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ROUNDUP New Knockdown Herbicide

John A. Meade, Extension Specialist in Weed Science, Cook College, Rutgers University

Monsanto has developed glyphosate, a new herbicide for broad spectrum control of weeds. It is being sold under the trade name, ROUNDUP. This herbicide is active only as a postemergence treatment; that is, it must be applied to plant foliage to be effective. It is not active in the soil and hence doesn't control weed seeds.

ROUNDUP has a low order of toxicity and is safe to use. There is a chance of eye irritation so goggles should be worn when mixing or spraying ROUNDUP.

It is presently labeled for nonagricultural uses such as railroad, pipeline, and similar rights-of-way; also for fences, industrial plant sites, parks, golf courses, and other public areas.

Its agricultural label is limited to treatments on nonbearing deciduous fruit, small grains, corn, and soybeans.

The major advantages of ROUNDUP are its low toxicity, effective control of annual and perennial weeds (including vines) and no residual activity in the soil.

SOD RENOVATION

While not specifically labeled for sod renovation, research indicates that it will be very useful. The herbicide was applied at the rate needed to control the weed species present. This varies from 1 lb./A acid equivalent for young annuals to 3 lb./A acid equivalent for hard-to-control brush. The injury symptoms show in two to three days for young annuals and seven to 10 days for perennials. There should be an interval of one week between application and tillage of the soil. This allows time for the chemical to translocate into the underground root stocks and effect more permanent kill. Since there is no effective residual control, the area can be reseeded immediately.

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Leaf Spot And Melting-Out Of Kentucky Bluegrass Turf

Philip M. Halisky and C. Reed Funk, Professors, Cook College, Rutgers University

Leaf spot and melting-out caused by *Helminthosporium vagans* is a destructive disease of Kentucky bluegrass turf throughout the Northeast. More than 45 years have elapsed sance Charles Drechsler of the U.S. Department of Agriculture first described the *Helminthosporium* disease of Kentucky bluegrass in 1930.

SYMPTOMS

There are two stages of disease development in Kentucky bluegrass; first comes leaf spotting followed later by crown-and-root rotting. On the leaves the disease first appears as small, water-soaked spots that enlarge into dark, purplish-red lesions one-fourth to three-eighths an inch long. As the infected areas enlarge, the color of the center changes to brown and finally to a straw color (Fig. 1).

Although any area of the leaf may become "spotted," infection is usually most damaging on the sheath. Large, irregular lesions appear on the sheath that girdles the leaf and cause it to drop, resulting in defoliation of the turf. Occurring along with leaf infection is an invasion by the fungus of the crowns, roots, and rhizomes. The disease in these tissues is a rot, appearing at first as a reddish-brown decay and finally turning dark brown to black with severe root pruning. Such plants often wilt under soil moisture conditions that would normally seem adequate for growth.

When Drechsler originally described the disease he referred to both the "leaf spot" and the "foot rot" phases as part of the disease syndrome. In New Jersey *Helminthosporium vagans* produces dark, purplish-red lesions on bluegrass leaves throughout the year. Foot rot, on the other hand, develops primarily during the cool, moist, cloudy weather of late spring. During this

(Please turn to pg. 3)

Figure 1. Kentucky bluegrass leaves showing *Helminthosporium* leaf spots with dark borders and light-colored centers.

Comments and Opinions

IT'S AN ILL WIND THAT BLOWS NO GOOD

The frustrations of research are too much for some research personnel and turfgrowers who observe turf studies. Like others, I try to forget the dead ends that are part of the game in research. One of the dead ends was several trial studies with gibberellic acid (a common name for a group of naturally occurring plant growth regulators called gibberellins).

When this chemical became available to research, I believed, with others, that it might be the "missing link" in speeding growth of some of the slower-growing grasses. It was disgusting to find that zoysia, our slowest growing grass, made the least response.

