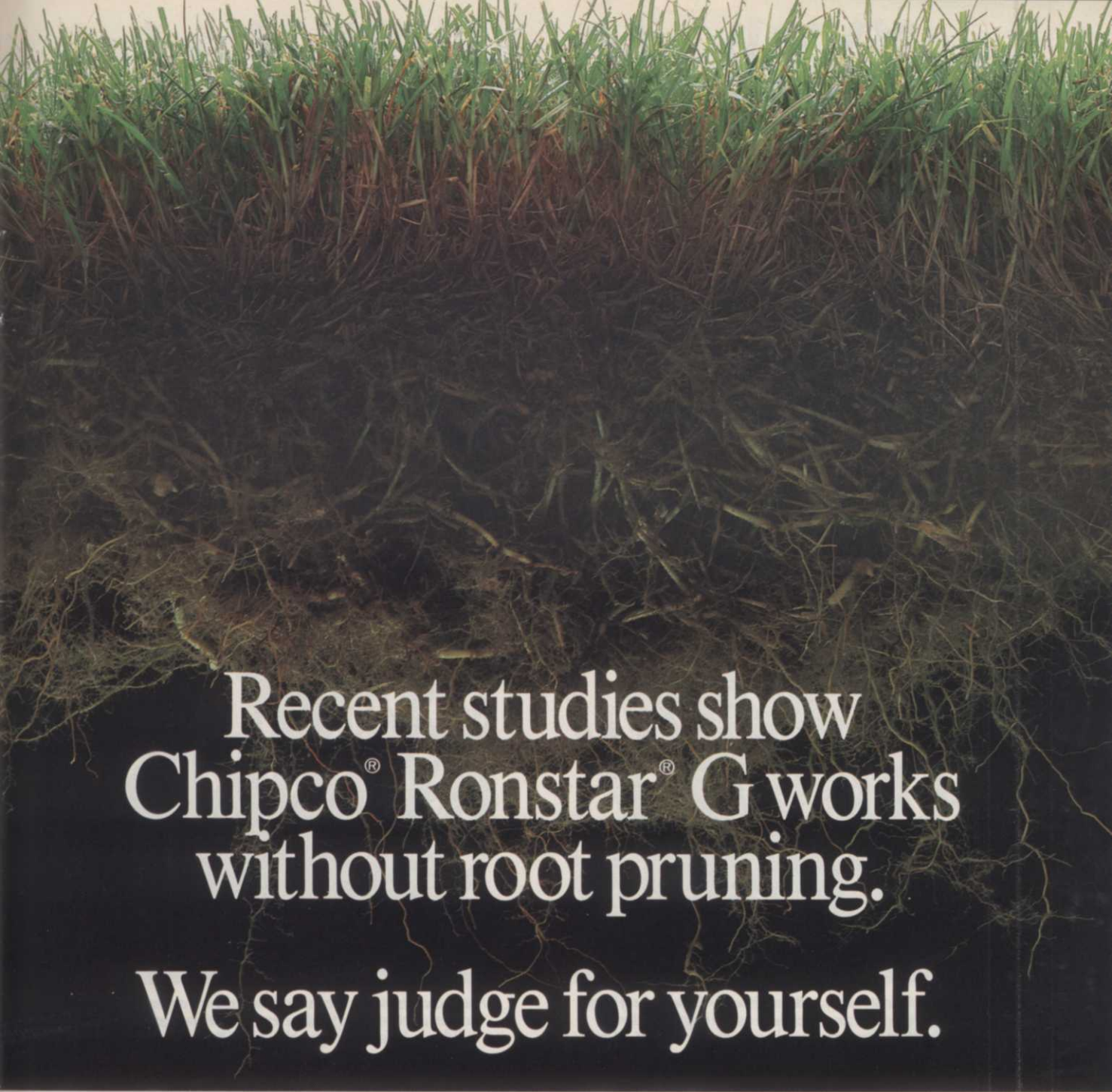

Recent studies show Chipco® Ronstar® G works without root pruning.

