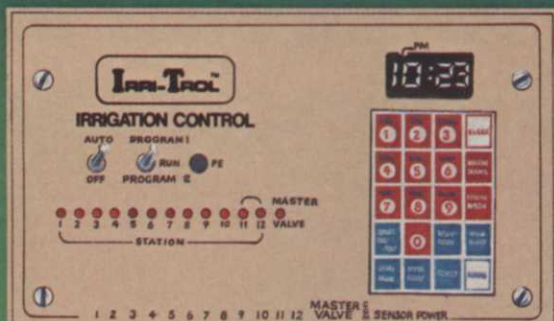


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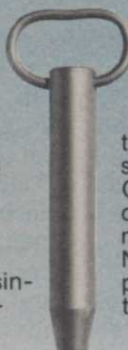
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tablished turf and, consequently, this application is also made directly to the turf. In the case of preemergence herbicidal applications either supplemental irrigation or natural rainfall are employed to wash the herbicide from the turf foliage and get it to the soil surface and into the soil. Rainfall and/or irrigation are detrimental to the effectiveness of a postemergence herbicide immediately following an application. An understanding of the factors influencing the efficiency of both preemergence and postemergence herbicides is certainly helpful in explaining results obtained and maximizing the control obtained with herbicides.

*Preemergence applications:* Application of a herbicide before weed seed germinate. Preemergence herbicides are not effective against perennial weeds or established annuals. To be effective, herbicides must be applied uniformly over the area. Their action is exerted only during or after germination as growth commences. Therefore, application to a dry soil severely reduces the effectiveness of preemergence herbicides unless moisture is added soon after treatment. Time of application must correspond to periods of germination. If annual bluegrass germinates starting September 1, an application of a preemergence herbicide such as DCPA, benefin, or bensulide on December 15 will be of little value. In contrast, if goosegrass germinates June 1, then a March 15 application will probably be ineffective. The residual level of the herbicide at this time would be too low to give control.

*Postemergence applications:* Application after weed seed have germinated or broken through the soil surface. The herbicide is applied to the foliage of the weed plant. Postemergence herbicides act as contact or as systemic (absorbed and translocated) herbicides. Contact herbicides act rapidly while translocated herbicides

usually require several days for their phytotoxic action to be observed. Translocated types usually kill the entire plant while contact types kill only the contacted part of the foliage.

Best results will usually be obtained with postemergence herbicides if plants are young, actively growing and the temperature is above 70 F. Foliar applied herbicides are less effective if soil is dry. Consult label for growth stage and environmental conditions for best results with a given herbicide.

Surfactants are frequently recommended for use with postemergence herbicides. For consistent results use nonionic agricultural surfactants, sold specifically for use with herbicides.

## **Selection of Herbicide and Formulation**

Two or more herbicidal products may be equally effective in a given weed situation. Also the same chemical may be available in a variety of commercial formulation trade names.

Your selection of herbicide and formulation will be determined by (1) the weed species involved, (2) the availability of the herbicide, (3) type of equipment at your disposal, (4) established residue tolerances, (5) hazards to humans, domestic animals, wildlife, and desirable plants, (6) relative total costs of materials and application, and (7) time of application.

All recommended rates of application are based on either active ingredient (most chemicals) or acid equivalent. Different commercial products vary in the percentage of active ingredient or acid equivalent. The label will give you the exact amount of weed-killing chemical present in the container. It is wise to figure the price of an available chemical on the basis of its active ingredient or acid equivalent. For example, Herbicide X can be obtained in liquid formulations varying from 6 pounds to less than 1 pound acid equivalent per gal-

lon. Usually, the more concentrated products are more economical on a per acre basis.

Granular formulations of many herbicides are also available. In comparison to sprays, granular herbicides offer both advantages and disadvantages. Some of the advantages are: simpler application - no water or mixing required, less drift, and a tendency toward longer activity in the soil. The problem of accurate calibration of granular equipment and the slightly higher per-acre cost of granular herbicides may offset these advantages. The range of concentration, particle size of product, and varying rates of application complicate calibration. More concentrated materials are usually more economical but errors in calibration are more critical. Calibration charts are supplied by manufacturers of granular applicators.

## **Control Strategy For Warm Season Turf**

Comments in this section will be restricted mainly to weed control in bermudagrasses. Zoysia, bermudagrass, centipedegrass and St. Augustine vary in their susceptibility to both preemergence and postemergence herbicides. However, it is possible in most cases to discuss bermudagrass and zoysiagrass as a group and include centipedegrass and St. Augustine in a second group. In general, herbicides that can be used on bermudagrass can be used safely on zoysiagrass. Centipede and St. Augustine are similar in their tolerance to herbicides.

