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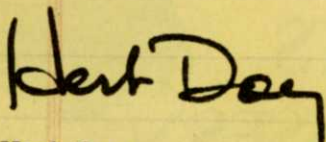
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We hope you'll use Tech Specs to find new opportunities for your business. It is written by Extension Service authorities to help you.

If there's anything you especially like about it—or want to see in a future edition, or you have any kind of landscape, nursery or turf problem, please write or give me a call.

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Sales Manager, Specialty Products

Stauffer Chemical Company  
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## CULTURAL PRACTICES AND HERBICIDE EFFECTIVENESS

**Euel Coats**

Mississippi State University,  
Mississippi State, Mississippi

**T**urf management practices prior to and following herbicide applications can influence control. Practices which encourage a healthy, vigorous turf are a critical part of a weed control program. However, a few temporary adjustments in a turf management schedule can increase the effectiveness of herbicides during application.

**1. Mowing** should be avoided three days prior to application of postemergence herbicides, as well as three to five days after application. Most postemergence herbicides work through the foliage. Insufficient surface exposure of the weed to the herbicide can result in poor control. Also, if the turf foliage is removed before the herbicide has time to enter the weed's system, control is also reduced.

Preemergence herbicides act through the soil, so mowing should not affect control.

Mow frequently to the recommended height. Under most conditions mow as high as your clientele will tolerate. Try not to mow more than one third of the height of the turf at one time. Keep mower blades sharp for a neat, clean cut without tearing or pulling the turfgrass plant.

**2. Cultivation and Aerification** should be done before applying preemergence herbicides to control weed seed brought to the surface in the process. Do not aerify following the preemergence application. Once soil is disturbed by aerification, the effectiveness of the preemergence is reduced.

**3. Withhold Irrigation** for two days after applying postemergence herbicides. Irrigation following preemergence herbicide or soil insecticide applications, however, is often recommended to "water in"

the herbicide into the thatch and soil.

Normally irrigation should be deep and infrequent to encourage deep rooting. Excess moisture can lead to turf disease, shallow root systems, *Poa annua*, and algae.

**4. Test Soil** for minerals, pH, and bulk density. Pesticide and fertilizer effectiveness and turfgrass vigor can be reduced by poor soil. Without correction, time and money are wasted. Contact the local Extension Agent for recommended soil conditions for your area and for testing facilities. Periodically check the pH of tank mixes since the effectiveness of certain pesticides depends upon pH. Guard against compaction by traffic control or frequent aerification.

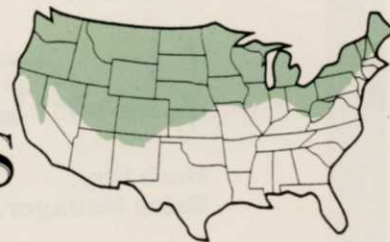
**5. Apply Proper Fertilizers**, but do not overfertilize. Maintain a dense turf but avoid thatch buildup with lush turf growth. Soil tests will tell you if you really need a complete fertilizer each time.

**6. Control Insects and Diseases** to prevent weed invasion.

**7. Select Competitive Turfgrass Varieties.** In the Sunbelt, Tifway for fairways and Tifgreen (328) for greens would be ideal for bermudagrass. Dwarf bermudagrasses do not afford the same competition to weeds. Tall turf-type fescues and zoysia are aggressive for the transition zone. Kentucky bluegrasses vary in aggressiveness for the North. Select one that is aggressive to prevent weed competition.

**8. Control Weeds.** Choose herbicides which are recommended and safe to use on your type of turfgrass. Be careful to apply them at the rates and in the manner specified on the label.

