

Control of Summer Annual Grass Weeds in Turfgrasses

Summer annual grasses continue to be pervasive weed problems in many turfgrass areas throughout Pennsylvania. The most common summer annual grasses in turf include crabgrasses (*Digitaria* spp.), goosegrass (*Eleusine indica*), foxtails (*Setaria* spp.), and barnyard grass (*Echinochloa crusgalli*). Satisfactory control of these weeds can be obtained by cultural and chemical methods, provided the life cycle of the plant is understood.

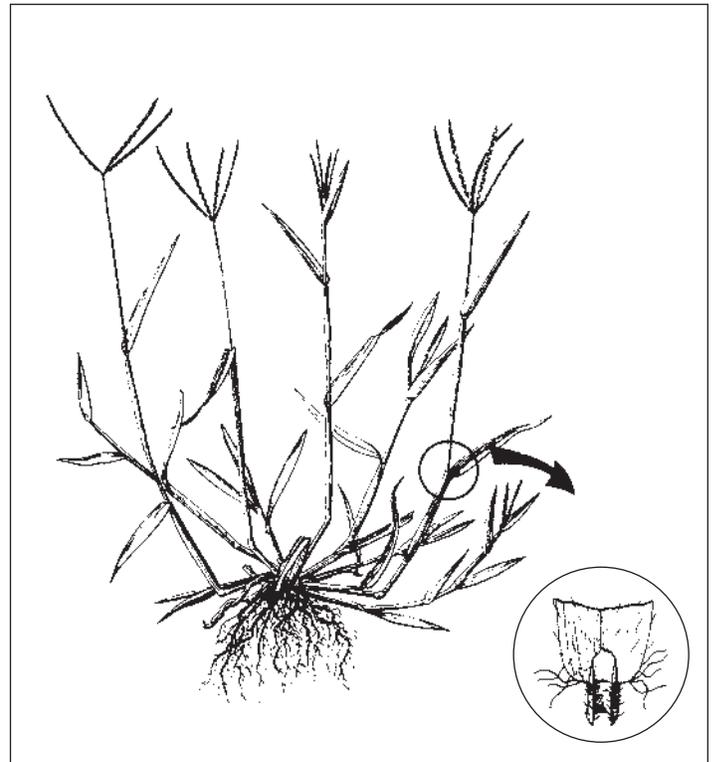
Two species of crabgrass, the hairy or large (*Digitaria sanguinalis*) and the smooth or small (*Digitaria ischaemum*), are commonly found in Pennsylvania. Both are true summer annuals. Their seed germination period ranges from midspring to midsummer, and all plants are killed by frost in the fall. Flowering and subsequent seed set take place from midsummer to early frost and are the means of perpetuating the species. Seed can be produced at mowing heights as low as $\frac{1}{4}$ inch. Abundant quantities of seed are produced. They vary in number depending on the general health and vigor of the plants.

Once established, crabgrass plants tolerate high temperatures, compact soils, and dry soils better than most turfgrasses. They do not survive shaded conditions produced by buildings, trees and shrubs, or dense turf.

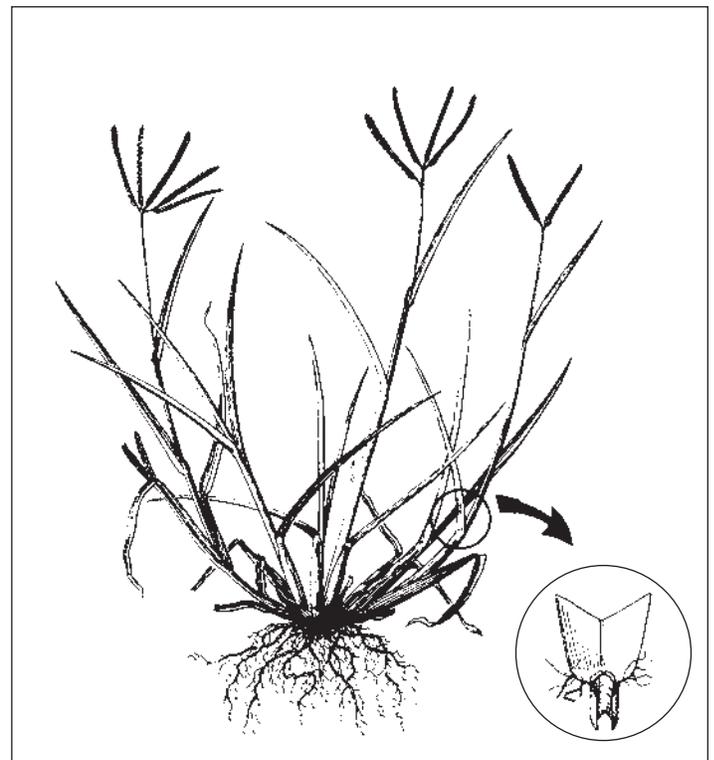
Crabgrass control cannot be completely accomplished in one growing season because of the great number of viable seeds in the soil from previous years of infestation. The basic principle of crabgrass control is to prevent reinfestation through seeding. If seed production is controlled for several years, the viable seed supply in the soil will diminish until it is no longer a serious threat to the lawn.

