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Stripe Smut In Turfgrasses

Philip M. Halisky and C. Reed Funk

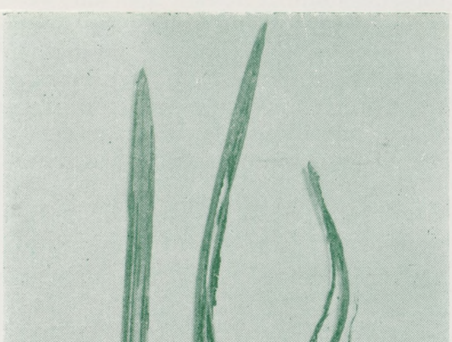
Stripe smut is caused by a fungus that infects both annual and perennial grasses. Among the turfgrasses, stripe smut is most commonly found in Kentucky bluegrass and creeping bentgrass. Only rarely is stripe smut found in red fescue or perennial ryegrass. The disease has not been observed in either zoysia or bermudagrass.

Symptoms

Early in April infected bluegrass plants appear as yellowish tufts of stunted, sick-looking grass. Closer examination will reveal the presence of grayish stripes in the leaves which later turn black and rupture releasing millions of smut spores into the soil. Smutted leaves subsequently curl and tear along these stripes resulting in plants that appear tattered or shredded (Figure 1). Such infected plants are readily destroyed by summer heat and drought resulting in visible thinning of the turf in late spring. Furthermore, smut-infected plants are more susceptible to other fungus diseases such as leaf spot and crown rot caused by *Helminthosporium vagans*.

Underground Fungus

Although stripe smut is most commonly seen in the leaves of infected grasses, all infection takes place underneath the soil.



Leaves of Merion Kentucky bluegrass shredded into ribbons by the stripe smut fungus.
(Photo by Steve Bachelder)

No infection takes place through the leaf surfaces. Spores of stripe smut are soil-borne and infection from these spores takes place through axillary buds on the crowns and rhizomes or through the coleoptile, all beneath the soil surface. Once the smut penetrates a grass seedling, the mycelium or fungus threads become established internally throughout the plant.

In newly-planted turf areas stripe smut is usually not conspicuous for several years. However, as the turf matures the incidence of smut builds up precipitously during the third to sixth years, especially in susceptible varieties

TABLE 1

Bluegrass Variety	Age of turf and no. smutted tillers/sq. ft. 4 yrs. 1966	5 yrs. 1967	6 yrs. 1968
Pennstar	4	27	33
Fylking	10	12	39
Newport	14	157	181
Merion	188	335	582

Bluegrass and Bentgrass Hosts

Among the bluegrasses those cultivars that tiller profusely appear to be infected with stripe smut more frequently. These include Merion, Newport, Windsor, Prato, and Cougar. In contrast, varieties with a rhizomatous habit of growth appear resistant to stripe smut. These include Pennstar, Fylking, Bonnieblue, Adelphi, Park, Sydsport, Sodco, Warrens A-20, Warrens A-34, NJE P-57, and NJE P-29. The relative resistance and susceptibility of selected varieties of Kentucky bluegrass to stripe smut are shown in Table 2.

Comparison of stripe smut incidence in Kentucky bluegrass varieties at Rutgers University.

TABLE 2

Bluegrass Variety	Smutted Tillers/sq. ft.
Pennstar	0
Fylking	0
Anheuser Dwarf	0
Bonnieblue	1
Belturf	2
Delta	11
Bellevue	11
Windsor	41
Merion	228

Among the creeping bentgrasses stripe smut has been reported in Seaside, Washington, Evansville, Penncross, Pennlu, Arlington C-1, Cohansey C-7, Toronto C-15, Congressional C-19, and Old Orchard C-52.

Table 1. Reaction of four bluegrass varieties to stripe smut infection showing progressive build-up of disease during three successive years.

In bentgrasses stripe smut is important on golf greens in the mid-West and southward to Missouri.

Pathogenic Races

Although stripe smut occurs in both bluegrasses and bentgrasses, there is *no* danger of the smut cross-infecting from bluegrass to bentgrass or vice-versa. The reason for this is that the smut races on *Poa* and those on *Agrostis* are different pathogenically and each group is specific for its respective host genus. This pathogenic specialization prevents the indiscriminate spreading of stripe smut among different genera of turfgrasses as commonly found on golf courses. Furthermore, the blending of turfgrass seed to include red fescue or perennial ryegrass with Kentucky bluegrass also is highly desirable from a standpoint of stripe smut control.