## TIMING PREEMERGENTS IN COOL SEASON GRASSES



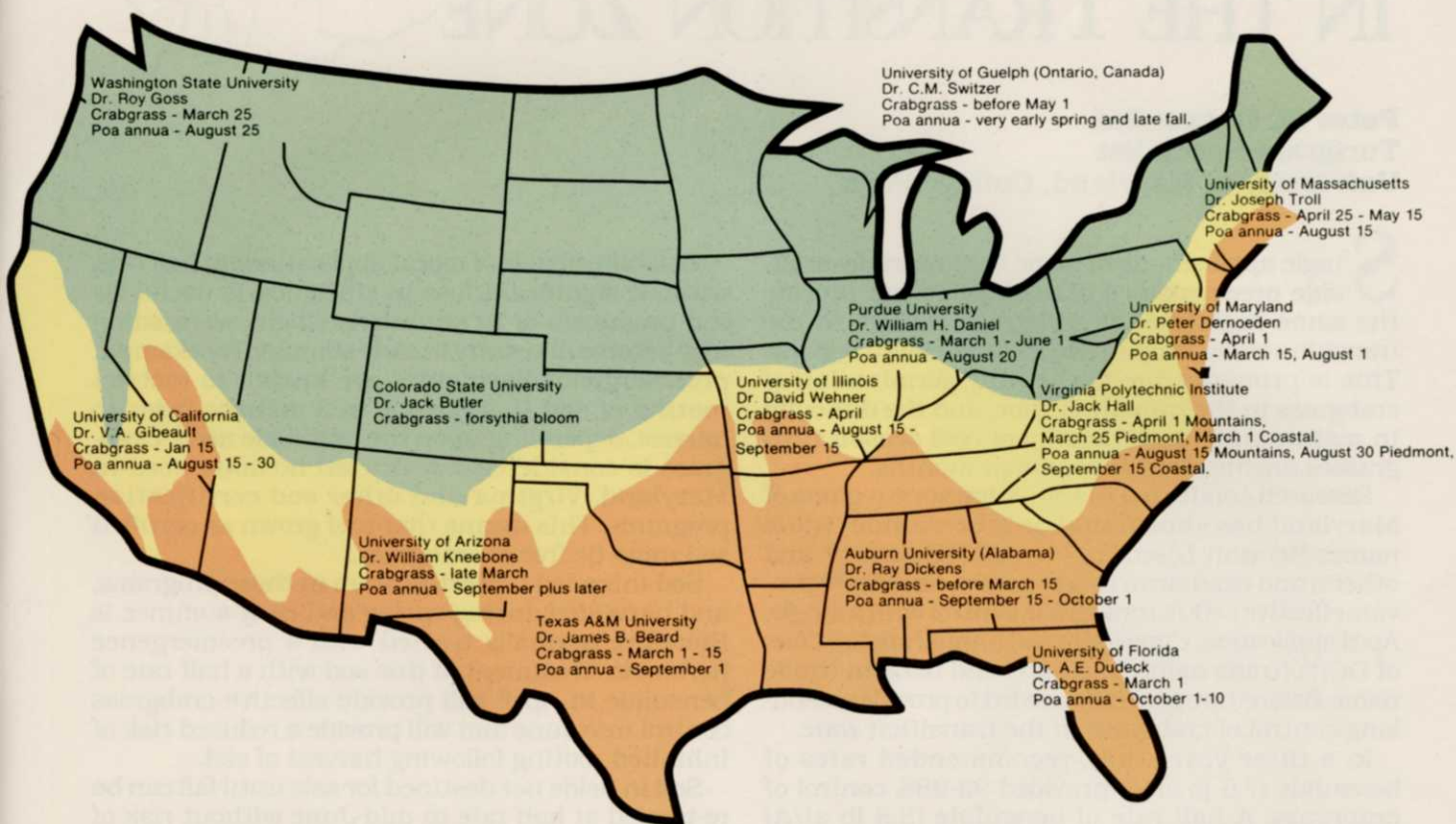
**T.L. Watschke**

Pennsylvania State University,  
University Park, PA

**I**t has long been recognized that effective control of summer annual grassy weeds can best be accomplished by using preemergence herbicides.

Proper application procedures and timing insure excellent control of a number of species (foxtails, smooth crabgrass, goosegrass, barnyardgrass) from several herbicide choices. However, many variables exist that can affect control; grass vigor, species, maturity, soil physical conditions, weather, and infestation level.

## Suggested Timing for Preemergence Herbicides To Control Crabgrass and Annual Bluegrass



### Application Timing

The most important aspect of successful preemergence control is correct timing of herbicide application. The chemical, such as Betasan®, must be present during the germination process to be effective. Therefore, application must be made seven to ten days prior to expected germination.

Regardless of the formulation used, rainfall is needed after application to disperse the active ingredient into the upper portion of the soil-thatch complex. If rainfall does not occur between application and germination, control may be substantially reduced. In some cases, irrigation may be required if rainfall does not follow within a few days of herbicide application.

