Herbicides control annual winter weeds in bermudagrass turf

B. J. Johnson[1]

Weeds are commonly found in bermudagrass turf during the winter and early spring throughout the Southeastern United States whether this turf is used for lawns, parks, athletic fields or golf courses. Mild winter temperatures favor rapid growth of these annuals. When bermudagrass goes dormant in the fall after the first killing frost, it does not compete with germinating winter weeds. Bermudagrass overseeded with a cool-season grass will offer some competition with the weeds and a good quality turf not overseeded will usually have less weeds than a lower quality, poor stand of turf. However, in most instances winter weeds will continue to be a major problem in all turfgrasses and detract from the appearance of the area (Fig. 1).

Herbicide treatments

Herbicides can be applied for preemergence or post-emergence control of many winter annuals. It is important to identify the weed species before selecting a herbicide for use. This is necessary since most of the chemicals will not control all of the different week species (Table 1). Controlling weeds in bermudagrass overseeded with cool-season grasses must be treated differently than non-overseeded turf. The results reported herein are for bermudagrasses not overseeded during the fall, winter or early spring.

Figure 1. *Winter weeds not controlled distract from the surrounding beauty.*

Preemergence control

Dates of preemergence herbicide treatments are important in obtaining optimum control of winter annuals. In the Piedmont region of Georgia, herbicides applied in July or August failed to control weeds as effectively as when treatments were delayed until September or October. The high temperatures during July and August reduced herbicidal effectiveness. Treatment should be earlier when herbicides are applied in Northern areas, but should be later in Southern areas. Regardless of location, most preemergence treatments must be applied prior to germination and emergence of weeds. Pronamide is an exception since the chemical possesses both preemergence and postemergence activity on weeds. Cooler than normal temperatures in late summer or early fall could also make an earlier treatment date necessary.

Pronamide. Fall application of pronamide controlled annual bluegrass (*Poa annua*), corn speedwell (*Veronica arvensis*), and common chickweed (*Stellaria media*), but did not control henbit (*Lamium amplexicaule*), spur weed (*Soliva spp.*), parsley-piert (*Alchemilla microcarpa*), or hop clover (*Trifolium agrarium*). Date of treatment would not be as critical for pronamide as it would for most other preemergence treatments since it possesses both preemergence and postemergence activity on the weeds. Pronamide should not be applied to any cool-season grass because of severe turf injury. Pronamide is very water soluble and the chemical will move in rain water from treated into untreated area. Therefore, caution should be taken to prevent treatment in areas where washing could occur.

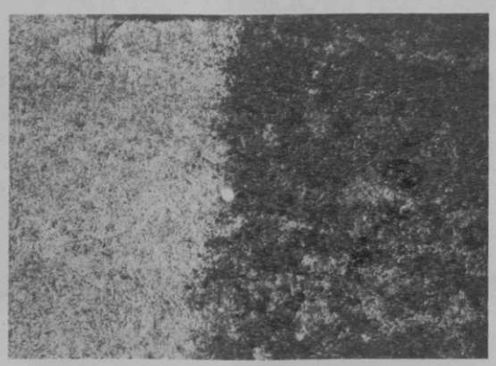

Figure 2. *Henbit and common chickweed control in left plot treated September 29, 1975 with benefin compared with no control in right, untreated plot. Picture made March 22, 1976.*

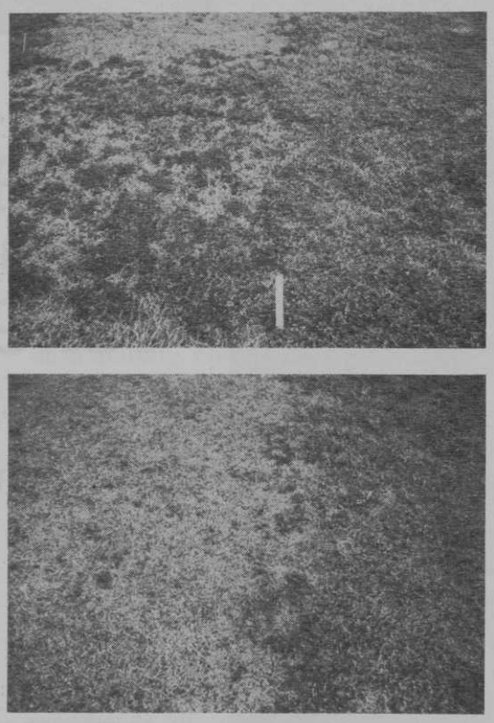

Figure 3. *Comparison of corn speedwell and common chickweed control with one and two applications of 2,4-D at 1.0 pound per acre. Upper: Plot on left treated once compared with untreated plot on right. Lower: Plot on left treated twice compared with untreated plot on right. Treatments were applied February 26 and March 12, 1973. Pictures were made March 26, 1973.*