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Let's face it, the last thing you need from a turf herbicide is root damage. That's why so many golf course superintendents are making CHIPCO® RONSTAR® brand G herbicide their first choice for broad-spectrum weed control. Root pull studies conducted at a leading university show that CHIPCO® RONSTAR® G herbicide works without pruning turf roots. That's important, because healthier roots mean stronger, more durable turf. Turf that stands up better to stress. Best of all, just one pre-emergence application of CHIPCO® RONSTAR® G provides season-long control of 25 tough broadleaf and grassy weeds —including goosegrass and crabgrass. You'll also appreciate the fact that CHIPCO® RONSTAR® G won't leach out or move laterally through the soil. And it's labeled for use on a wide variety of ornamentals. So you can apply it to ornamental plantings at the same time you do your turf. You'll get up to 120 days of weed-free control.

Plus CHIPCO® RONSTAR® is also available as a wettable powder and in granular fertilizer formulations under well known brand names.

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Dollar Spot first appears as yellow-green blotches on grass blades. Overall view of affected area shows patches from a few inches to several feet in diameter. Treat preventively at a rate of 1 oz./1,000 sq.ft. every 28 days.

Summer Patch first appears as small patches of light green turf but can fade within hours to a light straw color. Research indicates best results are obtained with a preventive application of 4 oz. when soil temperature reaches 60-70°, followed by a second application 30 days later.

Red Thread, in its latter stages, is distinguished by the presence of bright coral pink thread-like structures 1/16-1/4 inch in length. Use Banner preventively, before disease problems begin, with 2 oz. every 14-21 days.

Anthracnose is most severe on Poa annua and first appears as irregular patches of yellowing turf which eventually turn bronze before fading to light tan. Prevent damage with 1-2 oz. of Banner every 14-28 days.

The first preventive fungicide that lets

For years, medical science has known that to achieve the most effective control, different diseases often require differing methods of prescriptive treatment.

Yet only now, with Banner,® are you finally able to gain the same sophistication in the prevention of diseases on turf.

Because Banner is a truly unique systemic fungicide. With a broader spectrum of control and a more efficient method of treatment than any other yet devised.

Instead of one indiscrim-

Powdery Mildew gets its name from the early stage growth of a gray-white powdery fungus on the leaf surface. In cases of high incidence, entire turf areas may appear dull white. Prevent fungus growth with 1-2 oz. every 14-28 days.

Rust shows up first as light yellow flecks on the grass leaves. If left untreated, leaf surface will eventually rupture and yellow-orange or reddish-brown pustules develop. Preventive treatment calls for 1-2 oz. every 14-28 days.

Spring Dead Spot appears as circular, straw-colored patches on Bermudagrass leaves just as they begin to green-up in spring. The rest of the plant is affected with black to brown dry rot. University research indicates preventive control can be obtained with 4 oz. applied in the fall.*

Brown Patch is recognized by a "frog-eye" pattern formed by the diseased turf encircling green, unaffected plants. For prevention, apply 2-4 oz. every 10-21 days. If disease is already present, apply 2 oz. with a registered contact fungicide.

you treat each disease on its own turf.

inate rate, Banner gives you the precision to treat up to a total of twelve specific turf diseases with their own recommended rates, timing, and frequencies.

Rates that, in many cases, are lower than those that are required with other turfgrass fungicides.

Which means Banner isn't just an intelligent way to effectively prevent disease, it's an intelligent way to prevent spending more than you have to.

WARM-SEASON WEED CONTROL GUIDE

Controlling warm season weeds requires a one-two punch: vigorous turf and proper herbicide use.

by Tim R. Murphy, Extension Agronomist, University of Georgia

They don't fly or lay eggs, but weeds are probably considered by most landscape managers the major pest in warm-season turfgrasses.

For a vigorous, high quality weed-free turfgrass, you need a two-phase weed management strategy.

