

Prevention and Control of CRABGRASS IN LAWNS

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No planting adds more to the beauty of a home than a well kept lawn. Infested with crabgrass, lawns often become unsightly and a source of discontent to homeowners. Recognizing the value of good lawns and turf and the importance of the problem that crabgrass can create, we have investigated some of the means of crabgrass control useful to Connecticut residents. Our results and comparisons with results elsewhere are reported herein.

The results presented here are the best information that is currently available. However, the weed killers under discussion are relatively new. Little is known about the specific conditions that produce injury. Conditions leading to injury cannot be predicted. Being weed killers, they are by definition more toxic to some plants than to others. They can be expected to be toxic to foundation plantings, flowers, and other garden plants, though the extent of their toxicity to such plants is unknown.

Management or control of any plant properly begins with some understanding of its growth habit. Two species of crabgrass originally introduced from Europe are common in turf areas—small crabgrass (*Digitaria ischaemum*) and large crabgrass (*Digitaria sanguinalis*). Both are annual grasses, developing from seeds each year. Small crabgrass, with smooth stems, has a prostrate habit of growth, and is therefore difficult to mow. Large crabgrass has hairy stems and a more upright habit. Both species spread by stolens or creeping stems; consequently during a growing season a relatively few plants may eventually cover wide areas of lawn.

Crabgrass seeds begin to germinate in the spring when the soil warms up, usually during early May in Connecticut. Germination continues throughout the summer as long as moisture is adequate in the upper layer of soil. Crabgrass thrives during hot weather but is easily killed in the fall by the first hard frost. Seed production begins in midsummer or later as the plants mature, and continues until frost.

CULTURAL CONTROL OF CRABGRASS

Crabgrass control begins with cultural practices known to favor desirable lawn grasses. Crabgrass does not invade a dense turf. Good management is the most desirable means of crabgrass control and usually the least expensive, often controlling other weeds and disorders of turf as well. (Turf diseases and disorders are discussed more fully in Circular 208 of this Station.) Among the important management practices influencing the invasion of crabgrass in lawns are seeding, mowing, watering, and fertilizing.

Seeding

Late summer and fall seedings of turf are more successful in preventing crabgrass invasion than spring seedings, because the turf is usually thicker at the time of crabgrass germination. Spring seedings should be made as early as possible after the frost has left the ground and watered heavily in dry periods to stimulate growth. Adequate fertilization before seeding is essential in promoting vigor of new seedlings.

Mowing

In bluegrass and fescue lawns, close mowing decreases the vigor of the turf grasses and allows more light to strike the soil, raising the soil temperature and promoting germination of crabgrass. Mowing at heights of 1½ inches or higher in the spring and early summer helps to prevent invasion of crabgrass. Later in the season, however, one or two close mowings, designed to cut off the crabgrass seedheads in their early stages of development, decrease future infestations.

Watering

Watering lawns only when necessary—and then heavily—benefits the turf grasses more than the crabgrass. Frequent light waterings encourage crabgrass germination and growth.

Fertilizing

Fertilization in the fall and early spring encourages vigorous growth of turf grasses and causes them to spread at a time when crabgrass is inactive, preventing future invasion of crabgrass. Fertilization during the summer, however, when crabgrass is vigorous and the turf grasses relatively inactive, greatly encourages the crabgrass. Soil tests can be used to determine the fertilizer and lime requirements.

CHEMICAL CONTROL OF CRABGRASS

Over the past few years, promising chemicals have been developed for the control of crabgrass in turf. Several of these materials were tested at this Station during the 1960 season and at other Experiment Stations throughout the Northeast. Two types of chemicals are available,

those which control crabgrass after it is growing (post-emergence), and those which control crabgrass in its early stages of germination and growth (pre-emergence).

Plots at this Station were established in turf areas that were infested with crabgrass the previous season. Chemicals were applied before or after emergence of crabgrass and just after seeding one area in late April. The materials were applied with a lawn spreader calibrated for each material, a knapsack sprayer, or a watering can. To evaluate the results, stands of crabgrass in treated plots were compared with stands in adjacent untreated plots.