Chemical Control

Before the advent of systemic fungicides it was virtually impossible to control stripe smut in turfgrasses. Because the mycelium of stripe smut is established internally as systemic infection throughout the grass plant, attempts to control the disease with protectant fungicides generally failed. The control of stripe smut with the systemic fungicide "benomyl" has been well documented in recent years. Subsequent research further indicated that late fall applications of benomyl were more effective and required less chemical than corresponding spring treatments. The data in Table 3 verify the effectiveness of fall applications of benomyl and indicate the dosages required for various levels of stripe smut control.

Not all the systemic fungicides are effective against stripe smut. Many of the systemics that were reported to show some activity against the fungus in preliminary trials failed to control the disease under turf-maintenance conditions. Recent studies have revealed that two experimental pyrimidine compounds (EL-273 and EL-279) are even superior to benomyl in controlling stripe smut. However, these are not available commercially at the present time.

TABLE 3

Effect of a single application (October 30, 1969) of benomyl fungicide on stripe smut incidence in Merion Kentucky bluegrass during the following spring (May 18, 1970).

Dosages of benomyl[1] 50-WP	A.I.	Smutted tillers/sq. ft.
0	0	233
3	1.5	78
6	3	7
9	4.5	3
12	6	1
24	12	0

[1] Dosages are given as ounces of formulated product (50% wettable powder) and as active ingredient, respectively, per 1,000 sq. ft. of turf. Benomyl is registered for turf usage as Tersan 1991.

Why the Fluctuations In Grass Seed Prices

Peter S. Loft

One of the questions most frequently asked by people in the turfgrass industry is why are there constant price fluctuations in the cost of grass seed. Basically, there are four influencing factors that cause these fluctuations.

1. Weather at time of harvest which influences yield.
2. Demand caused by economic conditions in the country or by inclement weather conditions, which may adversely affect existing stands of turfgrasses.
3. The demand in Europe, which causes us to either import or export large quantities of grass seed.
4. The size of the crop which allows, in some cases, large users to artificially run the prices up by buying a large percentage of a particular seed. Such an example of a small crop that possibly could be influenced would be Red Top which has a rather inelastic demand, and is usually in short supply.

In late June or early July when most grass seed crops are being harvested, a heavy rain can cause sharp price fluctuations. It is virtually impossible by looking at stands of grass seed, to determine whether or not they will have good or poor yields. Thus the seed market is subject to many rumors all of which may cause fluctuations.

An example of economic conditions which influence usage whould be housing starts. Hot and humid weather such as we have had this year will cause many varieties to succumb to various turf diseases thus necessitating replacement which increases demand.

Since establishment of the Common Market no one can ever be sure how much seed will be exported to Europe, because the laws are constantly changing. A large export order for Germany, say 10 to 15 million pounds of Kentucky bluegrass, can certainly influence the market in this country, where approximately 50 million pounds are produced annually. The export market is an uncontrollable factor, thus it is impossible to anticipate.

When dealing with some of the smaller turfgrass seed crops such as Merion Bluegrass, Poa Trivialis, Seaside Bentgrass or Penncross Bentgrass, it makes it tempting for some of the larger users to take very large positions and attempt to manipulate the market, either up or down. Sometimes they are successful, and here again this causes fluctuations in the price of seed that no one can foresee.

All in all, buying seed in large quantities is a full-time job and should be left to the professional seedsman. I would advise against anyone, who is not prepared to spend a considerable amount of time considering these factors, attempting to outguess the seed market.

Timely Reminders

Dr. Henry W. Indyk

Algae in Turf

Interest in controlling algae in lawns and other turfgrass areas seems to be greater than ever. Requests for control commonly refer to algae as "a disease covering the soil surface after it destroys the turfgrasses." Contrary to such opinions, algae is not pathogenic on turfgrasses. Therefore, its control, generally is not effective in better growth of turfgrasses in areas in which it is growing.

Algae — characterized by a thin dark green to almost black film growing on the soil surface, slippery when wet and somewhat leathery when dry — is symptomatic of excessive soil moisture. The wet soil conditions rather than the algael growth account for the poor performance of the turfgrasses. Therefore, improvement of the growth of the turfgrasses in areas showing an abundance of algae, necessitates correction of the soil moisture problem.