Gibberellic acid has found no place to hasten establishment of turfgrasses. Yet, Dr. A. E. Dudeck, University of Florida, has uncovered an entirely different kind of use for this chemical. The following statements by Dr. Harry Myers, Extension turf specialist, are part of his summary on Dr. Dudeck's work:

> **"Gibberellic acid should prove very useful on golf courses in areas where winter temperatures are usually too high to justify the expense of overseeding but occasionally too cool for good bermudagrass growth and color. Gibberellic acid can be used under these conditions to effectively stimulate growth and maintain color.**
>
> **"The material is NOT a substitute for overseeding where such practice is necessitated due to continued bermudagrass dormancy and/or brown-off caused by extended cold weather. Cold temperature counteracting effects of gibberellic acid are based on its known ability to increase amylolytic enzyme activity and subsequent starch breakdown."**

Excessive starch collection in some tissues is theorized as a cause of cold injury in one of the tropical grasses. They stress the importance of timing with gibberellic acid as follows:

> **"For best results and where previous application has not been made then apply as close as possible to beginning of forecast cold spell (six to 24 hours). Earlier application time may cause excessive growth. NOTE – Growth enhancement effects last for approximately one week at the low application rate and two weeks at the high rate. DO NOT use on dormant turf. Gibberellic acid will not help or change already dormant turf. DO NOT apply during extended warm periods where night temperatures exceed 65°F. since excessive bermudagrass growth and/or thinning may occur."**

Whether gibberellic acid is ever used on "Yankee" grasses or finds a big place in the South, this study shows that one of the satisfactions of research is surprise. Of course, turfgrowers will accept the surprise benefits as well as those that come deductively and logically.

–R.E.E.

MOTHER NATURE

Some of us have begun to suspect that there may be no place to hide from carcinogens. More and more useful additives, pesticides and synthetic foods have been tagged by government researchers as being potential cancer producers. Now a scientist says that the compost heap – the darling of the natural food buffs – contains polyphenols, a chemical believed to be a cancer trigger.

Prof. Russell S. Adams Jr. of the University of Minnesota says it's hard and expensive to carry out research to determine how much "natural" polyphenols are transferred from the soil to the edible portions of plants. But think of the difficulty now of trying to weigh the cancer-producing factors contributed to food by pesticides, for instance, against whatever carcinogen is naturally present in the organic plant.

We still don't know enough about the foreign stuff that we gulp, chew and inhale every day. But when that old reliable humus pile becomes suspect, too, we can begin to wonder whether Mother Nature hasn't outflanked the Food and Drug Act.

As Prof. Adams puts it, if the law were applied to natural substances, no foodstuff could be legally sold.

–Standard-Star, New Rochelle, N.Y.

SORRY WE GOOFED

We trust that editorial errors do not cause confusion. For those who see errors, we would like to correct two that occurred in the Winter, 1976 issue.

On Page 1, the caption under the Hall of Fame picture should read James Smith, **Sr.** rather than James Smith, Jr. We dislike taking anything away from James Smith, Jr., but he has not seen enough "turfgrass winters" according to regulations.

The second error that we wish to correct is the heading on Page 2 under "Comments and Opinions." This should read **Use More Certified Sod.** Although some seed dealers would like more use of certified seed, our plea concerned those who want and need more assurance of quality **sod.**

SUSTAINING MEMBERS

The N.J.T.A. again expresses its appreciation for the support of its sustaining members.

The complete 1976 list of these much-esteemed friends is being prepared for publication in our Fall issue.

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(Leaf Spot from Page 1)

time severe infection of crowns, roots, and rhizomes often leads to extensive thinning-out or melting-out of bluegrass stands (Fig. 2).

DISEASE CYCLE

Generally, the Helminthosporiums are considered to be the worst enemies of turfgrasses. These fungi are particularly well adapted for rapid production of large quantities of spores that are propelled by air currents (Fig. 3). After wind dissemination occurs, each spore can germinate by two or more germ tubes which can penetrate grass leaves to produce new infections. Since each germ tube can initiate a single infection each spore constitutes a "double threat," having the potential for two or more infections. When temperature and moisture conditions are favorable, the disease spreads rapidly from plant to plant. Following the initial infection of the leaves the fungi often progress downward into the grass crown and destroy the basal grass tillers, resulting in crown rot, root rot, and ultimately thinning-out or melting-out of the turf. In addition to wind dissemination, these fungi can also be seed-borne.