Choosing an application date that is seven to ten days prior to germination should be based upon local experience. (See map for timing). Many use the biological index of petal drop of forsythia. While petal drop is usually indicative of approximately the correct timing, weather peculiarities during any given Spring may cause blossoms to be retained abnormally long or fall prematurely.

In situations where smooth crabgrass is expected

to germinate over a three month period, application of materials labeled for repeat applications should be made seven to eight weeks after the initial treatment. Repeat applications are unnecessary with Betasan.

If goosegrass is the target species, application of preemergence herbicides labeled for goosegrass control should be made approximately three weeks following the timing cited above for smooth crabgrass.

If annual bluegrass is the target species, preemergence applications should be made in mid-August for Pennsylvania. Check map above for timing in other areas. Annual bluegrass is a winter annual rather than a summer annual. Germination is predominately in the fall.

Combinations of fertilizer and preemergence materials in the liquid form are a common practice in professional lawn care. Soluble nitrogen sources can alter the solution pH and precautions should be taken to insure that the fertilizer-herbicide combination is compatible prior to preparation of large quantities. The activity of the herbicide may be affected through chemical alteration and/or precipitation in the tank.

## CRABGRASS CONTROL IN THE TRANSITION ZONE



**Peter H. Dernoeden**  
Turfgrass Specialist  
University of Maryland, College Park

Single applications of some commercially available preemergence herbicides do not provide the same high level of crabgrass control in the transition zone, compared to more northern regions. This is primarily due to the early germination of crabgrass in the transition zone, and the difficulty in maintaining good density of cool season turfgrasses during stressful summer months.

Research conducted in transition zone regions of Maryland has shown that only bensulide (trade names-Betasan, Lescosan, Pre-SAN®, Betamec®, and others) and oxadiazon (trade names-Ronstar®) provide effective (>90%) crabgrass control with a single, April application. Conversely, two annual applications of DCPA (trade name-Dacthal®) and benefin (trade name-Balan®) are generally needed to provide season-long control of crabgrass in the transition zone.

In a three year study, recommended rates of bensulide (7.6 lb ai/A) provided 93-98% control of crabgrass. A half rate of bensulide (3.8 lb ai/A) applied in early April and repeated in mid-June gave 90-95%.

Flexibility in use of repeat applications at half rate, without significant loss in efficiency, is useful for sod producers or in situations where overseeding may become necessary in early summer. For example, preemergence herbicides are known to restrict rooting of sod if applied 1 to 3 months prior to harvest, depending upon the herbicide used. Crabgrass is considered a restricted noxious weed in Maryland, Virginia and other sod certification programs. This means that turf grown as certified sod must be free of crabgrass.

Sod intended for certification in these programs, and harvested during spring and early summer, is therefore normally treated with a preemergence herbicide. Treatment of this sod with a half rate of bensulide in April will provide effective crabgrass control into June and will provide a reduced risk of inhibited rooting following harvest of sod.

Sod in fields not destined for sale until fall can be re-treated at half rate in mid-June without risk of significant crabgrass development during the remainder of the season. To be effective, however, it



*One application of bensulide in April provides season-long control of crabgrass in the transition zone.*

is suggested that bensulide be irrigated-in or applied within 24 to 72 hours of rain.

Bensulide applied in combination with napropamide (trade name-Devrinol®) or oxadiazon also effectively controls crabgrass. Registration of napropamide is expected soon. A bensulide-oxadiazon combination is available for use on turf. Currently, this product is labeled for use on bermudagrass, perennial ryegrass and Kentucky bluegrass.

**Bensulide** can discolor *Poa annua*, but **is safe to use on all turfgrasses**, and should only be applied to established turfs. Benefin, DCPA and oxadiazon are not recommended for use on fine-leaf

fescues (*Festuca rubra* and others), or bentgrasses (*Agrostis* sp.). While most preemergence herbicides are safe to use on warm season grasses (i.e. bermudagrass and zoysiagrass), oxadiazon is not recommended for use on zoysiagrass.

Only siduron (trade name-Tupersan®) may be applied in the seedbed at the time of seeding, or on seedling turf. Siduron is injurious to bermudagrass, particularly newly sprigged areas. Siduron has a short residual and does not provide effective, season-long control of crabgrass in the transition zone.