The first phase involves the use of cultural practices and insect and disease control programs that promote a dense, vigorous turf cover.

Weeds are opportunistic and easily infest bare or thin turfgrass areas. Keeping to approved cultural practices for fertility, watering, cultivation and mowing will promote vigorous turfgrass growth. It will also help prevent weed infestations. Insect and disease control programs should be continually monitored throughout the year.

TABLE 1

WARM-SEASON TURFGRASS TOLERANCE TO PRE-EMERGENCE HERBICIDES.

	TURFGRASSES				
Herbicide	**Bahia-grass**	**Bermuda-grass**	**Centipede-grass**	**St. Augustine-grass**	**Zoysia grass**
(PRE-EMERGENCE)					
atrazine[1]	NR	T(D)	T	T	I
benefin	T	T	T	T	T
benefin + oryzalin	T	T	T	T	T
benefin + 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
ethofumesate[2]	NR	T(D)	NR	NR	NR
fenarimol	—	T	—	—	—
napropamide	T	T	T	T	NR
oryzalin	T	T	T	T	T
oxadiazon	NR	T	NR	T	T
pendimethalin	T	T	T	T	T
pronamide	NR	T	NR	NR	NR
simazine	NR	T	T	T	T

[1]When dormant, bermudagrass and zoysiagrass have good tolerance to atrazine.
[2]Ethofumesate is labeled for use on dormant bermudagrass that is overseeded with perennial ryegrass.
T = Tolerant at labeled rates; I = Intermediate tolerance, NR = Not registered for use on this turfgrass.

SOURCE: DR. MURPHY

Using herbicides

The second phase of the weed management strategy involves using herbicides.

When used in combination with approved cultural practices and insect and disease control programs, herbicides can help prevent weeds. However, strict reliance on herbicides without regard for other management practices will not result in a high quality, aesthetically appealing turfgrass.

The herbicides used in warm-season turfgrasses are classified as either pre-emergence or post-emergence chemicals. Pre-emergence herbicides form the foundation of the chemical weed control program. They are primarily used for the control of annual grasses such as crabgrass, goosegrass and annual bluegrass. Post-emergence herbicides are generally used to control problem weeds, such as nutsedge, dallisgrass and wild garlic onions, that are not controlled by pre-emergence herbicides.

When pre-emergence weed control fails, post-emergence herbicides provide a valuable option for controlling emerged weeds. A complete chemical weed control program can be accomplished in most warm-season turfgrasses with post-emergence herbicides if multiple applications are used. But because repeat applications can cause temporary turfgrass injury, most landscape managers prefer to use post-emergence herbicides in conjunction with a pre-emergence weed control program.

Pre-emergence herbicides are applied to the turfgrass site prior to weed seed germination. This group of herbicides controls weeds during the weed seed germination process. Pre-emergence herbicides do not affect the viability of dormant weed seeds. Weeds that have emerged at the time of application will not be controlled by most pre-emergence herbicides.

Going both ways

Although most herbicides may be classified as pre-emergence or post-emergence, atrazine (Aatrex, Purge), simazine (Princep) and pronamide (Kerb) are exceptions. These herbicides have pre-emergence and post-emergence activity on a wide variety of winter annual weeds.

Pre-emergence herbicides are applied in the spring for crabgrass and goosegrass control and in the fall months primarily for annual bluegrass control. They must be applied before weed seed germination.

Late February to early March applications generally provide better crabgrass control than later applications. However, in the cooler, mountainous regions of the South, the spring application may be delayed until late March or early April. For annual bluegrass, late August to early October applications are used, depending on geographical location.

Pre-emergence herbicides need rainfall or irrigation water to move them into the zone of maximum weed seed germination. Recommendations vary slightly among different pre-emergence herbicides, but unless one-fourth to one-half inch of rainfall occurs within seven days, the herbicide should be irrigated into the top two inches of the soil profile.

