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Controlling Goosegrass

By Dr. Ralph Engel
Professor Emeritus of Turfgrass Science

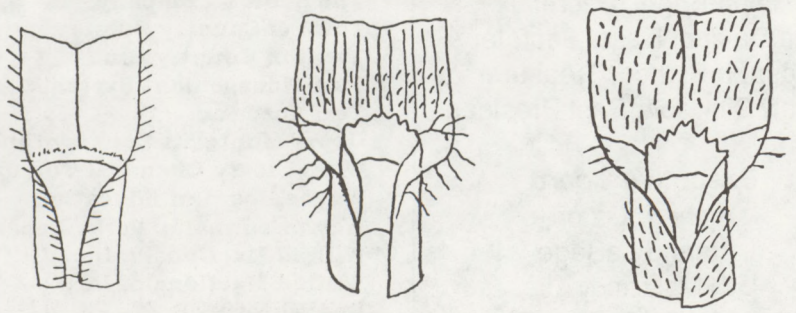
Goosegrass can be a morale and career destroyer on golf courses of warmer climates and in temperate climates that have appreciable 90° - 95°F weather. Its tough stiff leaves make it intolerable on greens and on other areas of the golf course. Even if seed of this annual is not present in the soil, it will be carried on a golfer's shoes from another golf course or brought in with contaminated sod, topdressing, or seed. This makes goosegrass one of the comeback weeds.

Goosegrass was introduced generations ago from Asia, and it has not found its way onto many sites of temperate zones. As a first step, do not let the first plant develop seed on a clean site. A few goosegrass plants can generate a real threat to a site in only a few years.

In lawns and roughs of cooler climates, goosegrass may be controlled with good cover and higher mowing heights. On closer-cut areas, herbicides are usually required. Fulwider in his Masters Thesis indicated the problem is less severe on higher cut areas because the seed needs light and high temperatures for good germination. His work was done in germinating chambers. Interestingly, we had difficulty germinating a good stand in closely cut scarified turf in a field plot. Previously, the area had only a

(see Goosegrass, page 3)

Figure 1
Contrasting Characteristics of Young Goosegrass and Crabgrass Plants



Goosegrass (left) *Eleusine indica:* leaves folded, sheaths flattened, leaf blade hairy along margins, no large hairs at collar, no rooting at nodes. Smooth Crabgrass *Digitaria ischaemum:* leaves rolled in bud, leaves sparsely hairy on upper side of blade at base, large hairs at edge of collar, rooting at nodes - later. Hairy Crabgrass *Digitaria sanguinalis:* leaves rolled in bud, leaves hairy above and below, larger ligules, rooting at nodes when older. Source: Drawings by C.E. Phillips (1956) Weeds of the Northeast. Field Manual No. 1. University of Delaware - Agricultural Experiment Station.

Summer Patch:

Identification, cause and control strategies

By Dr. Bruce Clarke
Extension Specialist in Turf Pathology

Summer patch was first recognized as a disease of cool-season turfgrasses in 1984. Previously, it was an unidentified component of Fusarium blight. Summer patch has been reported in North America on fine fescue and Kentucky bluegrass. The causal agent also has been isolated on occasion from bentgrass and perennial ryegrass. The disease generally occurs on turf that has been established for more than two years.

Symptoms of Summer Patch

On Kentucky bluegrass, symptoms first appear in early summer as small, circular patches of wilted turf 1.5 to 3.5 inches in diameter. Patches may enlarge to more than 24 inches, but generally remain in the 2- to 12-inch range. Affected leaves fade rapidly from a grayish-green to a light straw color during sustained hot weather (daytime highs 82° to 95°F and nighttime temperatures exceeding 68°F). Irregular patches, rings, frog-eye and crescent patterns may also develop and coalesce into large areas of blighted turf.

In mixed stands of bentgrass and

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Goosegrass
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small infestation of goosegrass, but was generously overseeded with goosegrass and had good soil with a slight slope to the southeast. Apparently, we could not maintain the required light and temperature requirements for germination. Those years also lacked severe heat in combination with irrigation and the wet weather for goosegrass development.

