GUIDE TO WEED CONTROL FOR MANAGERS OF TURF

By William H. Daniel, Ph.D., Department of Agronomy, Purdue University, W. Lafayette, Ind.

A careful analysis of the basic cultural operations should be the beginning of a contemporary approach to weed control. Turfgrasses* are often grown in situations which offer limited opportunity for their survival. Infestations by weeds can be expected as turfgrass density is reduced. Practices such as high mowing and good nutrition that aid in producing, strong turfgrass and reducing injury to or weakness in the turf will reduce potential weed encroachment.

Four herbicide use patterns for weed control in turfgrass are:

—Application of a selective preemergence herbicide such as siduron to maintain bare ground around individual plants.

—Application of a nonselective herbicide such as cacocylic acid, dalapon, amitrole, paraquat, glyphosphate, chloropicrin, metham or methyl bromide to vegetation for total kill to facilitate renovation (last resort).

—Application of a selective preemergent herbicide such as bensulide, benefin of DCPA to kill germinating weed seedlings.

—Application of a selective postemergence herbicide such as 2,4-D, silvex, dicamba and bentazon to kill weeds already present in the turfgrass.

In three of the four use patterns, the importance of selectivity is obvious.

Dicot Weed Control

Systemics applied to plants (postemergent) are absorbed and translocated to give selective kill of target species. Often two or more chemicals are combined to provide control of numerous weeds. The 2,4-D, 2,4-5T and MCPA are phenoxyacetic acid derivatives. These combine synergistically (supportive action) with MCPP and 2,4,5-TP, the phenyoxyproponic acid forms, to eradicate a wider range of species. Such a combination permits a lighter application than when individual chemicals are used. When dicamba, a benzoic acid-pneollacetic acid derivative, is added, a broad spectrum weed control formulation results.

A rule of thumb: initially use the lightest herbicide rate recommended. Weeds in cool season grasses may be treated any time that the weeds are growing. Since weeds germinate in the spring, summer and early fall, selective kill in September and October will assure a clean lawn for the coming spring and summer. A fall weed control program permits the desired grasses to develop maximum turfgrass cover in a favorable growth period.

The lease effective time for weed control is late spring as this opens the turfgrass to crabgrass and other weeds and thus encourages the cycle of weed production.

For best results apply hormone weed killers when the temperature is above 50° F and soil moisture is adequate for plant growth. Avoid windy or hot days. Apply herbicides when wind speed is low so as to minimize drifting of herbicide mist and vapors to nearby ornamentals.

Applications of herbicides one day prior to mowing is recommended. Ample leaf surface favors increased plant absorption. Most compounds require two to four weeks for evidence of a complete kill. Delay spraying of new lawns until the grass has grown enough to require two mowings, more than thirty days, to allow grass seedlings to become established.

Liquid and wettable powder herbicides should be diluted with enough water (1 to 3 gallons for each 1000 sq. ft.) sufficient to moisten the foliage. Apply at low pressure (20 lbs/sq. in.) in a double coverage (overlap) treatment. Avoid excess pressure which creates fine droplets or mist.

Weed and feed programs using herbicides on granules of fertilizers, vermiculite, or calcined clays, provide formulations for spreader use. Generally more chemical is needed in the dry granular form. These depend upon dew or leaf dampness to dissolve and distribute the weed chemical.

Check label and follow the correct procedure to obtain the desired result. Avoid excessive chemical use.

Chemically filled cans and aerosol cans offer a convenient form, particularly for individual plant treatment. Avoid excessive application when spot treating.

Preemergence Control for Annual Weeds

One of the giant steps for turfgrass management has been the development of preemergence weed control. Preemergence material is designed to eliminate selectively competition from unwanted seedlings. The preemergent chemical affects germinating weed seeds and allows the desired grass to flourish.

To be effective the chemical must be present in toxic concentrations at the soil surface during the time susceptible seedlings are germinating.

Warm soil and adequate moisture favor germi-

Dr. Daniel is in the final stages of writing his new "Handbook for Turf Managers." The book has 39 chapters on topics such as Management, Grasses, Rootzones, Pest Control, and Turf Uses. The new book will be available from Harvest Publishing Co. this spring.

nation of annual grasses. In the spring a soil under a turfgrass cover is cooler than bare ground. The warm rainy period in mid-spring aids in crabgrass germination which may continue until Labor Day. When the mean temperature reaches 55° F (13° C) for a two-week period crabgrass will germinate.

A good, dense turfgrass cover can shade and prevent new seedlings from starting. Mowing high and maintaining a dense cover, plus allowing the soil surface to dry between irrigations discourages crabgrass seedlings.

Earlier, Bandane, Azak, Chlordane and Zytron and arsenates were used routinely as crabgrass preventers, but currently they are not recommended.