A thick thatch layer decreases the persistence of pre-emergence herbicides. Elimination of heavy thatch by cultivation (aerification, verticutting, topdressing) increases herbicide contact with the soil and helps prevent accelerated breakdown of the herbicide in the thatch layer.

Cultivation has not been generally recommended or performed *after* a pre-emergence herbicide application. Cultivation was believed to disrupt the herbicide barrier in the soil and stimulate weed emergence.

A recent study conducted in Georgia investigated the effect of core aeration prior to and after pre-emergence herbicides had been applied to common Bermudagrass. Coring at the time of application or up to four months after pre-emergence herbicide application did not decrease large crabgrass control for five pre-emergence herbicides that were evaluated.

In a related study, coring up to three months following an application of oxadiazon (Ronstar) to a Bermudagrass putting green did not affect goosegrass control. Data are not available for other weed species; however, it appears that core aeration does not influence the normal level of weed control of pre-emergence herbicides.

Vertical mowing

A study conducted in Michigan on annual bluegrass showed that a light vertical mowing did not decrease large crabgrass control for three different pre-emergence herbicides. The effects of vertical mowing on the efficacy of pre-emergence herbicides has not been investigated on Southern turfgrasses. Using vertical mowing to remove thatch may possibly affect the effectiveness of pre-emergence herbicides under Southern environmental conditions.

Established warm-season turfgrasses have excellent tolerance to labeled pre-emergence herbicides (see table 1). Newly-seeded and sprigged turfgrasses have a low level of tolerance and can be severely injured by most pre-emergence herbicides.

On immature turfgrasses, pre-

HERBICIDE DIRECTORY

COMMON AND TRADE NAMES OF WARM-SEASON TURFGRASS HERBICIDES.

Common Name	Company	Trade Name and Formulation[1]
DCPA	Fermenta	Dacthal 75W
dicamba	Sandoz PBI/Gordon	Banvel 4 lbs./gal. Dicamba 4, 4 lbs./gal.
DSMA	Interag, Vineland, Others	Numerous trade names and formulations are available.
ethofumesate	Nor-Am	Prograss 1.5EC
fenarimol	Elanco	Rubigan 50W, 1AS
glyphosate	Monsanto	Roundup 4 lbs./gal.
imazaquin	Lesco	Image 1.5 lbs./gal.
MCPA	PBI/Gordon	MCPA 4 lbs./gal.
MCPA + MCPP	Riverdale	Weedestroy Triamine II
+ dichlorprop MCPP	Royalgard Rhone-Poulenc PBI/Gordon Lesco	Sabre Turf Herbicide MCPP 2 lbs./gal. Mecomec 4 4 lbs./gal. Lescopex 2.5 lbs./gal.
MCPP + 2,4-D + dicamba	PBI/Gordon	Trimec Southern
metribuzin MSMA	Mobay Fermenta, Platte, Others	Sencor Turf 75W Numerous trade names and formulations are available.
napropamide	Lesco ICI	Devrinol 5-G Ornamental Devrinol 50WP, 5G
oryzalin	Elanco	Surflan 4AS
oxadiazon	Rhone-Poulenc	Ronstar 2G
pendimethalin	Lesco Scotts	PRE-M 60DG Southern Weedgrass Control 2.45G, Turf Weedgrass Control 1.71G, Weedgrass Control 60DG
pronamide	Rohm-Haas	Kerb 50W
sethoxydim	BASF	Poast 1.5 lbs./gal.
simazine	Ciba-Geigy	Princep 80W, 4L, 90DG, 4G

emergence herbicide applications should be delayed until the soil is completely covered.

Pre-emergence herbicides persist in the soil for two to four months, advantageous in terms of length of weed control. However, these herbicides may cause establishment problems if seeding, sprigging, or sodding is planned for a particular site.

The herbicide label should be consulted to determine the length of time needed before renovation operations can be safely conducted.

