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TURFGRASS SCIENCE

at the University of Tennessee

Herbicides for Use on Golf Course Putting Greens

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Introduction

The two most common turfgrass species used on golf course putting greens in Tennessee are creeping bentgrass (*Agrostis stolonifera*) and hybrid bermudagrass (*C. dactylon* x *C. transvaalensis*). When managed appropriately, both species provide high-quality playing surfaces. However, turfgrasses managed for putting green use are subjected to a considerable amount of stress. These grasses are often mowed daily at heights less than 0.15 in. and are subjected to heavy traffic from both golfers and maintenance equipment.

Broadleaf and grassy weeds can invade putting greens lacking density and vigor. Herbicidal control of weeds on golf course putting greens can be difficult. Few herbicides are labeled for use on putting greens, because the stress of putting green management programs renders creeping bentgrass and hybrid bermudagrasses more susceptible to herbicide injury that can compromise both aesthetic and functional turf quality. In many instances, herbicides that can be used have labels that neither allow nor restrict applications to putting greens, which places all liability on end-users. This publication is designed to provide end-users with a list of herbicide options for controlling weeds in creeping bentgrass and hybrid bermudagrass putting greens.

Controlling grassy weeds

Crabgrass (*Digitaria* spp.), goosegrass (*Eleusine indica*) and annual bluegrass (*Poa annua*) are three of the most common annual grassy weeds of creeping bentgrass and hybrid bermudagrass putting greens (Figures 1-3).



Figure 1. Smooth crabgrass



Figure 2. Goosegrass infesting a hybrid bermudagrass putting green



Figure 3. Annual bluegrass infesting a creeping bentgrass putting green

Summer annual species such as crabgrass and goosegrass germinate in spring and seedlings mature throughout the summer. Preemergence control of these weed species is the easiest means of control. A full list of preemergence herbicides labeled for use on creeping bentgrass and hybrid bermudagrass greens is presented in Table 1. Be sure to apply preemergence herbicides after aerification, as the process of coring the putting surface can reduce the efficacy of these materials. For more information on preemergence control of crabgrass and goosegrass, see UT Extension publications *W146, Crabgrass Control in Turfgrass* and *W170, Goosegrass*. Currently, there are no herbicides labeled for selective postemergence control of crabgrass or goosegrass on creeping bentgrass putting greens (Table 1). On hybrid bermudagrass putting greens, diclofop (e.g., Illoxan) and foramsulfuron (e.g., Revolver) can be used for postemergence goosegrass control. There are no effective options for postemergence crabgrass control on hybrid bermudagrass greens, as herbicides such as trifloxysulfuron (e.g., Monument) only exhibit marginal activity against crabgrass species prevalent in Tennessee.

Seeds of annual bluegrass (*Poa annua*), a winter annual grassy weed, germinate in late summer in Tennessee. Preemergence control of annual bluegrass can be erratic due to this weed's ability to germinate from seed in a wide range of environments. Postemergence control is also difficult. This is due to not only a limited number of labeled herbicides, but also the possibility of multiple annual bluegrass biotypes persisting in putting greens, including both an annual- (*Poa annua* cv. *annua*) and perennial-type (*Poa annua* cv. *reptans*). There are currently no herbicides labeled for selective, postemergence annual bluegrass control in creeping bentgrass putting green turf. However, sequential applications of plant growth regulators such

as paclobutrazol (e.g., Trimmit) and flurprimidol (e.g., Cutless) have been shown to reduce annual bluegrass populations in creeping bentgrass putting greens. On hybrid bermudagrass greens, trifloxysulfuron can be used for postemergence annual bluegrass control, along with foramsulfuron, pronamide (Kerb) and rimsulfuron (e.g. TranXit).

Controlling broadleaf weeds

Several species of broadleaf weeds can invade golf course putting greens, including Virginia buttonweed (*Diodia virginiana*), mouse-ear chickweed (*Cerastium vulgatum*) and dollarweed (*Hydrocotyle* spp.) (Figures 4-5). While no preemergence herbicides are available for use on either creeping bentgrass or hybrid bermudagrass putting greens to control broadleaf weeds, several postemergence herbicides are safe for use on both species (Table 2). Labels for most of the herbicides listed in Table 2 neither allow nor restrict applications to hybrid bermudagrass greens, leaving liability on the end-user in the event that undesirable turfgrass injury occurs after application.