Turf Management Effects on Goosegrass

Preventing voids and reducing the amount of open turf cover from May through August are the best management antidotes for goosegrass control because they reduce light and heat necessary for germination. Avoiding bareness from disease, wear, injury, overwatering, and severe close cutting in late spring through August reduces the ability of goosegrass seed to germinate and become established. Minimizing excessive wear spots on greens and tees is especially important. Darkening the turf surface area from topdressing can give more heat at goosegrass germination time. Otherwise topdressing can be a deterrent to germination by excluding light. Some mushroom-based topdressing mixes have enough fertilization salts to prevent germination, and preparations with intense microorganism activity can destroy seeds.

Goosegrass Germination Period

Germination of goosegrass starts on some of the warmer sites of New Jersey, especially on sandy soils, as early as April. It is seen quite commonly in early May. If the spring season is late, a general germination may not occur until late May. With hot weather in late June, the turf cover may die back or thin and be conducive for abundant goosegrass germination where scarcely expected. From experience we have learned that goosegrass germination and development can be vigorous in late July and August in thin spots or voids such as divots. These late-germinating plants will set seed by mid-September and often into early October. This varied seasonal germination of goosegrass greatly complicates control. In contrast, crabgrass that germinates in August is less likely to set seed before a killing frost than goosegrass. On several occasions I have seen crabgrass germination in New Jersey turf in mid-to-late August, but I have not seen it set seed.

Late-season germination of goosegrass and crabgrass poses the question of distinguishing between the seedlings of these grasses as it does in May. Being able to identify the seedlings can be of interest and importance. While I have not seen test results, I would expect that crabgrass seedlings are easier to kill with Acclaim (fenoxyprop) than those of goosegrass. As for identification, there is a difference between the two species at emergence. They are easily distinguished a little later. Remember the vernation (seedling leaf) of goosegrass is folded in the bud and rolled in crabgrass. Crabgrass has varied hairiness to the leaf. Goosegrass has rough hairy margins of the leaf only. (Figure 1)

Chemical Controls for Goosegrass

Our golf courses would have a difficult messy problem with goosegrass were it not for herbicides. Although I admit their control and safety on turf leaves room for improvement. In the late 1920's, the arsenates were found to be effective on crabgrass and goosegrass (largely preemerge). Some golf course superintendents "singed" goosegrass seedheads with sodium arsenite. On a few occasions, the phenoxy herbicides would show control. This probably resulted when the goosegrass germination took place at or soon after the application. This was never recognized as a control measure since timing was too difficult.

In more recent years, a number of herbicides have been effective on goosegrass. Many of these give preemergence control, but consistency of control and safety to bentgrass ruled many out of use. One of the preemerge herbicides now available is Dacthal (DCPA) which has been used for approximately 30 years. In the granular form it offers fair to good control and is one of the safest preemergence herbicides where bentgrass and annual

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Goosegrass
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bluegrass dominate. Ronstar (oxadiazon) has been used for approximately 20 years with success. It is one of the more effective goosegrass herbicides, but it can injure bentgrass especially at the 3 lb/A rate. It is more damaging to annual bluegrass. At higher rates, especially on sandy soils, it may require delay of late summer overseeding of turfgrasses because of its residual nature. Pendimethalin is used alone and in combination with other herbicides. Its effectiveness has not been well-defined. Currently, newer materials are in trial use (Dimension (dithiopyr) and Drive (quinclorac)). These show good promise, but they need more testing on their effectiveness and safety to the turf. As with most new herbicides, use the chemical first on trial plots to determine what extent you might wish to use them.

Preemerge residues vary greatly. Before using this type chemical, especially on tees, consider what might happen to a divot reseeding, an overseeding of a tee, or areas that may need overseeding because of serious turf failure. With situations of this type, repeated postemerge with fenoxaprop may be the best choice.

Postemerge Control

Acclaim (fenoxaprop) is a handy "tool" for goosegrass or crabgrass seedlings missed by preemerge. (Commonly they give less than 90% control). There are many reasons for less than perfect results with preemerge, but do not despair; an application of fenoxaprop can give fair to good control of the seedlings as they appear in June, July or possibly later. Usually one early treatment will control the new seedlings. The lower recommended rate and a repeat application if necessary is a safer approach to minimizing bentgrass injury. Fenoxaprop is considered better on crabgrass than goosegrass. Spray with fenoxaprop on nearby aprons, collars, and rough areas that show goosegrass and crabgrass seedlings. This will prevent seed from reaching the tees and greens for a next year weed crop.