New pre-emergents

Three pre-emergence herbicides are in the final stages of development and evaluation by chemical companies and universities:

- Monsanto Company is investigating MON 15100 (Dimension) for annual grass and broadleaf weed control in both cool- and warm-season turfgrasses.
- Isoxaben (Gallery) is being evaluated by the Elanco Products Co. for wide spectrum broadleaf weed control and is expected to be on the market in 1989.
- Prodiamine (Sentinel) is a dinitroaniline herbicide being evaluated by the Sandoz Crop Protection Corp. for annual grass and broadleaf weed control in all major turfgrasses.

Post-emergents

Post-emergence herbicides are applied directly to the foliage of emerged weeds. In contrast to pre-emergence herbicides, this group of

See Guide on page 58

TABLE 2

WARM-SEASON TURFGRASS TOLERANCE TO POST-EMERGENCE HERBICIDES.

	TURFGRASSES				
Herbicides	**Bahia-grass**	**Bermuda-grass**	**Centipede-grass**	**St. Augustine-grass**	**Zoysia-grass**
(POSTEMERGENCE)					
asulam	NR-S	T[1]	NR-S	T	NR-I
atrazine	NR-I	T(D)	T(D)	T	I
bentazon	T	T	T	T	T
bromoxynil	T	T	T	T	T
2,4-D	T	T	S-I	S-I	T
2,4-D + dicamba	T	T	S-I	S-I	T
2,4-D + dichlorprop	T	T	S-I	S-I	T
2,4-D + mecoprop	T	T	S-I	S-I	T
2,4-D + mecoprop + dicamba	T	T	S-I	S-I	T
2,4-D + mecoprop + dichlorprop	T	T	I	I	T
dicamba	T	T	I-T	S-I	T
DSMA, MSMA	S	T	S	S	I
glyphosate[2]	NR-S	T(D)	NR-S	NR-S	NR-S
imazaquin	—	T	T	T	T
MCPA + MCPP + dichlorprop	T	T	I	I	T
MCPP + 2,4-D + dicamba	T	T	I	I	T
MCPP	T	T	S-I	S-I	T
metribuzin	NR-S	T	NR-S	NR-S	NR-S
pronamide	NR	T	NR	NR	NR
sethoxydim	NR-S	NR-S	T	NR-S	NR-I

[1] Asulam is labeled for use only on 'Tifway' (419) bermudagrass.
[2] Bermudagrass is tolerant to glyphosate when completely dormant.
T = Tolerant at labeled rates; I = Intermediate tolerance, use at reduced rates; S = Sensitive, do not use this herbicide; NR = Not registered for use on this turfgrass.

Control of annual grass

Crabgrass (large, smooth, Southern) and goosegrass are common summer annual weeds in warm-season turfgrasses. With the exception of atrazine, simazine and pronamide, spring applications of pre-emergence herbicides will provide good to excellent control of crabgrass (see table 3). Goosegrass tends to germinate later in the spring than crabgrass and is more difficult to control. Single applications of oxadiazon and bensulide + oxadiazon (goosegrass/crabgrass control) have provided high levels of goose-

See Grass on page 58

TABLE 3

ANNUAL GRASS CONTROL RATINGS FOR PRE-EMERGENCE HERBICIDES.

Herbicide	Crabgrass spp.	Goosegrass	Annual bluegrass
atrazine	P	P	E
benefin	E	F	E
benefin + oryzalin	E	F-G	E
benefin + trifluralin	E	F	E
bensulide	E	P	P
bensulide + oxadiazon	E	G	—
DCPA	E	F	G
napropamide	E	G	G
oryzalin	E	F-G	E
oxadiazon	G	E	G
pendimethalin	E	F-G	E
pronamide	F	P	E
simazine	F	P	E

E = Excellent, ≥ 90% control.
G = Good, 80 to 89% control.
F = Fair, 70 to 79% control.
P = Poor, < 70% control.