Figure 4. Virginia buttonweed



Figure 5. Mouse-ear chickweed



Figure 6. Yellow nutsedge



Figure 7. *Kyllinga* infesting a hybrid bermudagrass putting green

Mixtures of synthetic auxin herbicides can be used at reduced rates to control broadleaf weeds on putting greens. For example, 2,4-D + MCPP + dicamba (e.g., Trimec Classic) can be applied to creeping bentgrass putting greens at 0.62 lb ai/A (i.e., 1.0 fl oz of formulated product per 1500 square feet). The label does caution against applications when creeping bentgrass putting green turf is under heat or drought stress, and highlights that injury after application will be short-lived. A different formulation (e.g., Trimec Bentgrass Formula) is labeled for use on creeping bentgrass greens at rates less than or equal to 0.44 lb ai/A (i.e., 1 fl oz. of formulated product per 1000 square feet). This product contains a lower concentration of 2,4-D than Trimec Classic.

Carfentrazone (e.g., Quicksilver T/O) is a postemergence broadleaf weed control herbicide labeled for use on creeping bentgrass and hybrid bermudagrass putting greens. Rates for range from 0.016 to 0.031 lb ai/A; however, the product can be used at 0.098 lb ai/A for managing silvery thread moss (*Bryum argenteum*). Research at the University of Tennessee indicates that

applications of Quicksilver combined with appropriate cultural practices (e.g., increased nitrogen fertility and sand topdressing) control silvery thread moss better than simply spraying the herbicide by itself.

Controlling sedge & kyllinga species

Sedge (*Cyperus* spp.) and kyllinga (*Kyllinga* spp.) species can invade both creeping bentgrass and hybrid bermudagrass putting greens (Figures 6-7). These species prefer soils that remain moist for extended periods of time. Thus, their presence in putting green turf may indicate that drainage has been compromised or irrigation practices should be adjusted. *Kyllinga* species tend to be more tolerant of low putting green mowing heights and greater mowing frequencies than sedges; therefore, *kyllinga* infestations tend to be more prevalent. There are no herbicides labeled for selective control of either weed species on creeping bentgrass putting greens. On hybrid bermudagrass putting greens, applications of trifloxysulfuron will provide *kyllinga* suppression (Table 2).

Final thoughts

Due to a lack of labeled herbicides, implementation of proper cultural practices is essential to managing weeds on putting green turf. Following recommended fertility, irrigation, mowing and soil management programs will help prevent weed encroachment. When herbicide applications are needed for either broadleaf or grassy weed control be aware that turfgrass injury can occur after application. Make sure that spraying equipment is accurately calibrated prior to treatment and that the necessary steps are taken to ensure that each herbicide (or herbicide combination) is applied precisely according to label instructions.

Always refer to the product label for specific information on proper use, tank-mixing compatibility and turfgrass tolerance. Mention of trade names or commercial products in this publication is solely for the purpose of providing specific information and does not imply recommendation or endorsement by the University of Tennessee Institute of Agriculture. For more information on turfgrass weed control, visit the University of Tennessee's turfgrass weed science website at www.tennesseeturfgrassweeds.org

Table 1. Herbicides labeled for control of annual grasses on creeping bentgrass and bermudagrass putting greens

Preemergence Herbicides	Trade Name*	Rate (ai/acre)	Comments	Creeping Bentgrass Greens Use	Bermuda-grass Greens Use
bensulide	Bensumec, Betasan, Pre-San 7G or 12G, Weedgrass Preventer 8.5 G	7.6 to 12.5 lb	<ul style="list-style-type: none"> • Option for crabgrass, goosegrass and annual bluegrass control. • Don't make more than 2 applications per year • Don't exceed 25 lb ai/A in a single year 	Y	N
bensulide + oxadiazon	Anderson's Goosegrass/ Crabgrass Control	See Labels	<ul style="list-style-type: none"> • Provides preemergence control if crabgrass and goosegrass 	Y	Y
dithiopyr	Dimension 2EW, others	See Labels	<ul style="list-style-type: none"> • Products sold by Dow AgroSciences restrict use on both creeping bentgrass and bermudagrass putting greens due to the potential for turfgrass injury • Formulations sold by other companies are labeled for use on creeping bentgrass and bermudagrass putting greens. • Andersons Golf Products has combination products labeled for putting green use with 0.164% Dimension • Use on Tifgreen (Tifton 328) hybrid bermudagrass may result in injury 	Y	Y
fenarimol	Rubigan	1.36 to 2.04 lb	<ul style="list-style-type: none"> • A fungicide that exhibits efficacy for preemergence control of annual bluegrass • Two to three applications will be required to deliver at total of 4.08 lb ai/A 	N	Y
pendimethalin	Pendulum AquaCap	1.5 to 3 lb	<ul style="list-style-type: none"> • Provides preemergence control of annual grasses Label neither allows nor restricts applications to bermudagrass greens 	N	Y
pronamide	Kerb	1 to 1.5 lb	<ul style="list-style-type: none"> • Provides preemergence and postemergence control of annual bluegrass and annual broadleaf weeds • Label neither allows nor restricts applications to bermudagrass greens 	N	Y
siduron	Tupersan	8 to 12 lb	<ul style="list-style-type: none"> • Used for preemergence crabgrass control • Will suppress bermudagrass encroachment 	Y	N
Postemergence Herbicides					
diclofop	Illoxan	0.75 to 1.0 lb	<ul style="list-style-type: none"> • Restricted-use pesticide • Used for postemergence goosegrass control only 	N	Y