Goosegrass, also known as silver crabgrass, is commonly found in Pennsylvania and is often mistaken for crabgrass. Like smooth and hairy crabgrass, it is a summer annual, but it germinates 4 to 6 weeks later than crabgrass. Goosegrass is characterized by fibrous roots and very flattened sheaths that have a silvery green color, especially near the center of the plant. It has fingerlike seedheads bearing seeds with a zipperlike appearance on the seed stalk. Goosegrass grows well on heavily compacted soils and is especially troublesome in the southeastern portion of the state.

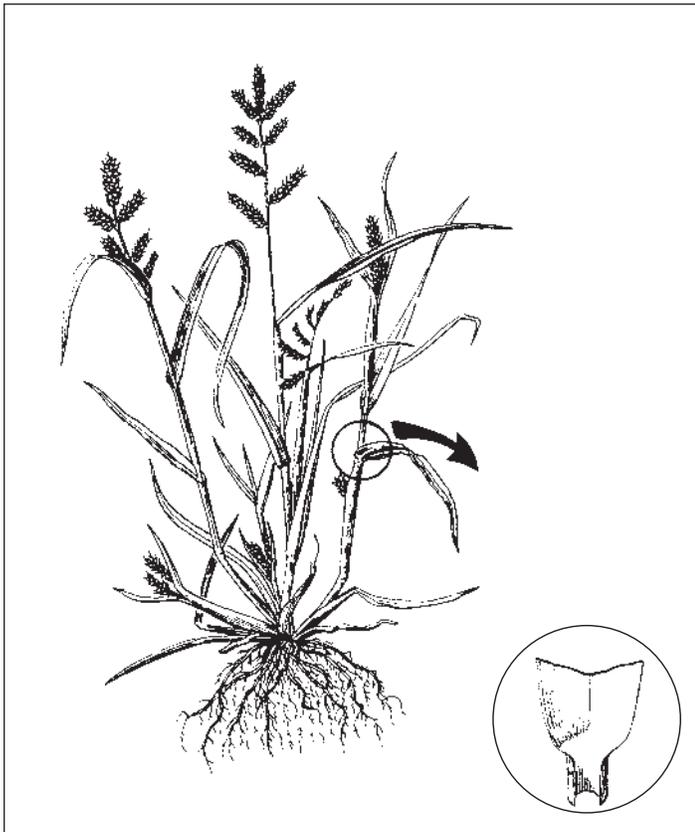
Other summer annual weeds, such as foxtails and barnyard grass, have the same general life cycle as crabgrass and goosegrass. Although these species are less common in turf, they can be very unsightly, particularly in newly seeded or immature stands.