Post-emergence Herbicides

Experimental results. Applications of DMA (disodium monomethyl arsonate) in granular and liquid forms and AMA (ammonium monomethyl arsonate) were made on crabgrass in turf consisting largely of Kentucky bluegrass. The crabgrass was in the 2- to 3-leaf stage when treatments were first applied.

DMA was applied at a rate of 4 lbs. per acre on June 17 and again on July 12 in one set of plots and on June 13 and again on July 12 in another set of plots. Following one treatment, DMA resulted in 95 per cent control of crabgrass on July 11, but no control was evident in September. With the second application DMA resulted in 30 to 40 per cent control in September. No serious injury to the bluegrass resulted. It was obvious that new crabgrass germinated and replaced that killed by the early treatment. Additional treatments would have been necessary to control crabgrass adequately in 1960.

AMA was applied at a rate of 3½ lbs. per acre on June 27 and on July 12. Following the first treatment, about 50 per cent control of crabgrass was evident on July 11 and about 70 per cent control in September. With a second application on July 12, about 79 per cent control was evident in September. There was no serious injury to the turf.

Comparisons with results elsewhere. Although DMA and AMA failed to control crabgrass satisfactorily for the entire season in our tests, both markedly reduced the crabgrass population following treatment. Other workers have noted that both materials usually are satisfactory when used in accordance with label directions. Three or more treatments at 7- to 10-day intervals are often required for satisfactory control of crabgrass. Dense stands of crabgrass may be difficult to control with DMA and AMA and turf discoloration sometimes results.

Other materials tested elsewhere for post-emergence control of crabgrass include PMA (phenyl mercuric acetate) and KOCN (potassium cyanate). PMA and KOCN frequently have injured turf and KOCN has been less effective than DMA and AMA on young crabgrass.

The arsonates and phenyl mercuries are poisonous to humans and pets, and therefore adequate precautions should be taken in their use.

Pre-emergence Herbicides

Experimental results. Applications of several pre-emergence herbicides were made on established turf consisting largely of Kentucky bluegrass, with some redbud, red fescue, and bentgrass in the mixture.

To encourage the invasion of crabgrass in the test areas, the turf was mowed short (¾ to 1 inch high) during May and June and slightly higher thereafter. This, combined with moist weather conditions and a good natural seeding of crabgrass in 1959, resulted in uniform stands of crabgrass for comparisons of herbicides.

Zytron (0-2,4 dichlorophenyl 0-methyl isopropylphosphoramidothioate) and dacthal (dimethyl 2,3,4,6 tetrachloroteraphthalate) were relatively new chemicals which had shown promise in tests at other Stations in 1959.

Three other materials were obtained commercially. Among these were Halts, containing chlordane as the active ingredient; Pax, containing a mixture of arsenicals, ammonium sulfate, and insecticide; and No Crab, containing calcium arsenate as the active ingredient for the control of crabgrass and a small amount of 2,4-D and silvex (2,4,5-TP) for the control of broadleafed weeds. An emulsifiable formulation of chlordane also was used; when this was applied with a watering can, control of crabgrass was unsatisfactory. (Watering-can application did not result in proper distribution of the chemical.)

The results obtained with these herbicides, applied on April 28 or 29 before crabgrass emergence, or on May 17, at about the time of crabgrass emergence, are shown in Table 1.

TABLE 1. Crabgrass control with pre-emergence herbicides in Connecticut, 1960

| Herbicide | Rate active ingredient lbs./acre | Date applied | Average control of crabgrass (per cent) | Rating of crabgrass control in Sept. | Turf injury |
|------------------|----------------------------------|--------------|---|--------------------------------------|----------------------------|
| Zytron | 10 | 4/28 | 90 | satisfactory | none |
| | 20 | 4/28 | 96 | excellent | none |
| Dacthal | 7.5 | 4/28 | 93 | satisfactory | none |
| | 10 | 4/28 | 97 | excellent | none |
| Calcium arsenate | 370 | 5/17 | 61 | unsatisfactory to excellent† | none |
| | 555 | 5/17 | 99 | excellent | Kentucky bluegrass: slight |
| Chlordane | 60 | 4/28 | 54 | unsatisfactory | none |
| | 120 | 5/17 | 53 | unsatisfactory | none |
| Pax | 784° | 4/28 | 29 | unsatisfactory | none |

° Rate of Pax per acre.