[1] *Professor of Agronomy, University of Georgia, Georgia Station, Experiment, Georgia 30212. Supported by State, Hatch and other funds allocated to the Georgia Agricultural Experiment Station.*

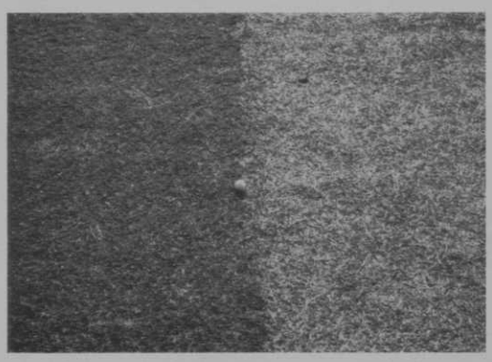

Figure 4. *Glyphosate controlled all winter annuals in dormant bermudagrass turf in the right plot when compared with untreated plot on the left.*

Benefin. Preemergence treatment of benefin controlled henbit, corn speedwell, common chickweed, and annual bluegrass effectively, but the chemical was not active on spur weed, parsley-piert, and hop clover. Fall treatments must be applied before weed seed germinate for effective control.

Bensulide. Bensulide controlled parsley-piert and annual bluegrass, but did not control any of the other weeds satisfactorily. Parsley-piert control was higher from bensulide treatment than from any of the other preemergence treatments as shown in Table 1.

DCPA. Preemergence treatment of DCPA controlled common chickweed and corn speedwell but did not control any of the other weeds. In some instances DCPA controlled annual bluegrass, but the control was not consistent.

Oxadiazon. Preemergence treatments of oxadiazon controlled four of seven weeds effectively. The weeds controlled were parsley-piert, hop clover, corn speedwell and annual bluegrass.

These results show the importance of knowing weed species before selecting a herbicide for use. With the exception of simazine, none of the herbicides controlled all weeds included in the test area. Oxadiazon and benefin controlled four of seven weed species, but each did not control all of the same weeds. Oxadiazon controlled parsley-piert, hop clover, corn speedwell, and annual bluegrass while benefin controlled henbit, common chickweed, corn speedwell, and annual bluegrass. Pronamide controlled three different species (common chickweed, corn speedwell, and annual bluegrass) while two species were controlled with bensulide (parsley-piert and annual bluegrass) and DCPA (common chickweed and corn speedwell).

When the same treatments were applied for two consecutive years, corn speedwell population increased up to 64 percent in bensulide-treated plots. Spur weed population increased from 2 percent in untreated plots up to 18 and 22 percent in DCPA and benefin treated plots, respectively during the same period. Oxadiazon controlled all major weeds in the area, but wild parsnip *(Pastinaca saliva)*, sandwart *a)arenaria serpyllifolia)* and common chickweed appeared in the treated plots. This indicates that when preemergence treatments are used for weed control, it may be necessary to apply different chemicals each year to obtain effective weed control and prevent a major shift in weed population.

Postemergence treatments

When herbicides are applied for postemergence control of winter annuals, it is usually necessary to apply repeated treatments for effective and complete control. For example, the effectiveness of control from a second 2,4-D treatment compared to a single treatment is clearly shown in Fig. 3.

2,4-D type. In most instances a higher percentage of winter broadleaf weeds was controlled when 2,4-D was applied in combination with dicamba or mecoprop + dicamba than from 2,4-D alone. 2,4-D applied alone controlled common chickweed and corn speedwell, but did not control parsley-piert or henbit. When dicamba or mecoprop + dicamba were applied with 2,4-D, the number of additional weed species was increased to include parsley-piert, henbit and corn speedwell. With exception of common chickweek, it was necessary to apply a second application of the combination treatments to obtain optimum control of all of these weeds.