## TIMING PREEMERGENTS IN WARM-SEASON GRASSES



**B.J. Johnson**  
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Experiment, Georgia 30212

**C**ontrol of weeds in warm-season turf is a year-long process. Turf managers must develop weed control programs for both summer and winter.

### Summer Weed Control

The germination of crabgrass and goosegrass depends on soil temperature and other environmental conditions. In the Piedmont region of Georgia, crabgrass generally germinates by mid-March and goosegrass germinates by mid-April. Studies conducted just south of Atlanta at the Georgia Experiment Station resulted in optimum crabgrass control by Betasan when applied March 15. Crabgrass control was reduced slightly when Betasan was applied early in February and drastically reduced when treatments were delayed until April or May. The poor control from late treatments occurred because weeds had germinated and emerged before chemical applications were made. When Betasan was applied to the same area for two or more years, crabgrass control was effective when full rates were applied the initial year and followed by one-half rates the following year.

When crabgrass has already germinated, tank mixtures of MSMA with preemergence herbicides such as Betasan will improve weed control. The MSMA controlled emerged weeds while preemergence treatment prevented reinfestation from late germinating weed seed. It is important not to apply the combination treatments to St. Augustine, Centi-

pede, or other grasses not tolerant to MSMA treatments.

Registration of Devrinol for turf is expected this fall. Devrinol applied in March controlled crabgrass and goosegrass in both granular and wettable powder formulations. Single March treatment with granular Devrinol controlled a higher percentage of goosegrass than a single March application of the wettable powder. However, a second wettable powder treatment in May resulted in excellent goosegrass control.

The new turf label for Devrinol recommends an application of Betasan in sequence with Devrinol for maximum control of both crabgrass and goosegrass.

### Winter Weed Control

Since mild winters occur where warm-season grasses are grown, winter weeds are a continuous problem. Weed identification is important before selecting a preemergence herbicide because a single herbicide will not control all weed species. For example, Betasan was the only chemical that controlled parsley-piert in a study conducted in the Piedmont region of Georgia. However, the treatment must be applied in September or October to obtain effective control. In all instances herbicides applied in September or October controlled a higher percentage of winter weeds than when treatments were applied in July or August. The poor weed control from July and August treatments was related to high temperatures at time of treatment. It should be emphasized that when warm-season grasses are overseeded with cool-season grasses in the fall, preemergence treatments must be applied at least 60 days before planting.

## SOD WEBWORM AND CHINCHBUG CONTROL

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Sod webworms and chinchbugs are two thatch-inhabiting insect pests capable of inflicting visible damage to turfgrasses. Control of these pests is readily achieved by timely detection and treatment with effective insecticides.

### SOD WEBWORMS

The term sod webworm includes a variety of species. The extent of injury from this group of pests varies with the species and location of occurrence.

Sod webworm adults are the small, grayish-white to beige moths with a wingspread of 3/4-inch fre-

quently seen flying over lawns at dusk or just after dark. The moths do not damage turf.

Sod webworm larvae are caterpillars varying in color from greenish to beige, brown or gray, depending upon the species. When mature, they are 3/4-inch long and most have characteristic dark circular spots scattered over the body length. As the larvae mature, they construct tunnels or burrows through the thatch, sometimes extending into the soil.

Feeding and consequent damage occurs at night. If feeding is extensive during dry weather, the plants may be killed.

**Life Cycle.** Female moths drop their eggs on the turf as they fly over the turf at dusk. Eggs hatch in a week to 10 days. About six weeks are required for development from egg to adult. The most common species on northern turfgrass, the bluegrass webworm and large sod webworm, have two generations each year and overwinter as larvae in silken webs

## DETECTION OF INSECTS IN TURF



*Pyrethrins and water sprinkled over turf will bring webworm larvae to the surface.*

*Flooding an area of turf inside a coffee can results in reliable chinchbug counts.*



**Sod Webworm.** Flocks of birds (particularly starlings) that frequently return to a turf area usually mean that sod webworms or other larvae are present. Further evidence of bird activity is probe holes left by the birds searching for larvae. Close examination of the turf in such areas either reveals larvae, or the green pellets of excrement (frass) left by them.