Siduron does not affect perennial grass seedlings, so overseeding can be done concurrently with the chemical application. Where spring seeding is needed the use of siduron allows the selective start of desired grasses.

Approximately fifteen weedy grasses including foxtails, sandburrs, goosegrass, barnyard grass, witchgrass, lovegrass, and most summer annual grasses as well as the hairy and smooth crabgrass may be inhibited by the application of preemergence herbicides.

"An ounce of prevention is worth a pound of cure" was never more true than in the use of preemergence herbicides. Preventing the competition of weeds has become a well accepted turf care procedure.

Postemergence

Two applications (5-7 days apart) of organic arsonates can selectively kill crabgrass, sandbur, goosegrass, witch and barnyard grass, foxtails, chickweed, yellow sedge, Johnsongrass and dallisgrass, and other weeds. However, it will not kill seeds of *Poa annua*, lovegrass and nimblewill, among others.

Formulations including monosodium, disodium, amine and calcium acid methane arsonates, applied when the soil moisture is adequate to favor growth, will kill eht plants by arsenic accumulation. Allow for a second treatment. Severe browning indicates excess use. Yellowing by the third day following the first application is the expected result.

Phenylmercuric acetate is used on lawns as a selective killer and fungicide. Granular formulations spread over a damp turfgrass surface are often used in lieu of sprayer applications. It may be practical to combine crabgrass killers (AMA) and weed killers (2,4-D) in one treatment. Centipede and St. Augustine grasses are not tolerant to organic arsenicals.

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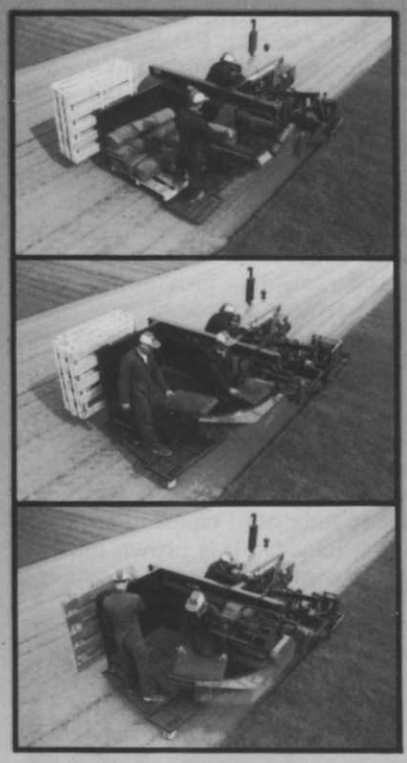

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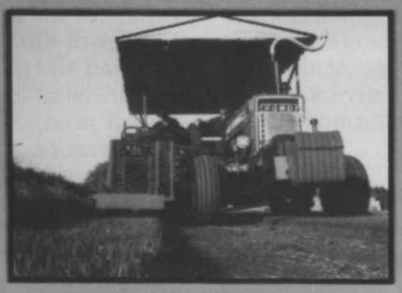

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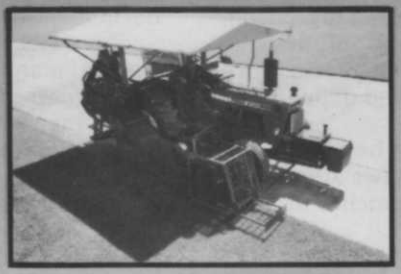

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powered thinners) may release desired species by cutting and reducing the fast growing crabgrass.

In areas of St. Augustinegrass, the postemergent product Asulam (Asulox®) has given selective control of crabgrass, bullgrass, bahiagrass, goosegrass and sandburr. With repeated treatments smutgrass, torpedograss, and crowsfootgrass were controlled. The standard rate of application for Asulam is 2 lbs. active ingredient per acre, or 2.2 kg per ha. When used on bermudagrass Asulam required less applications for an effective kill than MSMA required, but it can injure bermudagrass.

Control of Creeping Weedy Grasses

Plants that provide obvious variation in color or texture should be eliminated from a turfgrass lawn.

Creeping bentgrass is useful on golf greens but appears patchy in areas of bluegrass. The fine leaves, long stems, and the thick mat of disease and drouth-susceptible bentgrass can change from beautiful to ugly within one spell of adverse weather. The fine, soft, horizontal stems have many dormant buds which renew and expand, imparting a patchy look.

Often a few bentgrass seeds may be included in bluegrass seed. The seed labeling laws allow for a small percent of 'other crop'. The patches of bentgrass begin to show within two years. Bentgrass grows well in low wet areas and in shade and can be an excellent lawn turf when well managed.

Nimblewill is characterized by clumps of dark blue-green leaves during the summer. With the first frost the leaves turn brown and die back to the nodes. Nimblewill stems are harder and firmer than those of bentgrass. Regrowth starts at the nodes of the stems in the spring. Patches gradually spread and predominate over bluegrass in the midwest. Nimblewill can be useful in shaded areas. Seed produced in the fall is scattered by birds.