Late Season Follow-up

Weeds often sneak by us. The problem with late summer germination was mentioned earlier. So be twice warned, watch for August germination of goosegrass that can set seed before a killing frost or freeze in September. Often goosegrass continues to set seed into October before freezing. Jim Fulwider's work (5) showed application of methyl arsonate in early September cut goosegrass seed crops by 70%. In late summer, if it appears that you have no goosegrass or had excellent chemical control, inspect the areas for the last few plants. With the occasional plant in greens, tees, or other prime areas, a few minutes removal of plants will pay dividends toward goosegrass and crabgrass control. You must be as persistent and determined as the weed.

(5) Fulwider, J.R. and R.E. Engel (1960). Seed Characteristics and Control of Goosegrass. USGA Journ. of Turfgrass Management. Vol. 12:24-27.

Table 1

Germination of goosegrass *Eleusine indica* with different temperature and light conditions[1]

Dates of germination counts	30°C DL_4	30°C —	35°C DL_4	20-30°C[3] DL_4	20-35°C[3] DL_4	20-35° —
	Germination Average %[2]					
10	67	0.3	0	2	66	70
14	14	0.5	0	5	0.8	14
17	4	0	0	21	0	0
Av. % germination at 68 days	95.6	1.3	0	91.3	92.1	92.5

Note: (20°C = 68°F, 30°C = 86°F, 35°C = 95°F)
(1) From Masters Thesis of J.R. Fulwider
(2) Average for 4 plates with 100 seeds each
(3) Temperature was held at the first number for 16 hours/day
(4) DL incidates light was given 16 of 24 hours. All others received no light.

Summer Patch
(cont'd from page 1)

annual bluegrass maintained under putting green conditions, patches are circular and range from 1 to 12 inches in diameter. As annual bluegrass yellows and declines, bentgrass species frequently recolonize patch centers. On fairways and lawns, rings or frog-eye patches may not develop. In such cases, symptoms may appear as diffuse patterns of yellowed or straw colored turf that are easily confused with heat stress, insect damage, or other diseases. Infected roots, rhizomes, and crowns turn brown as they are killed. Examination of these tissues typically reveals a network of sparse, dark brown to black, ectotrophic hyphae from which hyaline penetration hyphae invade the underlying vascular tissue. In the latter stages of infection, vascular discoloration and cortical rot are extensive. No fruiting structures have been observed under field conditions.

Causal Agent

Magnaporthe poae *Landschoot and Jackson*, the causal agent of summer patch, is a newly described fungus whose asexual stage had previously been misidentified as Phialophora graminicola *(Deacon) J. Walker.* The fungus forms dark brown to black, septate, ectotrophic runner hyphae on roots, crowns, and rhizomes of turfgrass hosts. Sexual fruiting bodies, which have only been observed in culture, are black, spherical and have long cylindrical necks.

Disease Cycle

The pathogen is believed to survive the winter months as mycelia in previously colonized plant debris and in perennial host tissue. Colonization and suppression of root growth has been shown to occur between 70°F and 95°F under controlled environmental conditions, with optimum disease development at 82°F. In the field, infection commences in late spring when soil temperatures stabilize between 65°F and 68°F. The fungus moves from plant-to-plant by growing along roots and rhizomes. Symptoms develop during hot (86°F to 95°F), rainy weather or when high temperatures follow periods of heavy rainfall. Patches may continue to expand through the summer and early autumn and are often still evident the following growing season. The summer patch fungus may be spread by aerification and dethatching equipment as well as by the transport of infected sod.

Epidemiology

Summer patch is most severe during hot, wet years and on poorly drained, compacted sites. Although heat stress plays an important role in disease development, drought stress is usually not a predisposing factor. Under ideal conditions, the causal agent can spread along roots, crowns, and stem tissue at a rate of up to 1.5 inches per week. Symptom expression has been shown to increase with the use of nitrate-based fertilizers, arsenate herbicides, and many commonly used contact fungicides. The disease is frequently stimulated when turfgrass is maintained under conditions of low mowing height, high pH (> 6.0), compaction, and frequent, light irrigation.