An effective method of detection is to mix one tablespoon of 1 to 2% pyrethrins (a common garden insecticide) in one gallon of water and apply the solution uniformly over one square yard of turf. The solution irritates the larvae which soon come to the surface. This is for detection only, not control.

**Chinchbug.** Infestations of chinchbug are often masked by the general droughty appearance of turfgrass when under moisture stress. If adults are present, they are often seen wandering across sidewalks or driveways on warm afternoons. Close examination of the turfgrass, particularly thatch, usually exposes the insects.

Another effective method of detection is to remove both ends of an empty coffee can, cut the rim off one end to produce a sharp edge and push the can two or three inches into the soil in an area where chinchbugs are suspected. Fill the can with water and wait a few minutes. If chinchbugs are present, they will float to the surface. The tiny red nymphs may be difficult to see, especially for those color blind to red.

# BETASAN®. THE NUMBER ONE ANSWER TO YOUR NUMBER ONE PROBLEM ALSO CONTROLS EIGHT OTHERS.

It's no secret that Betasan® is the best pre-emergence herbicide in the business for knocking out crabgrass before it starts. In test after test, Betasan has proven best. Year after year. Little wonder more turf care professionals choose it over any other brand.

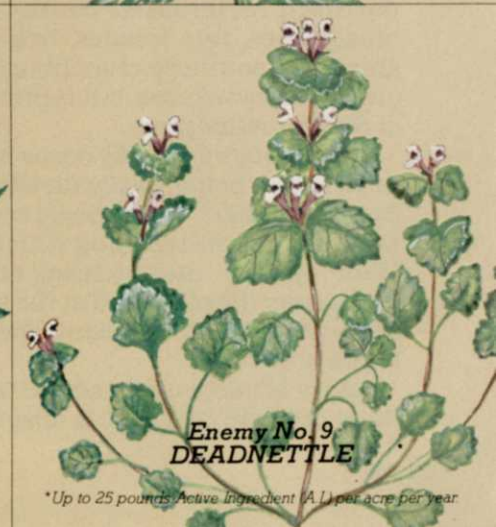
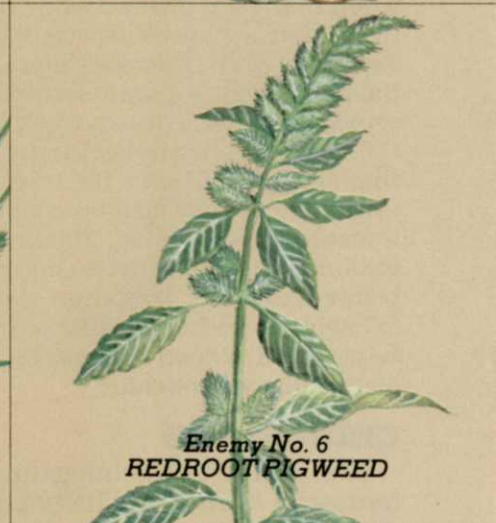
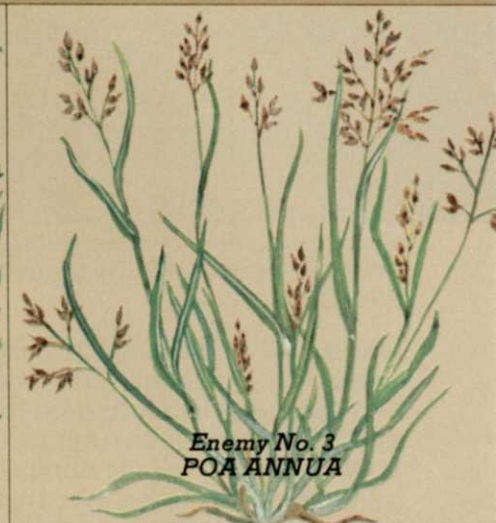
But crabgrass isn't the only tough weed Betasan can eliminate from your course. If you use Betasan at a lesser rate, you can safely make multiple applications\* and achieve near-perfect control of all the pest weeds and grasses shown here.

Especially goosegrass and poa annua.

Betasan is safe and effective on established bluegrass, fescue, bentgrass, perennial rye, Bermuda grass, Zoysia, bahia, centipede, St. Augustine and dichondra.