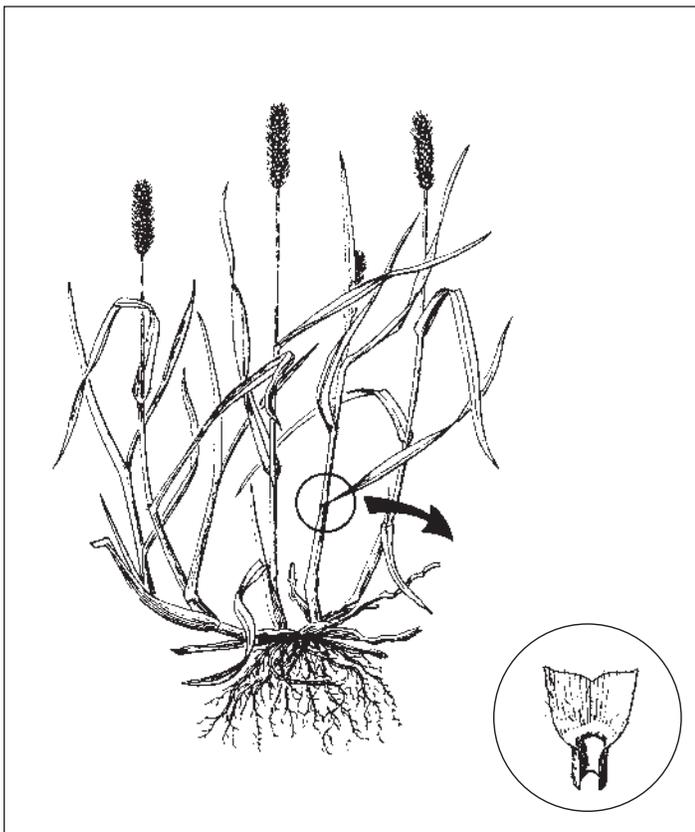
Crabgrass



Goosegrass



Barnyard grass



Foxtail

Cultural Control

Any management practice that increases the density and vigor of desirable turfgrasses tends to discourage competition from weeds. Cultural practices for the control of summer annual grass weeds are aimed at shading and crowding the young weed seedlings by producing a dense sod. Effective cultural control measures include the proper selection and establishment of turfgrasses, adequate liming and fertilization, proper mowing practices, judicious watering, and insect and disease control.

Turfgrasses that are not adapted to the environmental conditions and intended use of the turf may become weak and result in a thin stand. When there are voids in the turf, weeds have an opportunity to grow and compete with the desirable species. The use of proper establishment procedures helps ensure a dense turf that will compete with germinating weed seedlings.

Inadequate liming and fertilization lessens the competitiveness of turfgrasses, resulting in reduced density and subsequent weed invasion. Complete soil testing is the key to proper liming and fertilization. Soil testing can provide guidelines for fertilization and liming to establish and maintain turf grasses. Adequate nitrogen should be supplied to favor the desirable species in the stand. Phosphorus fertilization increases seedling vigor and is one factor in reducing weed infestations in newly established turf. Liming keeps the soil from becoming too acid.

Improper mowing is one of the most common causes of weed invasion. Mowing heights that are too short result in weakened turfgrasses. Most lawns should be cut at least 2 inches or higher.

Improper watering also contributes to summer annual weed invasion. Frequent light watering encourages shallow rooting and promotes weak turf, which becomes susceptible to insect and disease attacks as well as damage from traffic. Frequent light watering also encourages germination and development of crabgrass and goosegrass at the expense of turfgrasses. Watering deeply (4 to 6 inches) just before the turf begins to wilt is a practical approach to a sound watering program.

Summer annual grass weeds are extremely opportunistic, filling in voids in turf caused by diseases and insects. Diseases can be controlled by cultural practices and with fungicides. Insect damage can be reduced by maintaining a healthy turf and using biorational means of control, such as using endophyte-containing ryegrasses and fescues that discourage leaf- and stem-feeding insects.

Chemical Control

Chemical weed control with herbicides can help you produce a quality lawn. It should not be undertaken unless accompanied by an adequate management program designed to prevent reinfestation. To use herbicides safely and successfully, read the manufacturer's label carefully and follow directions. Application rates are not given in this publication due to the wide range of formulations available.

Preemergence control refers to the use of herbicides to prevent emergence or to kill very young seedlings early in the season without injury to established turfgrasses. These herbicides act by forming a chemical barrier in the soil prior to seed germination. The barrier effectively prevents grass seedlings from emerging and developing normally.

You can use several preemergence herbicides to control summer annual weeds in Pennsylvania. Table 1 lists the chemical (generic) and trade names of some commonly used preemergence herbicides.

Table 1. Commercially available preemergence herbicides for the control of summer annual grasses.

Generic names	Trade names
Benefin	Balan
Benefin + trifluralin	Team
Bensulide	Besumec, Pre-San
Bensulide + oxadiazon	Goosegrass/Crabgrass Control
Dithiopyr	Dimension
Mesotrione	Tenacity
Oxadiazon	Ronstar
Pendimethalin	Pendulum, Halts
Prodiamine	Barricade
Quinclorac	Drive XLR8
Siduron	Tupersan

There are several factors to consider when choosing a preemergence herbicide. The first is the safety of the chemical on turfgrass species and cultivars. Compounds such as benefin and oxadiazon may injure fine fescues but are generally safe on Kentucky bluegrass, ryegrass, and tall fescue. Most preemergence herbicides have long residual activity in the soil and may affect newly seeded turfgrasses. Thus, seeding of turfgrasses should be postponed for the amount of time specified on the manufacturer's label. Siduron and mesotrione are the only materials that can be safely used during or immediately following seeding. Quinclorac can also be used when seeding turfgrasses, but restrictions on application intervals during and after seeding are listed for individual turfgrass species on the manufacturer's label.

For maximum effectiveness, preemergence herbicides should be applied uniformly at the label recommended rates. These herbicides are more efficient when watered-in within 2 to 3 days of application.

