Cultural Practices and Herbicide Effectiveness

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Turf 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.

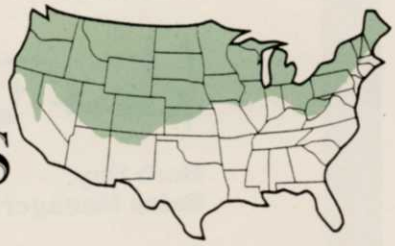
5. Apply Proper Fertilizers, but do not overfertilize. Maintain a dense turf but avoid thatch buildup with lush turf growth. Soil tests will tell you if you really need a complete fertilizer each time.

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



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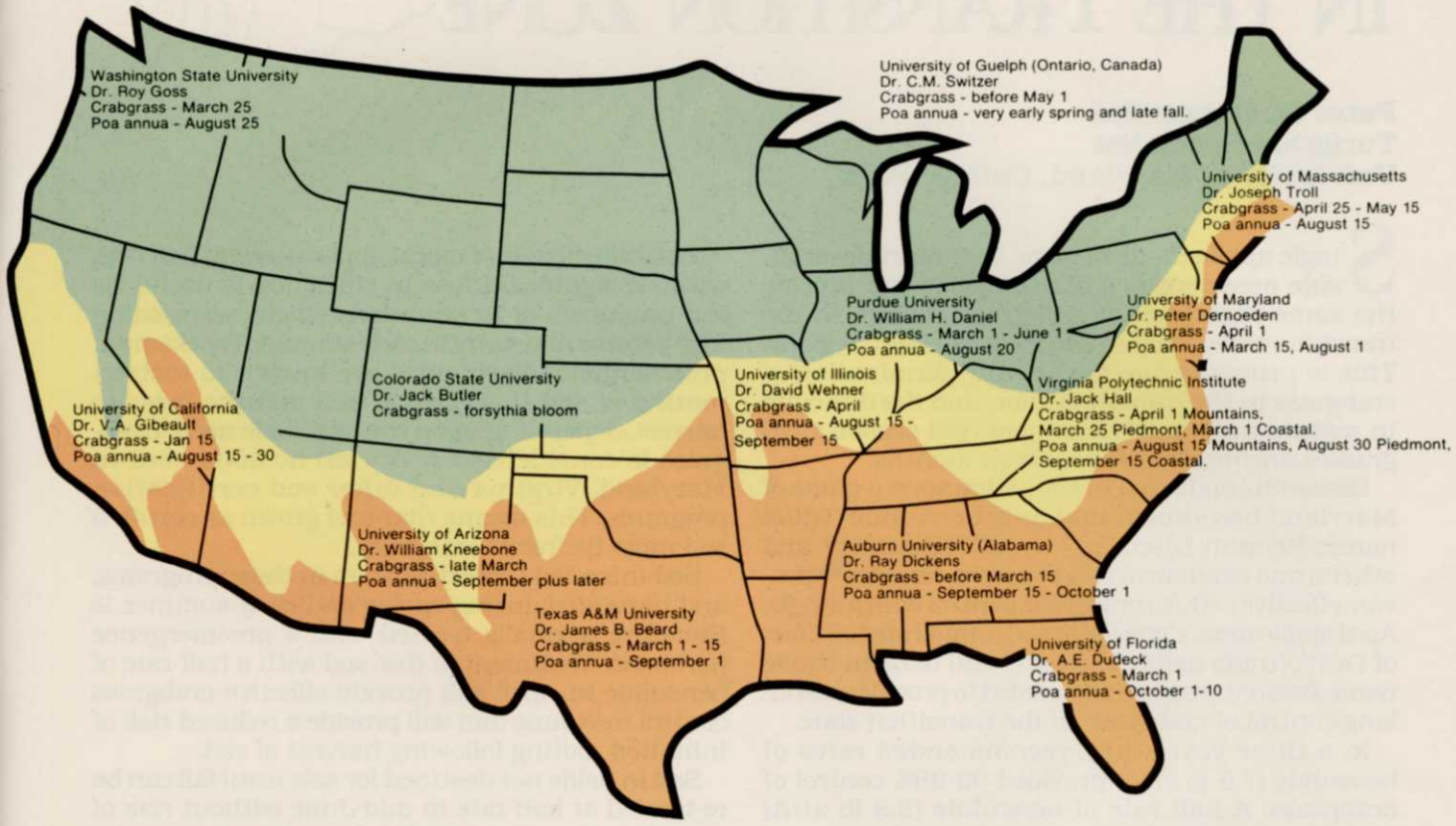
It has long been recognized that effective control of summer annual grassy weeds can best be accomplished by using preemergence herbicides. Proper application procedures and timing insure excellent control of a number of species (foxtails, smooth crabgrass, goosegrass, barnyardgrass) from several herbicide 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 unnecesary 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

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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

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Control 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, Centipede, 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 ¾-inch frequently 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 ¾-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.

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®, 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 there-after 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.