So to eliminate all these golf course enemies before you — or your members — ever see them, ask for Betasan. Always follow label directions carefully. Stauffer Chemical Company, Agricultural Chemical Division, Westport, CT 06881.

**BETASAN®** Stauffer  
No. 1 Against Crabgrass



Circle No. 130 on Reader Inquiry Card

\*Up to 25 pounds Active Ingredient (A.I.) per acre per year



Successful control of insect damage is evident in treated areas of this lawn. Untreated areas are damaged.

within the thatch. In southern climates, species such as the tropical sod webworm have several overlapping generations each year. In south Florida, generations continue through the year.

**Control.** When large numbers of sod webworm moths are seen flying over turf just after dark or when many are flushed while mowing, an infestation of larvae may be expected. Insecticide, such as Aspon<sup>®</sup>, applied two weeks after the moth population has decreased to a scattered few is effective in preventing damage. The two-week delay allows time for the eggs deposited by the moths to hatch into larvae that are then killed by the insecticide.

Insecticide may also be applied anytime a larval infestation is detected. Maximum effectiveness is obtained when the turf is thoroughly irrigated just before treatment. Irrigation *should not* be applied following liquid applications, but the turf *should be* irrigated as soon as possible after the application of granular insecticide.

## CHINCHBUGS

Two species of chinchbugs are considered important pests of turf. The hairy chinchbug, a pest of northern turfgrasses, causes severe damage to bluegrasses, fine fescues, bentgrass, and zoysiagrass. The southern chinchbug feeds on bermudagrass and zoysiagrass, but is primarily a serious pest of St. Augustinegrass.

Chinchbugs generally occur in scattered patches rather than being evenly distributed over the turf. Sunny areas are most heavily infested with populations sometimes reaching 200-300 per square foot. Plant injury occurs as a result of the insect sucking fluids from the plant and at the same time injecting salivary fluids into the plant. The turf wilts and then turns brown.

Injury is particularly severe when heavy infestations occur in turf that is dormant from moisture

stress. Such dry conditions are particularly conducive to chinchbug growth and population development.

Adult chinchbugs are 1/5 inch long, black with white wings folded over the back. The wings of some extend to the tip of the abdomen, but others extend only halfway to the tip. The nymphs (immature stages) range from 1/20 inch long, soon after hatching, to nearly the size of an adult. Upon hatching, nymphs are bright red with a distinct white band on the abdomen. Their color changes first to orange, then orange-brown, then black as the nymph goes through five growth stages. Each of these stages inflicts injury on the turf.

**Life Cycle.** Adult chinchbugs insert eggs in or on the lower leaf sheaths of grasses, stolons or in the thatch. The number of eggs laid is known to range from 233 to 289 per female.

The development of eggs and stages thereafter is directly dependent upon temperature—and therefore location—in the United States. One generation may take six weeks at 83°F and 17 weeks at 70°F. In south Florida and Louisiana, generations may be continuous with up to seven per year; three to four generations in north Florida; two generations in Ohio; and one in an area such as Rochester, N.Y.

In southern regions, chinchbugs remain active during the winter months, but in northern areas they become inactive and go into a resting state. In Ohio, these adults become active again in March and early April, laying eggs in May that develop into damaging populations in July and August. They produce another generation in September which develops into adults that overwinter in the turf or nearby sheltered areas.

While some adult chinchbugs are capable of flight, crawling is their usual means of mobility.

**Control.** Infestations of chinchbugs may be treated with insecticides, such as Aspon with up to 90-day control, anytime they are detected. Turfgrasses should be monitored closely during droughty periods to detect infestations before injury occurs.

Both liquid and granular forms of insecticide are effective. Irrigation before treatment helps maximize control. If a low volume of spray is applied (2 gal. or less per 1,000 sq. ft.) a light syringing or irrigation immediately after treatment helps wash the insecticide off the grass plant and into the thatch where chinchbugs live. Irrigation after treatment is usually not necessary when higher volumes of spray are applied. The turf *should be* thoroughly irrigated after applying granular formulations.