The timing of preemergence herbicide applications is the most critical component of an effective chemical control program. As a general rule, the best time to apply preemergence materials is approximately 10 to 14 days prior to the earliest expected germination period in spring.

Depending on the product, time of application, and location, reapplication of a preemergence herbicide within 60 days may be required for season-long control. Consult product labels to determine if two applications are allowed. Poor control also may occur with late applications. In these cases, postemergence herbicides may be required.

Summer annual grass germination is determined by moisture and temperature. Highly variable temperatures in early spring often cause concern about the best time to apply these materials. One factor to consider when contem-

plating an early application is that heavy frost may kill most summer annual grasses that have begun to germinate.

Crabgrass begins to germinate when the temperature in the upper inch of soil reaches 55 to 58°F at daybreak for 4 to 5 days. Plant flowering indicators such as forsythia bloom are not always reliable for determining crabgrass herbicide application or germination. Normally, preemergence crabgrass treatment in Pennsylvania should take place as follows:

Southeastern Pennsylvania	March 15 to April 15
Northern tier and high-altitude counties	April 20 to May 10
Other Pennsylvania areas	April 1 to May 1

Goosegrass germinates later than crabgrass. Preemergence herbicide applications to control goosegrass should take place 3 to 4 weeks after the normal dates for applying crabgrass control materials.

Postemergence control of crabgrass and some other summer annual weeds involves the use of chemicals that kill growing plants after they have appeared in the turf. Postemergence herbicides can be used to treat only those areas where summer annual grass weeds have emerged. Preemergence herbicides, on the other hand, are usually applied over the entire turf area because the applicator does not know where seeds are or if they are present.

Table 2. Commercially available postemergence herbicides for the control of crabgrass.

Generic names	Trade names
Fenoxaprop-ethyl	Acclaim
Dithiopyr	Dimension
Mesotrione	Tenacity
Quinclorac	Drive XLR8

For the postemergence herbicides to be effective, crabgrass must be uniformly covered. Thus, these compounds should be applied only when crabgrass is visible in the stand.

Fenoxaprop-ethyl is a postemergence herbicide that is slowly translocated within the plant. It can effectively control tillered crabgrass with a single application. It is relatively safe on cool-season turfgrasses but may injure some Kentucky bluegrass cultivars, especially at high temperatures. It should not be applied if cool-season turfs show signs of drought stress. Fenoxaprop-ethyl is less effective when tank-mixed with phenoxy-type herbicides such as 2,4-D and MCPP.

Dithiopyr acts as a preemergence and postemergence herbicide. It will provide postemergence control of crabgrass only until the one-tiller stage of development; however, it can be combined with fenoxaprop for crabgrass control when two or more tillers are present.

Mesotrione also acts as a preemergence and postemergence herbicide for crabgrass control. Postemergence applications are primarily for controlling newly emerged crabgrass in new seedings of Kentucky bluegrass, perennial

ryegrass, and tall fescue. Rates of mesotrione vary slightly with turfgrass species, and this herbicide should not be used in new stands of fine fescues. Label instructions suggest spraying only after newly germinated turfgrasses have been mowed twice, or 4 weeks after emergence. Mesotrione is most effective in controlling crabgrass when mixed with a nonionic surfactant. Susceptible weeds turn white before they die, creating a highly visible treatment effect.

Quinclorac is a postemergence herbicide for control of crabgrass, foxtail, barnyardgrass, and several broad-leaf weed species in turfgrasses. It is effective on newly emerged summer annual grasses, as well as mature plants (annual grasses with more than four tillers or stems). However, under certain conditions this herbicide may not provide complete control of annual grasses with two, three, or four tillers. Quinclorac can also be used as a preemergence and postemergence herbicide in new turfgrass seedings. However, the manufacturer's label suggests different application intervals following emergence of specific turfgrass species. For example, tall fescue seedlings can be treated 7 days after emergence, whereas Kentucky bluegrass should not be treated until 28 days after emergence.

Postemergence herbicides can be combined with pre-emergence herbicides to ensure that late germinating summer annual grasses will be controlled along with weeds that have already emerged. Studies at Penn State have demonstrated improved control of crabgrass with post-emergence/preemergence applications over postemergence applications alone. Be sure to follow label directions when considering combinations of herbicides.

Pesticide Safety

Follow all safety precautions recommended on labels when using pesticides. Store pesticides and dispose of empty containers so that they are not a hazard to humans and animals and are inaccessible to children. Do not contaminate streams, ponds, or other water sources. If you have questions, check with your county extension educator.

Revised by Peter Landschoot, professor of turfgrass science.

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