OVER-WINTERING

From a perennial standpoint, the Helminthosporiums survive the winter months in the mat or thatch layer of turf. What makes these fungi especially difficult to control is their ability to survive saprophytically in the absence of a living plant. It has been shown that under laboratory conditions these fungi can live in culture for 15 years and still retain their infective potential. In nature they survive in decaying organic matter, in soil, or on plant debris such as found in the thatch layer.

In the spring, spores are produced which are carried up onto leaves by splashing water or wind. These spores germinate and infect the leaves. From these infected areas new spores are produced which are, in turn, spread to new leaf parts and neighboring plants. Old leaves are more susceptible than young ones. With the arrival of the warm, relatively dry summer months, the fungus is restricted primarily to the crowns and roots of diseased plants. However, if cool, wet weather returns, the disease can break out on the leaves again (Fig. 4).

SEASONAL DEVELOPMENT

Under New Jersey conditions, *Helminthosporium vagans* initiates leaf-spot infections during the advent of cool, moist, cloudy weather in October and November. Large numbers of spores are produced during the late fall, winter and spring months. Highly susceptible varieties frequently become nearly 100 percent brown from disease by early March. Subsequent spring regrowth is also subject to considerable infection during periods of cool, moist, cloudy weather. The fungus virtually ceases to produce spores during the warmer season, May to October. However, infections already present continue to progress, causing a peak of destruction in late May and early June.

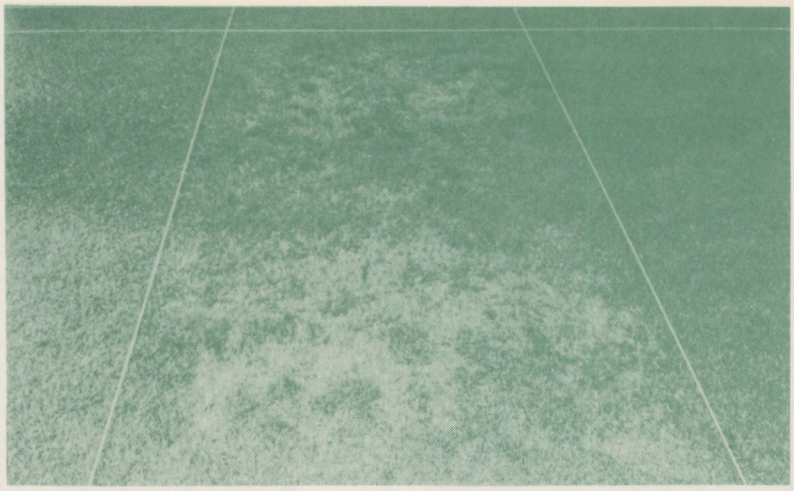

Figure 2. Melting-out of Park Kentucky bluegrass due to crown-rot and root-rot caused by *Helminthosporium vagans.* (See Table 1 for a list of resistant varieties.)

Defoliation and melting-out of bluegrass turf results in unsightly patches of bare ground subject to easy colonization by both crabgrass and broadleaved weeds. Subsequent recovery of the bluegrass depends on the level of food reserves present in the plant, the environmental conditions favoring recovery, and the extent of weed invasion.

This disease is normally of minor consequence during the bright, sunny weather of late summer and early fall. The occasional spots present on leaves produce very few spores during this warm season of bright sunshine.

The outbreak of leaf spotting during cool, wet weather is associated with sporulation by the fungus. Research conducted at Rutgers University shows that the number of lesions that produce spores (sporulate) is low during the hot summer months (2.8 percent) and high during the cool, wet winter months (40.2 percent) in New Jersey (Table 2).

Research conducted in Connecticut by Dr. R. J. Lukens has shown that melting-out of Kentucky bluegrass is a "low-sugar disease" since infection is most severe when sugar levels in bluegrass are reduced by cloudy weather or shading. Bluegrass becomes susceptible to melting-out when the turf is growing succulently. Succulent tissue is usually low in photosynthates. Leaf sugar can be varied by shade, cutting height, variety, or foliar sprays of

Table 1. Classification of Kentucky bluegrass varieties according to their level of resistance to leaf spot and melting-out by *Helminthosporium vagans* in New Jersey under turf maintenance.[1]