The abundant and frequent rainfall experienced this year, has been conducive to the prevalence of algae, particularly on poorly drained soils. Under such conditions, the only good control is improvement in surface and internal drainage of the soil.

Growth of algae should be a problem only when nature is generous with the rainfall. Man-made soil moisture conditions should not be overlooked as a major contributor. Frequent and excessive use of the sprinkling system provides ideal soil moisture conditions for growth of algae. Control of algae in such situations can be effectively achieved with proper water management.

Crabgrass in Late Summer

If your turfgrass area is one that is suffering from the "crabgrass explosion" that took place during the hot and moist conditions of early July, it would be wise to schedule it for preemergence treatment next April. Germination of crabgrass began during the first week of May. An abundance of seedlings remained in a rather anemic and stunted condition during the relatively cool period that extended into late spring and early summer. Growth of these seedlings seemed to explode in early July when soil moisture was plentiful and temperatures in the 90's.

Postemergence control of crabgrass can be effectively achieved with one of the methanearsonates. Best results are obtained when the crabgrass is very actively growing and in an early stage of maturity. In its present stage of maturity, crabgrass control becomes increasingly difficult. Two or more repeat treatments will be required at an interval of 7 to 10 days between treatments. In formulating a decision on treatment now, consideration should be given to the stage of maturity of the crabgrass and the time that will be required for completion of the repeat treatments.

Turf Repair

Turfgrasses have gone through a difficult summer season and may have suffered in varying degrees. The recovery season is now beginning and should be a reminder to "get busy" on the performance of various turfgrass management practices. In order to stimulate a more rapid and complete recovery for a better turf not only this fall but also next year, now is the time to give consideration to:

1. Reseeding of severely thinned or bare areas.
2. Fertilizing.
3. Liming.
4. Dethatching.
5. Selective control of broadleaf weeds.

Performance of these practices during the late summer-early fall season generally will provide greater results for effort expended than at any other time of the year. Why not take advantage of the opportunity?

Growth Retardants —What Role?

R. E. Engel

Chemicals that retard plant growth have been arriving on the research scene in increasing numbers. Maleic hydrazide (MH), the first of our modern collection of growth retardants, was used by this writer in 1949.[1] These treatments showed the chemical: (1) had ability to retard growth; (2) increased susceptibility of the grasses to injury in dry weather; and (3) retarded various grass species (but not equally). Also, a few years later, the ability of this chemical to prevent annual bluegrass seedheads was observed.[2] In this latter study, MH was considered too injurious for use on bentgrass turf. This chemical has had varied use for restricting growth along roadsides or some hard-to-mow areas and on turf edges as a "chemical trimmer." If conjecture is allowed as to why its use has not become more common, assorted reasons exist.

More recently chlorflurenol (CF 125) has been sold with MH. The latter is used at a lower rate than when it has been used alone. This combination of MH + CF 125 has been sold for both growth retardation and control of annual bluegrass seedheads. Its effectiveness for annual bluegrass control is not clear. When this MH + CF 125 treatment was sprayed across ranges of the Northeast Regional Kentucky bluegrass strain test in the spring of 1970, serious injury occurred on a significant number of these Kentucky bluegrasses. Thus, safety to the turf is a question with this chemical treatment.

Also, in the past several years we have experienced an assortment of distinctly different chemicals that are used experimentally for retardation or control of turf growth. This is of interest to turf research and anyone who starts theorizing on the subject. One of the most advanced of these is MBR 6033 (Surtan) from 3M Research, which Dr. Duell and I have tested since 1970.

While it is my opinion that we are not close to general use of chemicals for growth control, some specialized uses may develop. With new chemicals and the intrinsic interest in the subject, an assortment of new experiences lie ahead. The turf grower should watch these, not with the thought that he will use one of these chemicals next year, but for interest and learning about turf. Knowledge of improved safety to the turf, residue effects, optimum growth stage for treatment, weather effects, and reduced costs is needed. All treatments to date have not maintained the neat uniformity created by mowing. Also, we must remember that the physiological growth of the grass cannot be stopped totally. A plant that survives must make some measure of growth and continue certain life functions.

[1] Engel, R. E. and G. H. Ahlgren. 1950. Some effects of maleic hydrazide on turfgrasses. Agron. J. 42:461-462.

[2] Engel, R. E. and R. J. Aldrich. 1960. Reduction of annual bluegrass in bentgrass turf with chemical. Weeds 8:26-28.