### **Winter grass weeds**

Annual bluegrass is by far the most severe grassy weed infesting southern turf areas during the late growing season through the dormancy period and into the early growing season. It occurs in all turf environments. Aside from decreasing the aesthetic value of turf, the primary objection to annual bluegrass is its rapid die-back in

*continued on page 46*

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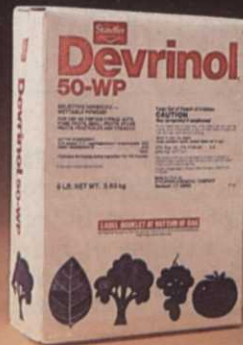
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# Turf

late spring. Bermudagrass coverage is usually slow following fade out of annual bluegrass leaving large sections of bare ground exposed. Other weeds, such as goosegrass, tend to move into bare areas.

Annual bluegrass control with preemergence herbicides is usually accomplished with either benefin, bensulide, DCPA, Pronamide, simazine, or terbutol. Two applications may be necessary during the dormant season for acceptable control except with Pronamide or simazine.

Pronamide has shown excellent potential for either preemergence or postemergence control of annual bluegrass in bermudagrass.

There are two choices for annual bluegrass control on bermudagrass greens overseeded with perennial

ryegrasses. Bensulide may be applied prior to overseeding. Ethofumesate may be applied 15-30 days after overseeding. Check both labels for timing to avoid delaying spring transition.

A third approach, employed particularly on many golf courses, is to use a postemergence application of a non-selective herbicide such as paraquat or cacodylic acid prior to breaking of dormancy. This usually does an excellent job on annual bluegrass as well as those annual broadleaved weeds present. Injury is often encountered if application is delayed until the bermudagrass starts breaking dormancy. The degree of injury is dependent on the amount of green foliage present at the time of application.

## Winter broadleaved weeds

Important broadleaf weed spe-

cies include: common chickweed, henbit, clovers, spurweed, mouse-ear chickweed, lawn burweed, common dandelion, wild onion, wild garlic, plaintains, and speedwells.

Preemergence control can be obtained with benefin, bensulide, DCPA, simazine and other herbicides. Henbit, chickweed, and clovers usually require something other than 2,4-D for postemergence control. In dormant bermudagrass and zoysiagrass, dicamba, or a combination containing dicamba are most used. The phenoxy herbicides are safe on completely dormant turfs. Actively growing turfs vary considerably in tolerance to phenoxy type materials. St. Augustinegrass will usually tolerate a .5 lb/A of 2,4-D with only

*continued on page 48*

## Summary of herbicide treatments on control of weeds in turfgrasses in Georgia. (B.J. Johnson)

Treatments		Weed species <sup>a</sup>								
Herbicide	Rate	Crab-grass	Goose-grass	Henbit	Common chick-weed	Spur-weed	Parsley-piert	Hop clover	Corn speedwell	Annual bluegrass
Atrazine	2.0			Po	Po	Po	Po	Po	Po	Po
Bensulide	10.0	P					P			P
Benefin	3.0	P		P	P				P	P
DCPA	10.0	P			P				P	
DSMA	3.0	Po								
Ethofumesate										P, Po <sup>c</sup>
Glyphosate <sup>b</sup>	0.5			Po	Po	Po	Po	Po	Po	Po
Metribuzin	0.5		Po	Po	Po	Po	Po	Po	Po	Po
Metribuzin + MSMA	0.12+									
	2.0	Po	Po							
MSMA	2.0	Po								
Oxadiazon	3.0	P					P	P	P	P
Paraquat <sup>b</sup>	0.5			Po	Po	Po	Po	Po	Po	Po
Pronamide	0.75				P				P, Po	P, Po
2,4-D <sup>d</sup>	1.0			Po	Po	Po	Po	Po	Po	
2,4-D+dicamba <sup>d</sup>	1.0+									
	0.5			Po	Po	Po	Po	Po	Po	
2,4-D+mecoprop + dicamba <sup>d</sup>	1.0+									
	0.5+									
	0.1			Po	Po	Po	Po	Po	Po	

<sup>a</sup>Weeds controlled from preemergence treatments are represented with P and those with postemergence treatments are represented with Po.

<sup>b</sup>Turfgrass must be completely dormant when paraquat and glyphosate are used. Paraquat has restricted use and applicator must be certified. Glyphosate does not have specific label for turf except for renovation.

<sup>c</sup>Safe to apply to bermudagrass overseeded with ryegrass.

<sup>d</sup>Repeated treatments at 2-week interval may be needed for effective control.

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minimal injury. At rates above .5 lb/A St. Augustinegrass is usually injured. This may seem unimportant when using phenoxy on dormant warm season turfs, but invariably application is made at various stages during spring transition. All turfgrasses are more susceptible to phenoxy injury during this transition period. The combination of mecoprop plus chlorfuralenol is often used, especially by the homeowners on St. Augustine.

### Summer grass and sedge weeds

Large crabgrass and dallisgrass invade more turf acreage in the Southern United States than any other grasses. Germinating seeds of both can be satisfactorily controlled with benefin, bensulide, DCPA, atrazine, and simazine. Certain formulations of atrazine and simazine are labeled for use on St. Augustinegrass, zoysiagrass, and centipedegrass for sod production while other commercial products containing atrazine and simazine are labeled for homeowner use.