A. Varieties with good resistance:

Adelphi	Pennstar	Parade
Birka	Majestic	Sydsport
Bonnieblue	Merion	Touchdown
Fylking	Nugget	Warren's A-20
		Warren's A-34

B. Varieties with moderate resistance:

Aquila	Victa	Windsor
Baron	Glade	
Cheri	Vantage	

C. Varieties with poor-to-fair resistance:

Delta	Kenblue	Park
Geary	Newport	South Dakota Certified

[1]For further information refer to Leaflet 509: Lawn Grasses for New Jersey, 4 pages, 1975.

glucose. In all instances, Dr. Lukens pointed out that severity of foot rot was inversely proportional to the concentration of reducing sugars in the leaves of bluegrass turf.

MANAGEMENT FACTORS

The severity of leaf spot and melting-out is greatly influenced by certain management factors. Disease injury is considerably greater under close mowing in contrast to higher mowing. Close mowing tends to deplete carbohydrate food reserves (low sugar), thereby weakening the grass and making it more subject to injury and less capable of recovery. Under New Jersey conditions, turf mowed at 2 1/2 inches and maintained at moderately low fertility showed little damage from melting-out and was virtually free of crabgrass. In contrast, turf mowed at three-fourths of an inch and heavily fertilized showed 63 percent turf loss from melting-out in early summer resulting in 33 percent crabgrass cover by the end of summer.

Nitrogen fertility alone has a significant influence of disease severity. In the Rutgers turf plots bluegrass growing at high fertility showed less leaf spot injury in March and April than the same varieties growing at low fertility. However, in May and June, when root rotting became active, this phenomenon was reversed and the high fertility plots invariably suffered greater injury from melting-out by *Helminthosporium vagans.* Judicious timing of fertilizer applications also is important. Most of the total annual fertilizer should be applied during September, October, and November to avoid lush growth in the spring.

VARIETAL RESISTANCE

Turf mowed high and fertilized lightly may not suffer as greatly from leaf spot but neither does it possess the rich green color, density, and neat appearance desired by most people. Varieties with a high level of disease resistance are therefore essential for the production of high quality turf. In Table 1 are shown a recent compilation of Kentucky bluegrass varieties and their respective responses to *Helminthosporium vagans* under turf-maintenance conditions.

In selecting a specific variety of bluegrass, or several component varieties to constitute a blend, attention should also be directed to other major diseases of bluegrass, such as Stripe Smut *(Ustilago striiformis)* and Fusarium Blight *(Fusarium roseum).* Bluegrasses may also be planted as mixtures with the turf-type ryegrasses or fine fescues to further minimize injury from *Helminthosporium vagans* and/or other major bluegrass diseases.

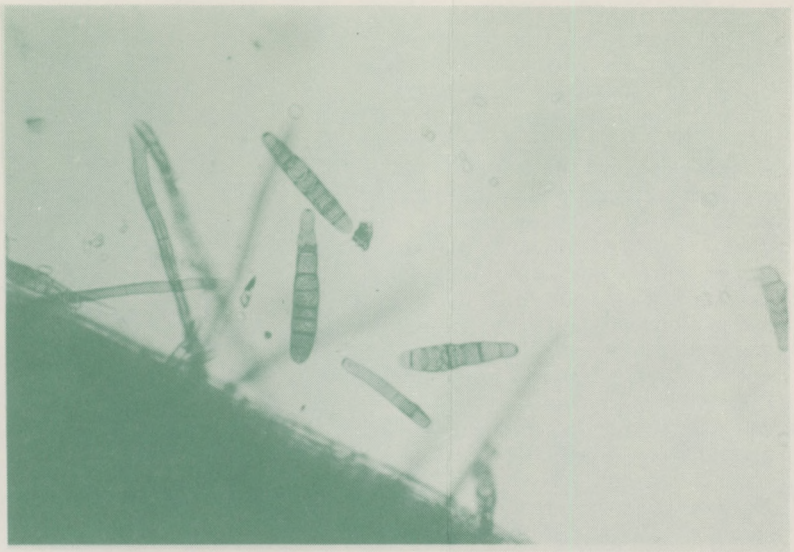

Figure 3. Spores of *Helminthosporium vagans which are disseminated by wind or splashing water and help to spread the disease.*