Control

Because summer patch is a root disease, cultural practices that alleviate stress and promote root development will reduce disease severity. Since low mowing enhances symptom expression, avoid mowing turf below recommended heights, particularly during periods of heat stress. In the Northeast, symptoms are less apparent when lawns are maintained at a height of 2 to 3 inches and golf greens and fairways are cut at or above 5/32 inches and 3/8 inches, respectively. Fertilize turf with ammonium sulfate or a slow-release nitrogen source such as sulfur-coated urea. Irrigate deeply and as infrequently as possible without inducing drought stress. Aerifying, improving drainage, reducing compaction, and

(see Summer Patch, page 7)

Evaluating Newer Postemergence and Preemergence Herbicides for Grasses

By Dr. James Murphy
Extension Specialist
Turfgrass Management

Preemergence herbicides have been a great help in controlling crabgrass and goosegrass. Their inconsistency of control is rather common due to unpredictable weather patterns that reduce the performance of the preemergence herbicide. Five or six years ago, postemergence herbicide control became another option when preemergence application was ineffective or had been omitted. Until this time, choices for postemergence control of annual grasses was limited to the methanearsonate class of herbicides (DSMA and MSMA). This report will discuss two new promising herbicides that may help with goosegrass and crabgrass control.

In 1986, Acclaim (fenoxaprop-ethyl) was marketed as an effective, single application postemergence herbicide providing good control of crabgrass and goosegrass. It has shown excellent control of smooth crabgrass up to the eight-tiller growth stage, and most cool season grasses, except bentgrass and annual bluegrasses, have good tolerance. Fenoxaprop has no preemergence activity; therefore, any annual grass germination following a postemergence application will require repeat application. The optimum time for application is generally considered to be mid-June to mid-July. A single application of fenoxaprop at this time should control crabgrass, but goosegrass may require a second application because goosegrass germinates throughout the summer. Another option is to apply a preemergence herbicide along with fenoxaprop to eliminate annual grass germination following the postemergence treatment. Fenoxaprop should not be applied to annual bluegrass, immature Kentucky bluegrass and fine fescue turfs that are less than one year old. Perennial ryegrass and tall fescue seedling turf are tolerant to fenoxaprop. Mature bentgrass turf can be severely damaged with fenoxaprop.

A more recent introduction is the herbicide Dimension (dithiopyr). Dithiopyr is different from fenoxaprop because it has both postemergence and preemergence activity. Therefore, the window of time for application of dithiopyr is rather long (up to 13 weeks). Postemergence application of dithiopyr must occur before crabgrass tillers (early postemergence activity; pre-tiller stage). Once crabgrass has tillered, other postemergence herbicides must be used for adequate control. Dithiopyr is safe for use on warm- and cool-season turfgrasses. However, some bentgrass varieties such as Seaside, Putter and Cohansey, and some varieties of Chewings fescue, may show injury. Safety on putting greens is still being researched. Because of the long residual activity of dithiopyr, reseeding or sodding should be delayed three months following application. Use of dithiopyr on seedling, fall-seeded or winter-stressed turf is not recommended until full establishment or spring recovery occurs.

A third herbicide, quinclorac (formerly named Impact) is available again through an experimental use permit program. Quinclorac (trade name Drive) is intended for late preemergence and postemergence applications. Quinclorac has shown good activity on crabgrass but is poor on goosegrass. It is also effective on some broadleaf weeds such as clovers, speedwell (Veronica) and dandelion. Postemergence

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Herbicides
(cont'd from page 6)

applications are effective up to the three- to four-tiller stage of crabgrass and other susceptible grasses. Only late preemergence application is recommended because of quinclorac's short residual property. However, the short residual characteristic provides the opportunity to reseed shortly after application of quinclorac. Quinclorac is safe on many cool-season seedling or established turfs. Exceptions are fine fescues, which are moderately tolerant, and bentgrass, where it is not recommended currently.

One more postemergence herbicide of a limited use is Tupersan (siduron). It has some activity on very early crabgrass (one- to two-leaf stage). It is safe on new seedings and can be used to give some control of crabgrass in spring seeded turf. Siduron applied at this early stage would control the initial germination and also provide some preemergence control. Long-term control will require repeat application. Fenoxaprop is another option for postemergence control in perennial ryegrass and tall fescue seedling turf.