Postemergence control of these two weeds in St. Augustinegrass and centipedegrass can be accomplished only with asulam (Asulox®). In bermudagrass and zoysiagrass, MSMA (monosodium methanearsonate) and DSMA (disodium methanearsonate) are effective. In fact, dallisgrass control is accomplished almost exclusively in bermudagrass and zoysiagrass with the arsonates.

In terms of difficulty of control, goosegrass is the number one summer grass problem in the Southern United States. Timing of application of preemergence herbicides (DCPA, benefin, bensulide or oxadiazon) is of paramount importance if control is to be achieved. We generally think goosegrass starts germinating in significant quantities 4 to 6 weeks after crabgrass. However, this can and does vary. If application of a preemergence herbicide is delayed, this means that large crabgrass will escape because it germinates

earlier than goosegrass. In bermudagrass and zoysiagrass, large crabgrass can be controlled quite effectively with post applications of the arsonate herbicides. The use of preemergence herbicides would appear to be a better approach to goosegrass control than postemergence control with arsonates.

Oxadiazon (Ronstar®) gives excellent control of goosegrass, however, cost may be a limitation. Research has shown that MSMA + metribuzen (Sencor) will postemergently give good control of goosegrass.

Other grass weed problems in southern turfs include sandbur,

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### Preemergence herbicides

for goosegrass control should be applied four to six weeks after application for crabgrass control.

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bahiagrass, crowfootgrass, torpedograss, and others. Sandbur and bahiagrass can be controlled with arsenicals. No means of selective control of torpedograss in any southern turf species has been developed at the present time.

Both annual and perennial sedges are problems in the Southern United States. Purple nutsedge and to a lesser extent, yellow nutsedge are the most severe problems. Multiple applications of arsenicals or an arsenical plus a phenoxy are generally recommended at the present time for purple nutsedge. Successful control is dependent on repeated applications at appropriate intervals. This is the only method commonly used for selective control in southern turf and can be used only on bermudagrass and zoysiagrass. Basagran® can be used if yellow nutsedge is a problem.

### Summer broadleaf weeds

Broadleaved weeds are a prob-

lem through the Southern United States in turf. However, no single species would appear to reach the level of infestation over large areas equivalent to that observed with large crabgrass, dallisgrass or goosegrass. Among the more important broadleaved weeds are prostrate spurge and Virginia buttonweed. As a group these are rather difficult to control. Multiple applications of 2,4-D + dicamba, Trimec® or Trex-San® are almost always necessary. Researchers generally observe that the use of a good agricultural grade nonionic surfactant is warranted.

### Control Strategy For Cool Season Turf

The primary preemergence herbicides for grassy and broadleaf weeds in cool season turf are benefin (Balan), bensulide (Betasan, Betamec-4, Pre-San), DCPA (Dacthal), oxadiazon (Ronstar), and siduron (Tupersan).

Siduron is the only preemergence herbicide that can be applied near time of seeding. Bensulide and DCPA can be applied in the spring following a fall seeding.

Benefin and oxadiazon should be applied to established turf. Bensulide can affect rooting of existing bermudagrass and caution is advised for use of most preemergence herbicides on bermudagrass greens. Thinning of fine fescue stands has been reported.

Preemergence herbicides should be watered in to get the chemical to the seed prior to germination and should remain effective for two or more weeks. Timing the application is critical. Contact local extension personnel for recommended dates for application.

The primary postemergence herbicides for grassy weeds in turf are the arsonates; CMA, DSMA, MAMA, and MSMA. Treated areas should not be reseeded soon after application. See labels for delay period. Bentgrass and fescue are more sensitive to arsonates

*continued on page 50*





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# Turf

than other cool season grasses. CMA is the safest for bentgrass.

Weed foliage should be sprayed while still young (2 to 3 leaf stage) if possible. The effectiveness of arsonates improves with temperature and rates may need to be increased for temperatures below 80 degrees F.

The primary postemergence herbicides for broadleaf weeds are 2,4-D, dicamba (Banvel), and MCPP. These herbicides should not be applied until a new lawn has had at least three mowings. The target weeds should be actively growing for best results. The temperature should be at least 60 degrees F. Applications during extreme heat or drought can cause severe damage to desirable turf.

Again timing information can be obtained from your local extension service. Two treatments are generally necessary. See label for the right amount of time between applications. Winter annuals can be sprayed early in the year, followed by summer annuals and perennials. Fall treatment for perennials is possible.

Postemergence herbicides are often combined to achieve improved control and reduce application time.

Occasionally, a landscape manager chooses to fumigate a seedbed prior to planting to reduce weed seed, control insects and fungi, and eliminate any off-type grasses. Methyl bromide (Dowfume), metham (Vapam), dazomet (Mylone) and Vorlex are used for preplant fumigation. See the labels for the recommended time of delay before seeding.

Turf renovation of existing stands is becoming common. Glyphosate (Roundup, Kleenup) has been very useful in killing actively growing weeds and grasses prior to reseeding. Amitrole, cacodylic acid (Phytar) and dalapon are also used for renovation. Glyphosate and cacodylic acid are deactivated within a few days of application.

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