Table 2. Effect of season on sporulation of *Helminthosporium vagans* **on incubated leaves of five varieties of** *Poa pratensis.*[1]

Season	Variety of Kentucky bluegrass					
	Common	Delta	Newport	Delft	Merion	Average (6-month)
May - October (warm)						
Total leaves	224	218	231	222	235	226.0
Total lesions	498	413	466	438	574	477.8
Lesions/leaf	2.2	1.9	2.0	1.9	2.4	2.1
Total sporulating	10	8	12	15	24	13.8
% sporulating	2.0	1.9	2.6	3.4	4.2	2.8
November - April (cool)						
Total leaves	226	231	249	246	251	240.6
Total lesions	435	371	451	432	503	438.4
Lesions/leaf	1.9	1.6	1.8	1.8	2.0	1.8
Total sporulating	169	152	189	181	188	175.8
% sporulating	38.9	41.0	41.9	41.7	37.4	40.2

[1]The data in the table represent a 12-month survey divided into two six-month periods. The individual figures represent the totals or averages for each period.

CHEMICAL CONTROL

The control of leaf spot and crown rot in Kentucky bluegrass turf usually involves integrating a combination of disease resistance, proper management practices, and chemical control measures. Since none of the resistant varieties is immune to this disease, and since disease severity is often accelerated by uncontrollable environmental factors such as cloudy weather, the use of fungicidal applications often is desirable.

No entirely satisfactory fungicide is available for *Helminthosporium* control. Among the protectant or contact fungicides best results may be obtained with Terraclor (PCNB), Daconil, Dyrene, Fore, Tersan LSR (maneb), Tersan 75 (thiram), or Ortho Lawn and Turf Fungicide. These should be applied early in the spring two to three weeks apart. It is especially important to make the first application of fungicide early.

To date all the systemic fungicides registered for turf usage and tested against *Helminthosporium* have proven ineffective and some have even increased disease incidence. The inability of several systemic fungicides to control crown-rot and melting-out as contrasted with the highly protectant action of Terraclor (pentachloronitrobenzene equals PCNB) is shown by the data in Table 3. The research was conducted on the Rutgers turf plots.

CONCLUSIONS

In conclusion, effective control of crown-rot and melting-out in bluegrass turf can best be achieved by a combination of select turf management practices. These include the following:

- Selection of a resistant variety.
- Planting blends or mixtures of resistant grasses.
- Raising the mowing height to 2 to 2 1/2 inches.
- Avoiding excessive nitrogen fertilization.
- Judicious timing of fertilizer applications.
- Preventing succulent growth in the spring.
- Applications of protectant (contact) fungicides.

REFERENCES

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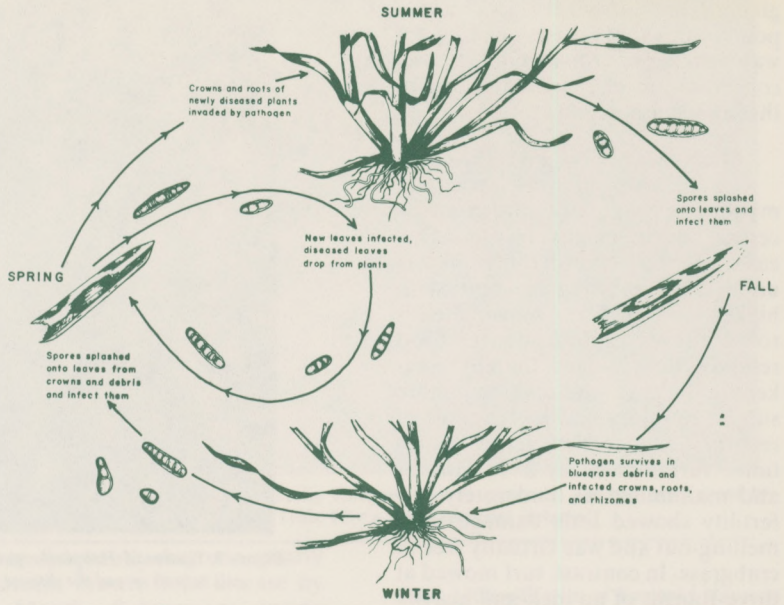

Figure 4. Cycle of development of melting-out in Kentucky bluegrass by *Helminthosporium vagans.* (Courtesy Virginia Cooperative Extension Service.)