SOURCE: DR. MURPHY

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Control of problem weeds with post-emergents

Many problem weeds can be controlled with selected post-emergence herbicides. Bentazon (Basagran) will control **yellow nutsedge**, but won't kill **purple nutsedge**. Monthly applications of MSMA or DSMA in tolerant turfgrasses will suppress the growth of both nutsedge species. Imazaquin (Image) has provided good control of purple nutsedge in tests conducted in Mississippi and Georgia. In tolerant turfgrasses (Meyer zoysiagrass, Bermudagrass), the addition of MSMA to imazaquin increases purple nutsedge control.

Wild garlic can be controlled with winter applications of 2,4-D or two-way and three-way herbicide mixtures that contain 2,4-D or dicamba. Late fall applications of imazaquin may also be used.

Virginia buttonweed is an extremely difficult weed to control in warm-season turfgrasses. Research conducted in Mississippi showed that 2,4-D + dichlorprop (Weedone DPC) is more effective for Virginia buttonweed control than other two-way and three-way broadleaf herbicide mixtures.

Dallisgrass and **bahiagrass** can be controlled in tolerant turfgrasses with MSMA and DSMA. Usually two to three applications, each at an interval of 5 to 10 days, is needed to control these weeds. In centipedegrass, two applications of sethoxydim at an interval of 10 to 14 days suppresses bahiagrass but not dallisgrass growth. Asulam (Asulox) will provide fair control of bahiagrass in St. Augustinegrass.

—Tim Murphy □

herbicides has no or only minimal soil residual activity. Certain post-emergence herbicides may be used at low rates on newly-established warm-season turfgrasses.

A general rule is to delay the application until sprigs have rooted and are actively growing, or until the turfgrass has been mowed three to four times. Delaying the application allows time for the sprigs or seedlings to become established. It also improves their tolerance to post-emergence herbicides.

Post-emergence herbicides may be used at various times during the year. Applications to weeds that are actively growing and not under drought and/or temperature stress will result in better control. Target the application to coincide with air temperatures

Guide *from page 56*

grass control in experiments conducted in Georgia.

Split applications, each at an interval of 8 to 10 weeks, of benefin + oryzlin (XL), benefin + trifluralin (Team), oryzalin (Surflan), pendimethalin (various trade names) and napropamide (Devrinol) will also provide acceptable (>80%) control of goosegrass. With the exception of bensulide, the pre-emergence herbicides used in warm-season turfgrasses will control annual bluegrass.

—Tim Murphy □

HERBICIDE DIRECTORY

COMMON AND TRADE NAMES OF WARM-SEASON TURFGRASS HERBICIDES.

Common Name	Company	Trade Name and Formulation[1]
asulam	Rhone-Poulenc	Asulox 3.34 lbs./gal.
atrazine	Royalgard Ciba-Geigy	Purge 4 lbs./gal. Aatrex 4L, 90DG, 80W
benefin	Elanco Lesco	Balan 2.5G, 85DG 2.5 Benefin Granular (2.5G)
benefin + oryzalin	Elanco	XL 2G
benefin + trifluralin	Elanco	Team 2G
bensulide	ICI Royalgard PBI/Gordon Lesco	Betasan 2.9E, 4E, 3.6G, 7G, 12.5G Roysan 4E, 12.5G Betamec 4LF Lescosan 4E, 7G
bensulide + oxadiazon	Scotts	Goosegrass/Crabgrass Control 6.5G
bentazon	BASF	Basagran - 4lbs./gal.
bromoxynil	Rhone-Poulenc Lesco	Buctril 2 lbs./gal., Buctril 4EC, Brominal 2 lbs./gal., ME4 Brominal Brominal 2 lbs./gal.
2,4-D	Interag, Lesco, Fermenta Others	Numerous trade names and formulations are available
2,4-D + dicamba	Rhone-Poulenc Lesco PBI/Gordon	Weedone Super D Pro Amine Eight-One Selective Herbicide Phenaban 801
2,4-D + dichlorprop	Rhone-Poulenc	Weedone DPC Amine, Weedone DPC
2,4-D + mecoprop	Lesco Rhone Poulenc PBI/Gordon	Lescopar Turf Kleen Phenomec 2+1
2,4-D + mecoprop + dicamba	Lesco	Three-way
2,4-D + mecoprop + dichlorprop	Riverdale	Weedestroy Triamine

[1]Numeral refers to percent or pounds of active ingredient.