**NOTE - Insecticides are commonly labeled for control of both chinchbugs and sod webworms. Since summer infestations of the two pests often occur simultaneously, application of insecticide for control of one usually controls the other.**



# Ornamental

## WEED CONTROL IN GROUND COVERS

**Kent W. Kurtz**

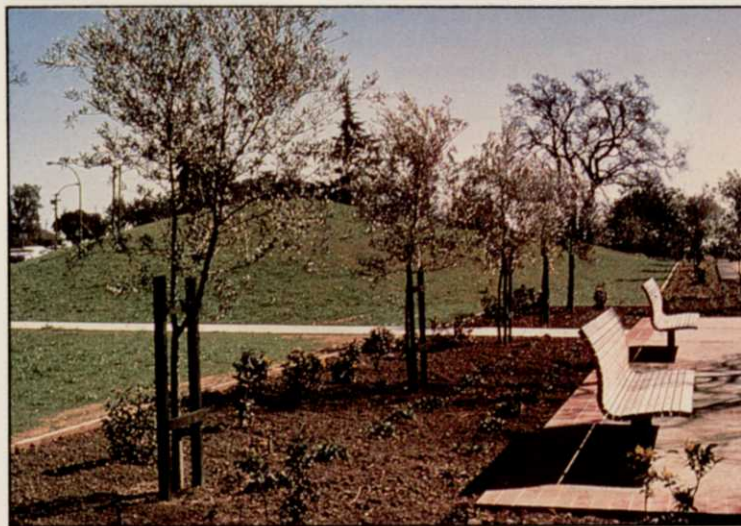
Professor of Horticulture  
California Polytechnic Institute  
Pomona

Ground covers are generally referred to as plants that cover slopes, open beds or serve as border plantings and grow to one foot in height or less. Most ground covers are perennials, evergreen and have growth habits that are trailing, spreading or clumping in nature. Most ground covers require a considerable amount of work and attention during their initial period of establishment. Depending on the vigor of the species and how rapidly they cover the ground, they are usually planted at spacings ranging from 12 to 36 inches. The popularity of ground covers in the urban landscape is due primarily to the wide array of different textures and colors available. Ground cover popularity is also determined on the uniformity, density and attractiveness of the plant material in covering open soil areas.

During the period when new plantings are becoming established, sunlight has the opportunity to reach the open soil areas and this favors the growth of weeds. Weeds thrive and compete with the ground covers for available moisture, nutrients and sunlight. Whenever the ground cover reaches the proper density and thickness, it shades the open soil surface thereby eliminating the environment for sprouting annual weed seeds. The most troublesome weeds are the perennials which include several grasses and broadleaf types. Perennial weeds require a sound program of weed control and management. To be effective, weed control in ground covers should utilize management techniques designed to reduce the weed population. These techniques include a thorough pre-plant clean-up, proper selection of the correct plant material, mechanical cultivation, and various types of mulches and chemical treatments.

### Sound Cultural Practices First

The landscape manager should first utilize sound cultural practices such as thorough cultivation and removal of debris from the site selected. This should be followed by one or several irrigations to allow weed seeds to germinate and then additional cultivation to exhaust the seed reservoir in the soil. Weeds that are more difficult to eradicate may require a post emergent herbicide or fumigation in addition to the cultivation.



*Highly visible plant beds require less maintenance after fumigation and application of preemergence herbicides.*

### Pre-plant

**FUMIGATION.** Fumigation may be used to kill seedlings of both annual and perennial weeds and weed seeds in the soil on both new sites and in established plantings. This method usually destroys the growth of any plants in the area so clean, fresh plant material is required to replant the ground cover bed. Fumigation is not recommended on slopes since the gas moves down the slope and does not control seeds at the top. Materials used for fumigation are limited to two materials: Methyl bromide (a highly toxic gas that requires a covering of a gas-tight plastic material) and metham (Vapam® which is a liquid material that is mixed with water and may require a vapor-proof covering like water). Methyl bromide must be applied by certified pesticide applicators.

### Post-plant

**PREEMERGENCE CONTROL.** Preemergence herbicides control primarily annual weeds as they are germinating from seed. Some are applied directly to the soil surface while others work best if they are incorporated into the soil. Many preemergence herbicides can affect the rooting ability of the ground cover, therefore, it is important to place the plant deep enough to avoid the chemical from coming into contact with the plant's root system.

Several compounds are recommended for pre-emergence control of weeds in ground covers; including Devrinol and Eptam®.