† Crabgrass control was excellent where calcium arsenate was applied at the time of or just prior to crabgrass emergence, but control was poor where it was applied after considerable crabgrass had emerged.

Dacthal and zytron provided excellent seasonal control of crabgrass with no injury to the turf. Although the zytron plots looked slightly greener than the dacthal plots in September, the two materials were about equal in other respects. Both materials also were tested on bentgrass (variety C1-C19) in July and had caused no injury 3 months later.

Calcium arsenate provided excellent control of crabgrass when applied before or at the time of crabgrass emergence but did not control emerged crabgrass. The higher rate of calcium arsenate, (1½ times the dosage suggested on the bag), caused thinning of the Kentucky bluegrass early in the summer but this was less evident in the fall.

Neither chlordane at 60 lbs. per acre nor Pax, applied pre-emergence on April 28, was satisfactory for the control of crabgrass. It must be noted, however, that due to an error in calibration Pax was applied at about 87 lbs. per acre less than the amount suggested on the bag. This may have contributed to the poor results obtained with Pax. No injury to the turf was observed with chlordane or Pax and the Pax plots were noticeably greener for about 2 months because of the fertilizer ingredient.

Chlordane was applied on May 17 to determine the tolerance of the turf to a double dosage. Although the turf was not injured, control of crabgrass was unsatisfactory.

When applied immediately after seeding an area to a mixture of Chewings fescue, Kentucky bluegrass, Colonial bentgrass, and annual ryegrass on April 28, none of the treatments listed in Table 1 was satisfactory. Zytron and dacthal severely injured the new seeding and chlordane and Pax failed to control the crabgrass. A calcium arsenate treatment at 370 lbs. per acre, applied 3 weeks after seeding, severely injured the turf seedlings and also failed to control crabgrass. The net result in the fall from all treatments applied immediately after seeding was a poor stand of turf, due either to the toxicity of the chemical or the suppression by crabgrass.

Discussion and comparisons with results elsewhere. Results obtained in control of crabgrass at this Station are similar to results obtained at other Stations during the 1959 and 1960 seasons. At other Stations, however, considerable injury to certain species of established turf grasses was noted with most materials.

Zytron in our tests provided excellent control of crabgrass with no detectable injury to mixed stands of bluegrass, fescue, and bentgrass. At other Stations in the Northeast, crabgrass control with granular zytron at 15 to 20 lbs. per acre has ranged from about 70 to 100 per cent and was considered good to excellent in all but one test. Treatment time does not appear to be critical with this material provided it is applied before the crabgrass emerges.

In tests on Long Island, fall applications of zytron also have shown promise for crabgrass control the next season. Zytron has injured fescue grasses and bentgrass grown in pure stands, whereas Kentucky and Merion bluegrass have been quite tolerant. In mixed stands, where Kentucky bluegrass often predominates, injury to fescues often has gone unnoticed because of the stimulation of the bluegrass resulting from crabgrass control.

Dacthal provided crabgrass control equal to that of zytron in our tests, with no visible injury to mixed stands of turf. In at least 14 tests

throughout the Northeast during 1959 and 1960, crabgrass control with dacthal has ranged from good to excellent, depending somewhat upon rate and time of application.

Results with dacthal have been best when it was applied before germination of crabgrass. Applications at the time of, or just after crabgrass emergence, have been less effective. Fall applications have also been effective in some tests. Like zytron, dacthal has injured red fescues and Colonial bentgrass in pure stands and occasional injury to fescues has been noted where this species made up a large part of the turf mixture. Although some of the injury has been slight, severe thinning of fescue turf has been noted by several workers. This injury usually is greater than that caused by zytron.

When applied before crabgrass emergence, calcium arsenate provided excellent control at this Station in 1960, but injury to Kentucky bluegrass was noted at a higher dosage (555 lbs./A). At other Stations, calcium arsenate has provided equal, slightly better, or slightly poorer crabgrass control than dacthal and zytron.