Bermudagrass patches occasionally occur in lawns, especially in southern areas. Hairy, stubby leaves, long hard stems, fast summer growth, and aggressive spread typify bermudagrass. Following fcost, the white, dead leaf is obvious. White, hard, coarse, underground rootstalks provide for survival overwinter, and are the source of new shoots for next season's growth. Bermudagrass is very drouth tolerant and high temperature tolerant. Bermudagrass is hard to kill.

Zoysiagrass was so well advertised a few years ago that many people planted a few 'plugs'. Within three years dense patches developed. The stiff, spreading stems and strong upright leaves tend to dominate. Zoysia spreads until checked by a barrier or dense shade. Because it is brown during a dormant period overwinter it may be considered

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undesirable. It is drouth and sun tolerant, susceptible to few diseases or pests and recommended for use in sunny turf areas in the southern portion of the midwest and midsouth.

Quackgrass has thick, tender, white underground stems which favor an aggressive spread and minimize the chance for control. It is most prevalent in farm and new urban areas. It quickly spreads from the balls of soil around shrubs and from flower beds or new topsoil. A ring of brownish fibers at the nodes of the white rhizomes helps to identify quackgrass. The leaves are dark green and wide. The seedhead is a central stem with closely packed large seed (similar to ryegrass). Quackgrass is a nuisance in a well-managed bluegrass lawn.

There are alternatives in dealing with these creeping weedy grasses if one chooses not to tolerate them. To reduce bentgrass, the area should be harshly thinned in the spring and fall. Groom and manicure in an effort to keep the desired grass healthy. Hand rake, thin with vertical power thinners and aerify or cultivate — anything to keep the bentgrass open and immature. Rake from the edges to the center of the patches to reduce them.

Annual Weedy Grass Preventors

Active Ingredient per acre	per 1000 sq. ft.	Generic Name	Manufacturer & Trade Name
pounds			
2	0.05	BENEFIN	Elanco, Balan
12	0.3	BENSULIDE	Stauffer, Betasan
12	0.3	DCPA	Diamond-Shamrock, Dacthal
12	0.3	SIDURON	DuPont, Tupersan
4	0.1	OXADIAZON	Rhodia, Ronstar

Persistence of Various Herbicides in Soil

Herbicide	ai	Residual Phytotoxicity
	lbs./acre	months
glyphosate	1-3	0-2 days
paraquat	1-3	0-2 weeks
2,4-D	1-5	1 month
Dalapon	6-20	1 month
Endothall	6	1 month
Amitrole	3-18	1-3 "
2,4,5-T	1-2	3-6
Silvex	1-2	4-7
Arrazine	2-4	4-7
Monuron	2-4	5-6
Diuron	3,6-4	5-7
Picloram	0.5-1	6-12
TCA	12.5-67	7-12
Fenac	4-5	12
Simazine	2-4	12
2,3,6-TBA	15-20	12-32

Nimblewill may be eliminated by under cutting and removing one-half inch sod, after which the area should be reseeded. A practical alternative (for the fall period) is to spread bluegrass seed and then rake the surface vigorously. Loosening and thinning the soil will reduce the stems of niblewill. Rake again in early spring.

A dilute spray of glyphosate (½ ounce/1,000 sq. ft.) is most effective on mature grass leaves. Spray when th eplant needs to be mowed so as to obtain maximum benefit from plant adsorption. The area should not be mowed for 24 hours following spray application. After the glyphosate has translocated, which requires one to three days, seed can be spread. The germination of the seed will be enhanced if the area is verticut and then raked heavily to remove thatch. Hand hosing to wash seed into soil can be helpful. Maintain a moist area by daily watering to aid in seed germination.

Patches of bentgrass may be eliminated from bluegrass with Ebdothal (1 lb./A) and Silvex (2 lb./A) in hot summertime. Caution is important to avoid using these chemicals in areas having tree and shrub roots. Glyphosate can be safely and effectively used to eliminate bluegrass or all growing grasses.

Removal ofsod will eliminate thatch and weeds and allow the area to be started with improved varieties of turfgrass. Bentgrass and niblewill are comparatively easy to remove since they produce primarily surface stems. Bermuda and zoysia grasses have hard, deep, coarse underground stems. Where there is one sprig of either of these grasses, it will reinfest. To rid an area of these grasses all pieces must be removed, especially along the edges of walks, around trees and shrubs.