Turf Conditions for Best Control

When using postemergence herbicides, keep in mind that the effectiveness of an application is reduced when the target weeds are drought-stressed. Irrigate a few days prior to postemergence application to improve control. Erratic results can occur when postemergence materials are applied with flood jet nozzles. Good postemergence control requires thorough coverage of the weed's leaf surface with herbicide to be effective. If the crabgrass and goosegrass are large enough to mow, withhold mowing several days prior to application to ensure sufficient leaf surface exposure to the herbicide application. Also, mowing should be delayed one or two days following application to allow the herbicide to move into the plant. Do not expect control of sedges with fenoxaprop, dithiopyr, or quinclorac. Nutsedge can be controlled with Basagran or methanearsonates (DSMA, MSMA). Good control of some broadleaves can be expected with dithiopyr and quinclorac (consult the labels).

With the two new herbicides (dithiopyr and quinclorac), remember they are still in a trial stage. Often the lower suggested rate may be best. Leave some untreated check strips where the weed is insignificant. This will help you determine the amount of turf injury.

Summer Patch
(cont'd from page 7)

syringing to reduce heat stress are other practices that will aid in the control of this disease.

Overseeding affected areas with perennial ryegrass, tall fescue, or resistant cultivars of Kentucky bluegrass is one of the most cost effective means of controlling summer patch. Use mixtures or blends of resistant turf cultivars or species for best results. Conversion of golf areas from bluegrass to bentgrass also will reduce disease incidence.

Fungicides that can effectively control summer patch are available. Applications should commence on a preventative basis in late spring or early summer when soil temperatures stabilize between 64°F and 68°F. Systemic fungicides, such as Rubigan (fenarimol), Banner (propiconazole), Bayleton (triadimefon), and the benzimidazoles (i.e., Tersan 1991 and Cleary 3336), have proven to be most effective but must be applied at high label rates. Repeat two to three times at 21-28 day intervals for best results. Efficacy is enhanced when products are applied in at least 4 gallons of water per 1000 square feet. The continued use of contact fungicides at high label rates may stimulate symptom severity.

The author wishes to thank the GCSANJ and the Tri-State Research Foundation for their support of this research.

Keep Fighting Canada Thistle

Unless we work to control Canada Thistle, Circium arvenuse Scop, it is sure to become worse. Like most weeds this species has not spread as far as it can go. It was introduced from Eurasia generations ago. Now it is common in Southern Canada, northern USA and south to Virginia and Northern California. Allowing landscapes to grow without mowing has helped spread it in New Jersey. I have written twice to the New Jersey Department of Transportation maintenance office. The first letter brought a rather unbelievable response, but the second promised some early mowing on highways to check this and other weeds.

This raises the question: How are we, as turf growers, doing on controlling this weed in roughs and waste areas?

Canada Thistle with its pink-purple to whitish flowers will become conspicuous starting in late spring. Later, its airborne seeds can be seen floating in light breezes. It produces a lot of seed that can remain viable for long periods of time.

Mowing to prevent flowering and seed set can be practiced on most areas. While this does not kill the abundant rootstocks, it is effective for reducing spread by seed. While we have herbicides that kill back Canada Thistle, it is still a very difficult weed to eliminate because of its abundant production of long-lived seed and rootstalks.

In 1954, Canada Thistle was on the noxious weed list, although today we hear little about enforcement of noxious weed laws. Garden stores often sell thistle seed, but I have not found one salesperson who can tell me which thistle is used or if the seed was heat treated to destroy germination. Anyone who has tusseled Canada Thistle in their landscape will surely agree to put it on their noxious weed list. Limit Canada Thistle growth by cutting it back or chemically killing the top growth. This weed is uncommon in good lawns that are mowed regularly at medium to close cuts.

R.E.E.

Editor's Note:

This eight-page issue of Greenworld features Dr. Bruce Clarke, who is well known for his research and extension work on turfgrass diseases, and Dr. James Murphy, who will be a frequent contributor as the new Extension Specialist in Turfgrass Management. We are grateful for their contributions, and we believe you will find their information valuable in your work. We invite your comments on past and future issues, and written contributions are welcome.

This issue of Greenworld contains a behind-the-scenes change of editorial and production duties. Two new editors, Jim Morris and Dory Devlin, have assumed responsibility for producing Greenworld. Jim and Dory are a husband-and-wife team who met as reporters for the Daily Record of Morris County. Dory now reports for the Star-Ledger, and Jim is the assistant director at the Cook College Office of Continuing Professional Education, which works with the NJTA on several fronts.

The editors owe a great debt to Deena Amont, who smoothly navigated all desktop publishing obstacles, and to Dr. Engel, who collects, writes and feeds us items of interest.

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