Spring applications of calcium arsenate have been more effective than fall applications, and April applications more effective than May applications. Our tests have shown that higher rates are required for satisfactory control when applied at the time crabgrass is emerging in May. Injury to Kentucky bluegrass has been observed here and in New Jersey with calcium arsenate and injury to fescue and bentgrass was observed with higher rates applied in Pennsylvania. Serious injury to turf grasses also has been reported in Massachusetts. In most cases, however, turf injury from calcium arsenate was slight to moderate but not serious. Some workers have reported no detectable injury. Because of the high dosages required and the long residual activity of calcium arsenate, it may be anticipated that this material will pose more of a toxicity problem with repeat applications than dacthal or zytron.

In our tests, chlordane provided unsatisfactory control of crabgrass. At most Stations, chlordane at 60 to 70 lbs. per acre provided 35 to 80 per cent control of crabgrass, which generally was considered unsatisfactory. Higher rates (80 to 120 lbs./A) have provided good to excellent control in some tests and poor control in others, the results being somewhat variable. Applications in early spring, well before crabgrass emergence, seem to be most effective. No injury has been observed with granular formulations of chlordane on the common turf species. However, the emulsifiable concentrate, which generally has provided poor control of crabgrass, occasionally has caused turf discoloration.

Lead arsenate and Pax (a mixture of lead arsenate, arsenous oxide, nitrogen fertilizer, and insecticide), when used at rates of 800 to 1080 lbs. per acre also have been variable with respect to crabgrass control. Results have varied from poor to good with these materials but usually were poorer than with zytron, dacthal, or calcium arsenate. Fall or early spring applications appear best for lead arsenate and Pax. Pax has injured Kentucky bluegrass in some tests, probably because of the high nitrogen content. In some tests dead patches in the turf have resulted; in others only slight injury.

None of the pre-emergence herbicide materials mentioned has been completely satisfactory for use on newly seeded turf. Only chlordane appears safe enough for turf seedlings and even this compound may

reduce the turf density if crabgrass is controlled. However, studies so far indicate that areas may be reseeded in the fall, following spring use of the pre-emergence herbicides.

The arsenicals and chlordane are poisonous to humans and pets and adequate precautions should be taken in their storage and use. This may involve watering the material into the turf. Zytron and dacthal are relatively non-poisonous and constitute less of a hazard. Information on precautions and rates of application are given on the herbicide label.

Where narrow strips of turf were missed with the lawn spreader in applying pre-emergence herbicides, crabgrass grew vigorously. To obtain good control of crabgrass, all of the area must be treated, usually by overlapping slightly.

Most pre-emergence materials tested have multiple uses, such as Pax, which is intended for fertilization and the control of insects as well as the control of crabgrass. The arsenicals in general are effective against grubs and also common chickweed. Chlordane is effective against insects and zytron is reported to have some effect on grubs. (See Circular 212 of this Station.)

IN BRIEF

Crabgrass may be controlled to a large extent by management practices aimed at increasing turf vigor. A number of chemicals also offer promise for controlling crabgrass in established turf, but even with these 100 per cent control may be difficult to attain.

Post-emergence crabgrass killers, such as DMA (disodium monomethyl arsonate) and AMA (ammonium monomethyl arsonate) can kill crabgrass seedlings with little or no turf discoloration, but repeat applications are required for seasonal control. Under certain conditions (high dosages and high temperature) turf discoloration can be severe. Both of these materials, and all other arsenical compounds are poisonous to man and animals and must be used with caution.

Of the pre-emergence herbicides tested, zytron, dacthal, and calcium arsenate have been most promising. When applied in the fall, and particularly when applied in the early spring, these materials have provided satisfactory control of crabgrass for a full season. However, zytron and dacthal have been injurious to red fescue and bentgrass in some tests, and calcium arsenate sometimes has injured bluegrass and fescues. Uniform and timely application is essential for best results with these materials. Observations of test areas treated in 1960 will be continued in 1961 to determine carry-over effects, if any, on crabgrass and lawn grasses.