The 2,4-D + dicamba and 2,4-D + mecoprop + dicamba combination treatments controlled a higher percentage of corn speedwell when treatments were applied in January or February than when compared in March. The control was also higher when second application was applied

Table 1. Weeds controlled in turfgrasses with herbicides.

	Winter weeds						
Herbicides	Henbit	Common chickweed	Spur weed	Parsley-piert	Hop clover	Corn speedwell	Annual bluegrass
	weed control[2]						
Preemergence chemicals							
Bensulide	P	P	P	E	P	P	G
Benefin	E	E	P	P	P	E	E
DCPA	P	G	P	P	P	E	P
Oxadiazon	P	P	P	G	G	E	E
Pronamide	P	E	P	P	P	E	E
Postemergence chemicals							
Atrazine	E	E	E	E	E	E*	E
Glyphosate[1]	E	E*	E*	E	E*	E*	E*
Metribuzin	E*	E*	E*	E*	E*	E*	E*
Paraquat[1]	E	E*	E	E	E*	E	E*
Pronamide	P	-	P	P	P	E*	E*
2,4-D	P	E	-	P	E	G	P
2,4-D+dicamba	E	E*	E	E	E	G	P
2,4-D+mecoprop +dicamba	E	E*	E	F	E	F	P

1/ Turfgrass must be completely dormant when glyphosate and paraquat are used.

2/ Weed control ratings were based on E=90 to 100, G=80 to 89, F=70 to 79, and P=below 70. Asterisk indicates the control was obtained with a single postemergence application and no asterisk indicates the control was obtained with two applications.

at a 2-week interval instead of four weeks. For henbit, the highest control from 2,4-D combination treatments occurred from February and March treatments when the second application was made at 4-week intervals. The control of parsley-piert, spur weed, and common chickweek was not affected by time of treatment nor interval between first and second applications. These results show that 2,4-D combination treatments were influenced by dates of treatment and interval between treatments for specific weeds. Therefore, it will be necessary to determine the optimum dates of postemergence treatments for the major weeds to be controlled within a given area.

Metribuzin. Metribuzin applied as postemergence treatment controlled all winter annuals completely throughout the two-year period in our studies. The control was similar from a single 0.5 lb. ai/A (active ingredient per acre) rate or from 0.25 lb. ai/A applied in each of two applications at 2-week intervals. Inconsistent control may occur when metribuzin is applied as a single treatment at the lower rate. Since metribuzin is very water soluble, caution should be taken when it is used around cool-season grasses. If rain water from the treated area moves across cool-season grasses (bermudagrass greens overseeded with cool-season grasses or bentgrass greens), severe injuries to the cool-season grasses will occur.

Metribuzin applied to dormant bermudagrass turf will not delay turf green-up or early growth in the spring. However, when applied to semidormant turf in early spring, common bermudagrass was moderately injured while Tifway was injured only slightly. The initial injury was temporary and turf fully recovered within 4 to 5 weeks after the initial treatments. To avoid any injury, metribuzin should be applied while bermudagrass turf is completely dormant.

Pronamide. Pronamide has both preemergence and postemergence activity. Therefore, it has an advantage over several other herbicides in that it can be used for weed control in both fall and spring. Postemergence treatments of pronamide controlled annual bluegrass and corn speedwell effectively, but not any of the other broadleaf annuals. Additional broadleaf weeds were controlled from combinations of pronamide with 2,4-D type treatments. Spur weeds were controlled completely from combinations of pronamide + 2,4-D with either dicamba or mecoprop + dicamba, while parsley-piert control was fair from pronamide + 2,4-D + dicamba. It should be noted that when pronamide was applied in combination with these broadleaf type herbicides, annual bluegrass control was not acceptable. This indicates that care should be taken when different chemicals are mixed together and applied as a single treatment. When chemicals are mixed the first time, they should be applied only to small test areas to determine their effectiveness in each area.