Poa Annua

Annual bluegrass, *Poa annua*, is so named because it produces seeds during the year of germination, while most other poa's produce seed only in the second year of their growth. The individual *Poa annua* plant is constantly rejuvenating itself by forming new tillers, crowns, roots and seedheads. It is unlike corn or oats which mature and die. Instead *Poa annua* continues to produce new growth and live until wear, disease, drouth or stress kills the plant. Meanwhile, the multitudes of seed already produced are lodged at the soil surface, and with favorable moisture and cool temperature, seedlings begin to develop. More than 60 seedlings per square inch (6/cm^2) have been observed in a fairway. (Ohio in August).

Some individual *Poa annua* plants have been observed to have lived for three years. While the old plants persist, new seedlings infest. This process continues for ten months of a year and provides a combination that is difficult to eliminate or prevent.

Poa annua grows in every county of every state in the U.S. and throughout much of the world. The fairways of the oldest golf course in Sweden have more than 90% *Poa annua* cover. Due to rapid infestation the age of some European sportsfield turfgrass areas can be judged by the extent of *Poa annua* infestation. In Holland experimental blue-

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grasses which are most infested with *Poa annua* are discarded as 'least competitive' after one year's test.

The most prevalent weed on golf courses in the United States is *Poa annua* whether it be in bentgrass greens, bermudagrass alone, or overseeded areas in winter. In cool moist climates *Poa annua* as well as many other turfgrasses can provide excellent turfgrass cover.

Poa annua, 'friend or foe,' long has been debated by turf managers. Its acceptance as a 'creditable' turf species is subject to future review. The authors feel that until *Poa annua* is controlled turf renovation and seeding to the newer improved cultivars of turfgrass will be seriously handicapped.

Some products useful for crabgrass prevention have been known to kill *Poa annua* as it germinates. Crabgrass germinates primarily during April through June. In contrast, *Poa annua* germinates from the first of August to the first of July in cool locales and October through May in warm winter areas.

Some turf managers have used as many as three applications of preemergence herbicides a year and still may have 30-40% *Poa annua*. Granular Linuron for selective *Poa annua* control in bluegrass is labeled and available to sod growers in some areas. Growth regulating chemicals slow the growth of *Poa annua* but have a similar effect on other turfgrasses. Growth regulators have also been used to inhibit seed formation and thus subsequent seed development for future infestation. Currently experimental rates of glyphosate is being used for *Poa annua* control.

Research on *Poa annua* continues because of the evident need. Meanwhile, the lack of control will restrict the sale and utilization of some of the new improved Kentucky bluegrass and bentgrass varieties. The more vigorous competitive improved perennial ryegrasses will be used as a 'preferred to *Poa annua*' turfgrass cover.

In areas where *Poa annua* is being used for turfgrass it should be kept open and growing aggressively so that its renewal process can provide adequate young plant parts. **WTT**

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Watson recommends drought measures

With or without drought conditions, there never will be enough water anywhere in the world to allow continuing excessive waste to be tolerated, according to Dr. James R. Watson, agronomist and vice president of The Toro Company, in his keynote address at the Texas Turfgrass Conference in December.

Drought not only means a lack of rainfall, he said, but a shortage of water. In addition to lack or rainfall, water shortages exist because of an increasing demand and excessive, growing waste.

Two kinds of strategy are needed to combat drought, he emphasized: one for personal and business use of water; and another to apply on a much broader scale — the "green industry".

Dr. Watson offered several suggestions for using less water to maintain large turf areas.

Highest watering priority should go to the most intensively managed area. The greens on a golf course are an example. They are generally the most valuable part of the course and an area where play is most critical.

Should irrigation practices should be followed. The best combination of little wind, low temperature and high humidity is the best time to irrigate. That time occurs most often just before dawn. When watering trees and shrubs, use probes so the water will penetrate deeply, he suggests.

Reduce other causes of stress, being especially alert to salt buildup.

Make sure fertilization programs are adequate, especially phosphorus to encourage root growth. Maintain a constant and uniform supply of nitrogen at a low to medium level to avoid unnecessary leaf growth. Slow release materials should be considered. If soluble sources are used, apply the materials frequently at low rates rather than vice versa. Infrequent high rates encourage excessive leaf growth.

Raising mowing height, even as little as 1/32 of an inch on a green, can have a significant effect on the ability of the turf to tolerate moisture stress. Mow less frequently.

Wind barriers can help, especially where there are large expanses of open spaces.

Aggressively seek additional sources of water. Among the possibilities is treated sewage effluent. There are about 75 golf courses, known to Dr. Watson, in the U.S. that are using treated wastewater for irrigation. There are more than 30 in California, at least six in both Arizona and Colorado, and one or more in Texas, Florida, Idaho, Illinois, Missouri, New Mexico, Nevada, New Jersey and probably several other states.

There are approximately 2,000 facilities in the U.S. today that provide land disposal of wastewater in volumes ranging from a few thousand to several million gallons per day. The amount of waste water available for irrigation is going to expand dramatically, Dr. Watson predicts, mainly as a result of EPA action.