SOURCE: DR. MURPHY

Sorry, crabgrass. Sorry, goosegrass. You won't be checking in here this season. Not on turf areas treated with Team preemergence herbicide.

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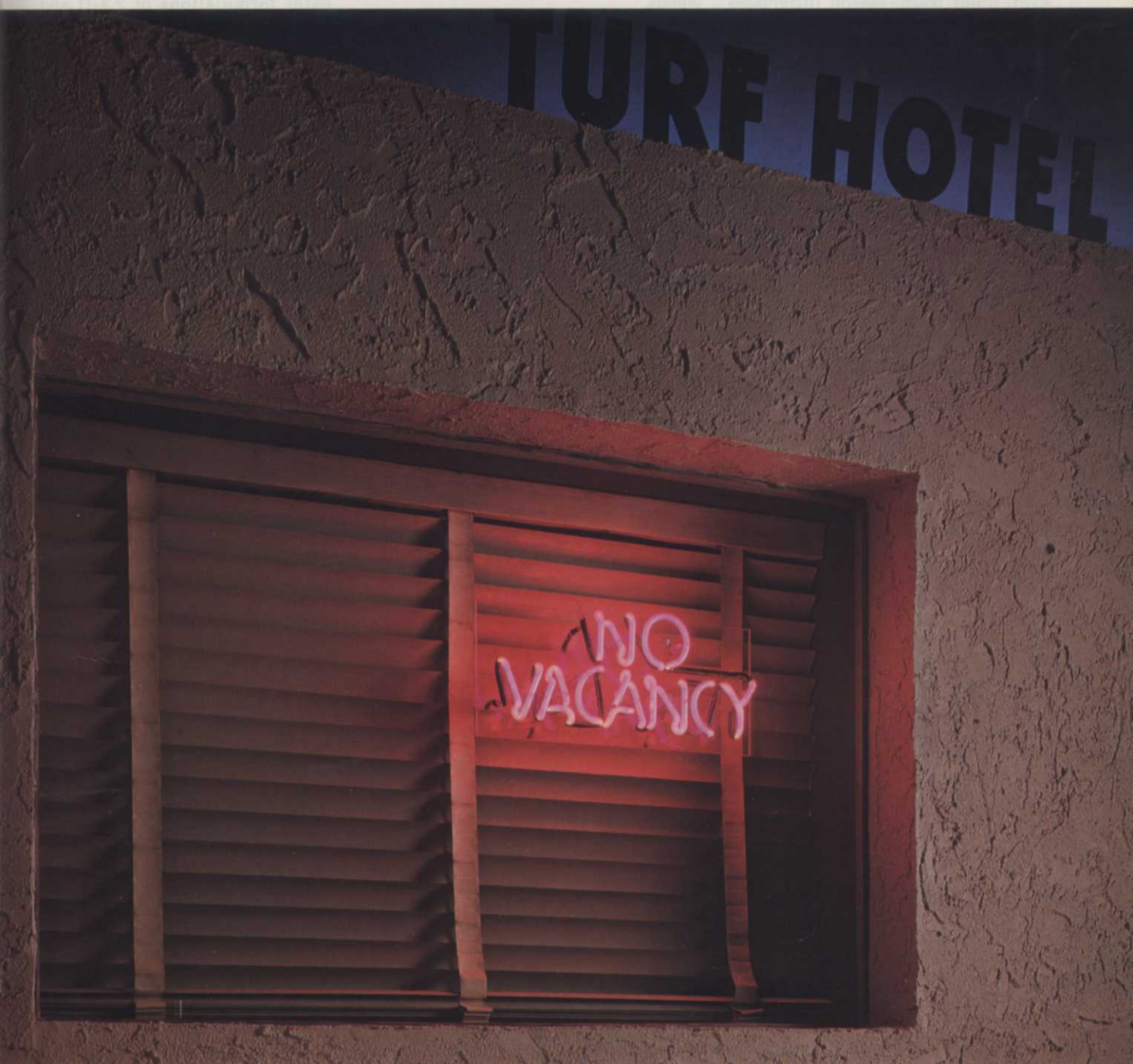