foramsulfuron	Revolver	0.006 to 0.052 lb	<ul style="list-style-type: none"> Used to remove overseeded cool-season grasses on bermudagrass greens but will also control certain broadleaf weeds Exhibits activity against annual bluegrass 	N	Y
rimsulfuron	TranXit	0.125 to 0.5 oz	<ul style="list-style-type: none"> Used to remove overseeded cool-season grasses on bermudagrass greens but will also control certain broadleaf weeds Exhibits activity against annual bluegrass 	N	Y
trifloxysulfuron	Monument	0.016 to 0.025 lb	<ul style="list-style-type: none"> Label neither allows nor restricts applications to bermudagrass greens Used for postemergence control of annual bluegrass and sedge/kyllinga species 	N	Y

*The same active ingredient may be available under several different trade names from various manufacturers

Table 2. Herbicides labeled for control of broadleaf weeds on creeping bentgrass and bermudagrass putting greens

Postemergence Herbicides	Trade Name*	Rate (ai/acre)	Comments	Creeping Bentgrass Greens Use	Bermudagrass Greens Use
2,4-D + MCPP + dicamba	Trimec Classic	0.68 to 1.37 lb (hybrid bermudagrass only)	<ul style="list-style-type: none"> Do not exceed 0.62 lb ai/A on creeping bentgrass greens using 145 gallon per acre spray volume. May cause temporary injury Label neither allows nor restricts applications to bermudagrass greens 	Y	Y
carfentrazone	Quicksilver T/O	0.016 to 0.031 lb	<ul style="list-style-type: none"> Effective control of certain broadleaf weeds and silvery thread moss Adjust rate to 0.098 lb ai/A to control silvery thread moss 	Y	Y
carfentrazone + MCPP + MCPA + dicamba	PowerZone	0.81 to 2.18 lb	<ul style="list-style-type: none"> Label neither allows nor restricts applications to bermudagrass greens 	N	Y
carfentrazone + 2,4-D + MCPP + dicamba	SpeedZone	0.55 to 1.39 lb	<ul style="list-style-type: none"> Label neither allows nor restricts applications to bermudagrass greens 	N	Y
dicamba	Banvel	0.25 to 0.5 lb	<ul style="list-style-type: none"> Label neither allows nor restricts use on creeping bentgrass or bermudagrass greens May cause injury to creeping bentgrass at rates greater than 0.5 lb ai/A 	Y	Y
foramsulfuron	Revolver	0.006 to 0.052 lb	<ul style="list-style-type: none"> Used to remove overseeded cool-season grasses on bermudagrass greens but will also control annual bluegrass and certain broadleaf weeds 	N	Y

Table 2. Herbicides labeled for control of broadleaf weeds on creeping bentgrass and bermudagrass putting greens (continued)

Postemergence Herbicides	Trade Name*	Rate (ai/acre)	Comments	Creeping Bentgrass Greens Use	Bermudagrass Greens Use
MCPP	Mecomec 2.5 and 4SL, MCPP-p 4 Amine	See labels	<ul style="list-style-type: none"> Do not apply when temperatures exceed 90 F 	Y	N
MCPP + 2,4-D + dicamba	Trimec Bentgrass Formula	0.45 lb	<ul style="list-style-type: none"> Contains less 2,4-D (6.2%) compared to Trimec Classic (25%) Do not exceed 0.45 lb ai on creeping bentgrass putting greens May cause temporary injury 	Y	N
rimsulfuron	TranXit	0.125 to 0.5 oz	<ul style="list-style-type: none"> Used to remove overseeded cool-season grasses on bermudagrass greens but will also control certain broadleaf species 	N	Y
sulfentrazone + 2,4-D + MCPP + dicamba	Surge	0.75 to 1.09 lb	<ul style="list-style-type: none"> Label neither allows nor restricts applications to bermudagrass greens 	N	Y
trifloxysulfuron	Monument	0.016 to 0.025 lb	<ul style="list-style-type: none"> Label neither allows nor restricts applications to bermudagrass greens Used for postemergence control of annual bluegrass and sedge/kyllinga species Will control certain broadleaf species 	N	Y

*The same active ingredient may be available under several different trade names from various manufacturers