Glyphosate-paraquat. When either glyphosate or paraquat is used for postemergence weed control, the turfgrass must be completely dormant to prevent injury to the turf. Both herbicides controlled all seven different weed species included in these experiments. However, it was necessary to repeat glyphosate treatment when applied at 0.25 lb. ai/A rate to control henbit completely and paraquat when applied at 0.5 lb. ai/A rate for similar henbit and parsley-piert control. Either herbicide will control a broad spectrum of weeds in bermudagrass turf as shown by glyphosate treatment in Fig. 4.

In most instances there is little advantage in applying combinations of paraquat and 2,4-D-type chemicals as a single treatment for broadleaf weed control. An exception occurred for spur weed since paraquat applied with either 2,4-D + dicamba or 2,4-D + mecoprop + dicamba controlled a higher percentage of the weeds than did single treatments of either chemical applied alone. However, a second application of paraquat applied alone at 2-week intervals should result in similar control. Therefore a choice could be made between the use of a combination of chemicals applied in a single application, and the use of paraquat applied alone in two split applications.

Glyphosate applied at 2.0 lb. ai/A or higher will control bermudagrass when it is applied to actively growing turf. Since glyphosate at 0.25 to 0.5 lb. ai/A is used for control of winter weeds, we wanted to know the effects of these low treatment rates on tolerance of bermudagrass not completely dormant. This information is needed since turfgrass may turn slightly green during warm periods in winter and early spring before the last killing frost. Our studies revealed that glyphosate applied at low rates will injure semi-dormant bermudagrass just as severely as actively growing

Figure 5. *Turf in the right plot treated with herbicides for winter weed control resulted in excellent turf in early Spring when compared with poor turf in left, untreated plot. Picture was made May 16, 1972.*

Figure 6. *Improper application of herbicide results in poor quality turf.*

turf. However, the turf usually recovered within 6 to 8 weeks after treatment with the 0.25 lb. ai/A rate. Since turf quality during the recovery period would not be acceptable to most turf managers, the turf must be dormant at time of treatment to prevent any injury. Paraquat will also injure semi-dormant bermudagrass turf, but it will recover more rapidly than when treated with glyphosate.

Atrazine. Atrazine completely controlled all winter annuals evaluated in our experiments. The control was effective in some instances from a single 1.0 lb. ai/A rate, but for consistent control it was necessary to apply either as a single 2.0 lb. ai/A rate or 1.0 lb. ai/A in each of two applications. Similar results were obtained whether it was applied during mid winter when temperatures were colder and weeds were smaller or treatments delayed until temperatures were warmer and weeds were larger.

When most .postemergence herbicides, such as glyphosate, paraquat, and 2,4-D type chemicals are applied in January or early winter, additional winter weeds may germinate in treated plots by early spring. Our studies showed that when atrazine was applied in January or later, weeds were controlled throughout the late winter or early spring. Therefore, the use of atrazine may eliminate the need for a second series of postemergence treatment when complete weed control is desired.

Advantages of herbicide useage

The primary useage of herbicides in the fall and winter is for weed control during this period. If the weeds are not controlled, they will compete with bermudagrass the following spring and contribute to a low quality turf having poor spring growth. Bermudagrass cannot initiate good spring growth until hot weather kills the existing winter weeds. When the weeds die, the turf requires time before it can produce enough growth to fill in vacancies left by the dead weeds. Herbicides will eliminate competition from winter weeds and will promote a good quality turf immediately after green-up in early spring. The difference in quality of bermudagrass turf between treated and untreated turf is shown in Figure 5.

Herbicide applications

When herbicides are used in turfgrasses for weed control, care should be taken to determine that the spray equipment is correctly calibrated. Additional care should be taken during chemical applications to prevent nozzle stoppage or failure to lap the chemicals during application. When this occurs, strips of untreated turf will remain weedy, as shown in Figure 6. This type of treatment results in an overall poor quality turf which can be eliminated with care during chemical application.

Summary

No single herbicide will control all different weed species, therefore, it is necessary to identify weeds before selecting a herbicide. All preemergence treatments except pronamide must be applied before weed seed germinate and emerge in the fall. When paraquat and glyphosate are used for postemergence weed control, the turf must be completely dormant to prevent severe turf injury. In most instances when 2,4-D type herbicides are used for weed control, it will be necessary to apply split application at approximately 2-week intervals for effective control. **GB**