Table 3. Comparative effectiveness of fungicides evaluated for control of crown-rot and melting-out in Delta Kentucky by *Helminthosporium vagans* under turf maintenance in N. J.

Chemical Name*	Rate Oz AI/M**	% Turf Loss
Terraclor (PCNB)	6	4 a
Tersan LSR (Maneb)	6	30 b
Triarimol (EL-273)	2	39 b
Triarimol (EL-273)	4	53 c
Bromosan	4	54 c
Mertect-360 (TBZ)	4	61 cd
Mertect-360 (TBZ)	2	62 cd
Cleary-3336	2	74 cd
Cleary-3336	4	65 cd
Check Plots	0	65 cd
Topsin-M	2	65 cd
Topsin-M	4	72 d

*Triarimol (EL-273), Mertect-360 (TBZ), Topsin-M (thiophanate methyl) and Cleary-3336 (thiophanate ethyl) are systemic fungicides.

**Chemicals were drenched into the turf in 200 gal. water/M on April 23 and May 26 and rated for turf loss on June 11, 1971.

AVOID TROUBLE SAVE GREENS

Bob Dunning

(Editor's note — Bob Dunning, who works the Oklahoma area, is one of the "Grand Guys of Turf." Here are bits of his wisdom.)

Just a few words of advice, that may help avoid pitfalls, that have been gained in over 30 years of golf course work. This is given in a helpful spirit without criticism of anyone and only in an effort to prevent troubles.

1) Grass knows nothing about Saturdays, Sundays, holidays and tournaments.

2) When turf starts to thin, compensating measures must be taken.

3) The most critical time for watering is after heavy rains on a hot, humid day. Avoid heavy traffic and change cups often and syringe greens frequently.

4) Wilt probably accounts for the loss of more turf than any other reason.

5) Locker room greenkeepers can be a most dangerous source of troubles unless someone takes the time to explain the facts of life. Any questions on golf course maintenance should be taken up with the superintendent by the chairman of the greens committee and settled. This may avoid disastrous consequences where too many hands are in the pie.

6) **The best herbicide is a good stand of healthy turfgrass.** Few weeds or *Poa annua* invade greens until the turf begins to thin. Let it be walked off, mowed off or killed in any manner, the greens have had it — the weeds are coming.

–Turf Tips

(Roundup from Page 1)

Most annual weeds are controlled as well as perennial weeds such as quackgrass, Kentucky bluegrass, Canada thistle, fescues, and field bindweed.

A few precautions:

- Don't mix with other herbicides or use dirty water since the ROUNDUP will be tied up and weed control will be reduced.
- Do not add surfactant (wetting agent).
- Don't apply if rain is threatening; rainfall within six hours of treatment will reduce effectiveness and retreatment may be necessary.
- Don't work the soil for seven days after treatment.
- Don't allow the chemical to drift since small quantities can cause severe injury to nearby desirable plants.

SUMMARY

ROUNDUP is an effective herbicide of low toxicity. It is nonselective and controls a wide spectrum of annual and perennial plants. It has no residual activity in the soil and seedings may be made soon after treatment.

As with any pesticide, read the full label for use directions and precautions.

For Your Convenience

You, like man other **Green World** readers, may be saving each issue for reference purposes. (A smart ides, too, especially when you want to look up information such as we offer you in this issue's in-depth article on leaf spot and melting-out.)

And so we're giving you wider margins so each issue will fit better in your loose-leaf or pinch binder.

We still have a few copies of past issues available at a quarter each or $3.50 for all.

Activated Charcoal Can Erase Some Mistakes

Mistakes with turf or landscape chemicals can happen in the "best of families."

It seems desirable that a few bags of activated charcoal be on hand or easily obtained in case of emergency. A quickly absorbed and quick-acting chemical leaves very little lag time for the charcoal application. Rates of 100 to 300 lbs./acre are adequate for most treatments. This treatment is not effective on all chemicals.

Agriculture preparations of charcoal will list many of the chemicals that can be deactivated and will give instructions on desirable rates and techniques. Always read the instructions.

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