 weeks later each at the standard or reduced rate is usually more effective; R = resistant in most cases.

continued

Susceptibility of Broadleaf Weeds to Turf Herbicides (Cont.)

Response of Weeds to Herbicides

Weed	Classification of Weed	2, 4-D	Mecoprop (or MCPP)	Dicamba (Banvel)
Ground Ivy	P	I-R	I	S-I
Hawkweed	P	S-I	R	S-I
Healall	P	S	R	S-I
Henbit	WA	I-R	I	S
Knawel	WA	R	I	S
Knotweed, Prostrate	SA	R	I	S
Lespedeza	SA	I-R	S	S
Mallow	SA	I-R	I	S-I
Mugwort	P	I	I-R	S-I
Parsley-piert	WA	R	S-I	S-I
Pennywort, lawn	P	S-I	S-I	S-I
Plantains	P	S	I-R	R
Purslane, Common	SA	I	R	S
Red Sorrel	P	R	S	S
Speedwell, Corn	WA	I-R	I-R	I-R
Spurge, Prostrate	SA	I	I	S
Spurge, Spotted	SA	I-R	S-I	S-I
Spurweed	WA	I	S-I	S
Strawberry, India Mock	P	R	I	S-I
Violet, Johnnyjumpup	WA	I-R	I-R	S-I
Violet, Wild	P	I-R	I-R	S-I
Woodsorrel, Common Yel.	P	R	R	I
Yarrow	P	I	I-R	S

A = annual; B = biennial; P = perennial; SA = summer annual; WA = winter annual; S = susceptible; I = intermediately susceptible, good control sometimes with high rates, however a repeat treatment 3 to 4 weeks later each at the standard or reduced rate is usually more effective; R = resistant in most cases.

Tolerance of Cool-Season Turfgrasses to Post-Emergence Herbicides for Broadleaf and/or Grass Weed Control

Turfgrass	2,4-D	Mecoprop	Dicamba	Bromoxynil	Dichlorprop	Triclopyr	DSMA, MSMA, CNA	Benzon	Ethofumesate	Fenoxaprop
Bentgrass	S-I*	T	I	T	I	S-I	I	T	S	S
Kentucky Bluegrass	T	T	T	T	T	T	I	T	S	T
Tall Fescue	T	T	T	T	T	T	I	T	S	T
Fine Fescue	T	T	T	T	T	I	I	T	S	T
Perennial Ryegrass	T	T	T	T	T	T	T	T	T	T

*I = Intermediately tolerant, use with caution, use at reduced label rates, or minimum label rates; S = sensitive, do not use this herbicide; T = tolerant.

Post-Emergence Herbicides and Package Combinations for Selective Control of Broadleaf Weeds in Cool-Season Turfgrasses

Common Name of Herbicide	Examples of Commercial Products for Professional Applicators
2,4-D	Various
mecoprop	Lescopex, Mecomec
dicamba	Banvel
bromoxynil	Buctril
2,4-D + dicamba	Lesco Eight-One
2,4-D + dichlorprop (2,4-DP)	Weedone DPC, Weedone DPC Amine
2,4-D + mecoprop (MCPP)	Turk Kleen, Lescopar, 2 Plus 2
triclopyr + 2,4-D	Turflon D, Turflon II amine
2,4-D + dichlorprop + dicamba	Super Trimec
2,4-D + mecoprop + dicamba	Trimec Classic, Trex-San, Lesco Three-Way
2,4-D + mecoprop + dichlorprop	Weedestroy Triamine, Weedestroy Tri-ester
MCPA + mecoprop + dicamba	Trimec Encore, Weedestroy Triamine II

(WARM-SEASON)

Tim R. Murphy, University of Georgia

Common and Trade Names of Turfgrass Post-Emergence Herbicides

Common Name	Company	Trade Name and Formulations ¹
asulam	Rhone-Poulenc	Asulox 3.34 lbs./gal.
atrazine	Security	Purge 4 lbs./gal.
	Ciba-Geigy	Aatrex 4L, 90DG, 80W
bentazon	BASF	Basagram 4 lbs./gal.
bromoxynil	Rhone-Poulenc	Buctril - 2 and 4 lbs./gal., Brominal - 2 and 4 lbs./gal., Brominal 2 lbs./gal.
2,4-D	Lesco	Numerous trade names and formulations are available.
	Vertac, Lesco, Fermenta, Others	
2,4-D + dicamba	Rhone-Poulenc	Weedone SuperDPro Amine
	Lesco	Eight-One Selective Herbicide
	PBI/Gordon	Phenaban 801
2,4-D + dichlorprop	Rhone-Poulenc	Weedone DPC Amine, Weedone DPC
2,4-D + MCPP	Lesco	Lescopar
	Rhone-Poulenc	Turf Kleen
	PBI/Gordon	Phenomec 2 + 1
2,4-D + MCPP + dicamba	PBI/Gordon	Trimec Classic
	Sierra	Trex-san
	Lesco	Three-Way
dicamba	Sandoz	Banvel 4 lbs./gal.
	PBI/Gordon	Dicamba 4
diquat ²	Valent	Diquat 2 lbs./gal.
DSMA	Vertac, Vineland	Numerous trade names and formulations are available.
	Others	
ethofumesate	Nor-Am	Progress 1.5EC
glyphosate	Monsanto	Roundup 4 lbs./gal.
imazaquin	Lesco, American Cyanamid	Image 1.5 lbs./gal.
MCPP	Rhone-Poulenc	Turf Herbicide MCPP 2 lbs./gal.
	PBI/Gordon	Mecomec 4 4 lbs./gal.
	Lesco	Lescopex 2.5 lbs./gal.
metribuzin	Mobay	Sencor Turf 75W
MSMA	Fermenta, Platte, Others	Numerous trade names and formulations are available.
MSMA + 2,4-D + MCPP + dicamba	PBI/Gordon	Quadmec
MCPP + 2,4-D + dicamba	PBI/Gordon	Southern Trimec
pronamide	Rhom-Haas	Kerb 50W
sethoxydim	BASF	Poast 1.5 lbs./gal.

¹Numeral refers to percent or pounds of active ingredient.²Diquat has a state label in Arkansas, Louisiana, Mississippi, Oklahoma, Tennessee and Texas for winter annual weed control in dormant bermudagrass.

Warm-Season Turfgrass Tolerance to Post-Emergence Herbicides

Herbicide	Turfgrass			
	Bermuda-grass	Centipede-grass	St. Augustine-grass	Zoysia-grass
asulam	T*	NR-S	T	NR-I
atrazine	T (D)	T	T	I
bentazon	T	T	T	T
bromoxynil	T	T	T	T
2,4-D	T	S-I	S-I	T
2,4-D + dicamba	T	S-I	S-I	T
2,4-D + dichlorprop	T	S-I	S-I	T
2,4-D + mecoprop	T	S-I	S-I	T
2,4-D + mecoprop + dicamba	T	S-I	S-I	T
dicamba	T	S-I	S-I	T
diquat	T (D)	NR	NR	NR
DSMA, MSMA	T	S	S	I
glyphosate	T (D)	S	S	S
imazaquin	T	T	T	T
MCPP	T	S-I	S-I	T
metribuzin	T	NR-S	NR-S	NR-S
pronamide	T	NR	NR	NR-T
sethoxydim	NR-S	T	NR-S	NR-I

*Asulam is labelled for use only on 'Tifway' bermudagrass (419).

T = Tolerant at labelled rates; I = Intermediate tolerance, use at reduced label rates; S = Sensitive, do not use this herbicide; NR = Not registered for use on this turfgrass; D = Dormant applications only.