Since most pre-emergence herbicides are not effective against emerged weeds, applications must be made before weed seed germination.

of 60 to 90°F. Applications made below 60°F can result in poor herbicide activity. Temperatures greater than 90°F increase the chance of injury to the turfgrass.

In contrast to pre-emergence herbicides, warm-season turfgrasses differ markedly in their tolerance to post-emergence herbicides. For example, centipedegrass has excellent tolerance to sethoxydim (Poast); however, other warm-season turfgrasses can be severely injured by this herbicide. Also, cultivars within a turfgrass species may respond differently to the same herbicide.

More injury risk

Research conducted in Georgia showed that Meyer zoysiagrass had better tolerance to MSMA than Emerald and Matrella. The risk of injury from post-emergence herbicides is greater during the spring green-up process (transition from winter dormancy to active growth) than when the turfgrass is fully dormant or actively-growing (completely green).

Post-emergence herbicides need a 6- to 24-hour rain-free period after application for maximum absorption. Irrigation schedules should be coordinated with post-emergence herbicide applications to prevent inadvertent wash-off from treated weeds.

Mowing schedules also need to be coordinated with post-emergence herbicide applications. A general rule is to delay mowing three to four days before and after application. The delay prior to treatment increases the leaf surface area of the weed and improves spray coverage and leaf retention. The delay after treatment is needed to allow time for herbicide absorption and translocation processes to occur.

The majority of pre-emergence herbicides used in warm-season turfgrasses are extremely safe to apply near ornamentals. In fact, many pre-emergence herbicides such as oryzalin, benefin + oryzalin, DCPA (Dacthal), oxadiazon and others are labeled for use in landscape ornamentals. Refer to the label to determine if there are any precautions on the use of a herbicide near landscape ornamentals.

Post-emergence herbicides however, can readily injure ornamentals, either by foliage contact or by root absorption. Spray drift injury can be prevented by spraying on calm days at wind speeds less than 5 mph and by using a nozzle tip and spray pressure that produces large droplets.

Ester formulations of 2,4-D and other phenoxy herbicides can injure ornamentals by vapor drift. (Vapor drift is the gaseous movement of herbicide vapors from the site of application.)

Ester formulations usually provide slightly better weed control than amine formulations. However, due to the potential for vapor drift, ester formulations should not be used during the warm months when conditions are favorable for volatilization.

Avoid applying atrazine or herbicides that contain dicamba over the root zone of desirable ornamentals. Ornamentals can be injured by root uptake of these herbicides. Ornamental injury due to root uptake is most likely to occur on sandy soils when a heavy rainfall immediately follows a dicamba or atrazine application.

Proper storage important

Herbicides should be stored in their original containers with intact labels and in areas separate from insecticides and fungicides. Numerous incidents of turfgrass injury occur each year due to a non-labeled herbicide being mistakenly applied as an insecticide or fungicide.

Always keep records of all herbicide and other pesticide applications. The documents can be a valuable resource in the event complaints arise concerning the management practices used on a particular site.

Professional landscape managers probably have more herbicides labeled for use in turfgrasses than any other agricultural commodity. Cultural practices that promote vigorous turfgrass growth, and the timely use of pre-emergence and post-emergence herbicides should enable the landscape manager to grow a high quality, aesthetically appealing, weed-free turfgrass. **LM**