# Ornamental

## Postemergence Control

Since mechanical cultivation will not control or eliminate many perennial weeds, a postemergence herbicide may be necessary to reduce the weed population. Basically there are two herbicides which are used to control persistent perennial grasses such as Quackgrass, Dallisgrass, johnsongrass and bermudagrass and these include: Glyphosate (Round-up® systemic weed and grass killer) and dalapon (Dowpon®). However, it should not be applied over

the top of most ground covers.

The herbicide diphenamid (Enide®) may sometimes be used also as a post-emergence control for young grasses if the plants do not exceed 3 inches in height. Additionally, two commercial fertilizers are sometimes used to control weeds in specific ground covers such as iceplant (*Carpobrotus edulis*). These fertilizers include ammonium sulphate and magnesium chloride.

## GARDEN FUMIGATION

### New opportunity in landscape maintenance.

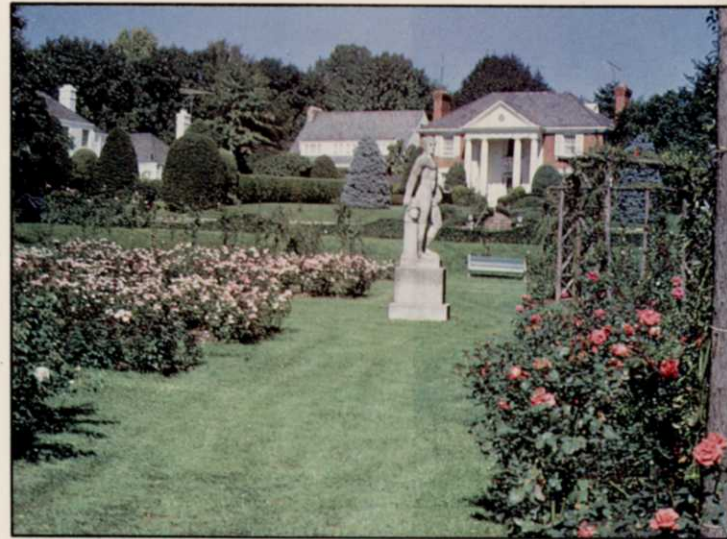
**Francis R. Gouin**  
Department of Horticulture  
University of Maryland  
College Park, Md. 20742

All newly established gardens are plagued with weeds and soil born insects during their first 2 to 3 years of establishment. Turning under of sod or debris from neglected gardens is certain to create severe weed and grub or wireworm problems especially during the first year of gardening unless the soil is fumigated.

Our soils are infested with billions of weed seeds, roots and bulbs of perennial weeds and eggs or larvae of insects. Soils that have been gardened with the same crops for many years often become infected with virulent strains of fungus organisms that reduce yields.

Plowing, liming, fertilizing or adding compost to garden soils all make conditions favorable for seeds, roots and bulbs of annual and perennial weeds to germinate and grow. The most effective immediate control of such weed problems is to fumigate the soil before planting. Fumigating will also kill the eggs and larvae of insects, nematodes and soil born diseases. Because these fumigants are most active when soil temperatures are 60° or above, they may be applied in the fall while soils are still warm or in the spring as soon as the soil warms sufficiently.

Soil fumigants, such as Vapam, have been used for many years by nurserymen, growers of small fruits and vegetables. Soil fumigants leave no residues when they are properly used at recommended tem-



*Most homeowners don't have gardens like this, but they might welcome assistance with weed control from landscape maintenance firms in their gardens.*

peratures and aerated as recommended by the manufacturers. For maximum effectiveness, the soil should be thoroughly tilled, lime and compost amendments added before fumigating. After the soil has been fumigated and aerated, care should be taken to avoid digging deeply into the soil to prevent bringing to the surface unsterilized soil. Depending on the method of sterilization, only a 6" to 8" layer of soil is sterilized. Care should be taken to avoid sterilizing soils near desirable plants. Soil fumigants are nonselective and will kill desirable as well as undesirable plants.

The cost of fumigating soil is relatively inexpensive when one considers the advantages of weed free gardening and the increase in yields that have been reported. There are no weeds to compete with the desirable plants for water, nutrients and light; no insects to chew the roots or eat the stems; and no diseases to infect the roots and kill the plants.

Fumigating home owner gardens could be a new income source for landscapers and lawn care professionals. The suburban dweller in most cases would prefer a service perform this duty for a fair fee.