Adelphi Kentucky Bluegrass

C. R. Funk

"Adelphi" Kentucky bluegrass was developed cooperatively by the New Jersey Agricultural Experiment Station of Rutgers University and Robert A. Russell of J. and L. Adikes, Inc., Jamaica, New York. NJE P-69 was the experimental designation of this variety.

Adelphi is a moderately low-growing, leafy, turf-type bluegrass variety with good density and vigor and a medium texture. One of the most distinctive features of the variety is an attractive, bright, dark green color. Its green color is especially noticeable in early spring before many other bluegrasses become green and again in late fall after most other varieties start to lose color. A pleasing, moderately dark green color is also apparent at only moderate fertility levels.

Adelphi has demonstrated good or moderately good resistance to the leaf spot and crown rot disease incited by *Helminthosporium vagans,* leaf rust caused by *Puccinia poae-nemoralis,* stripe smut caused by *Ustilago striiformis* and *Typhula* snow mold. It is moderately susceptible to powdery mildew.

Turf performance trials at Rutgers and a number of other locations throughout the country indicate that Adelphi should be well suited for quality lawns, parks and sports turf in regions where Kentucky bluegrass is well adapted. It would appear to be compatible in blends with other darker colored bluegrass varieties and in mixtures with fine fescues and the improved, fine-textured, turf-type varieties of perennial ryegrass.

Adelphi is an apomictic, first generation hybrid obtained by crossing "Bellevue" Kentucky bluegrass with "Belturf" Kentucky bluegrass. Cytological studies by Dr. Jerry Pepin indicate that Adelphi has approximately 80 chromosomes. It possesses all 56 chromosomes of the Bellevue plant which was used as the mother and approximately one-half of the 49 chromosomes of the Belturf parent.

The Bellevue parent of Adelphi was selected from the second fairway of the Bellevue Country Club near Syracuse, New York by Thomas E. Topp, Superintendent, and Alexander M. Radko, USGA Green Section Agronomist in the summer of 1958. This Bellevue selection had demonstrated good performance and persistance under close-cut fairway conditions. Tests at Rutgers conducted by Ralph Engel and Elwyn Deal had shown the Bellevue selection to be essentially equal to Merion in density, texture and leaf spot resistance. In addition, it had excellent resistance to leaf rust and moderate resistance to stripe smut. Perhaps the most outstanding attribute of the Bellevue selection is its very attractive color in late winter and early spring. The Bellevue selection has not been released as a commercial variety because it is only about 60 per cent apomictic and therefore not sufficiently true breeding for commercial use.

The Belturf parent of Adelphi was selected from an old management experiment at Beltsville, Maryland by Dr. Felix Juska and Dr. A. A. Hansen of the United States Department of Agriculture. Belturf is a highly apomictic turf-type bluegrass with excellent density and vigor producing an attractive, moderately fine-textured turf with a dark green color. It has excellent resistance to stem rust and moderately good resistance to stripe smut but is moderately susceptible to *Helminthosporium* leaf spot.

Adelphi recombines most of the favorable characteristics of its two elite parents. From the Bellevue parent, Adelphi inherited its exceptional early spring and late fall color, its good resistance to leaf spot, its moderately good seed production potential and its good resistance to leaf rust. From the Belturf parent, Adelphi obtained its dark green color and leafiness, its resistance to stripe smut and stem rust and its higher degree of apomictic reproduction. From both parents, Adelphi received its turf-type growth habit and its moderate tolerance to drought and close mowing.

A moderate quantity of seed of Adelphi was harvested in July of 1972 and is being marketed by J. & L. Adikes, Inc., Jonathan Green and Sons, Inc., Northrup, King and Co., Inc., and Vaughan's Seed Company.

Plant patent 3150 has been granted on this variety.

Sincere appreciation is expressed to the U.S.G.A. Green Section Research and Education Fund, Inc. for its generous support of the turfgrass breeding program at Rutgers University.

Spring Dead Spot Down Under

1. Spring Dead Spot of Couch Grass (Bermudagrass) Turf in New South Wales. (1971) Jour. Sports Turf Res. Inst. 47:54-59. Single ascospore isolates of *Leptosphaeria narmari* from couch grass were used on greenhouse cultures and a field planting of the grass species. This produced discoloration of stems, crowns, and roots and essentially a complete kill. Nearby healthy plants were free of the organism.

2. Control of Spring Dead Spot of Couch Grass Turf in New South Wales. (1971) Jour. Sports Turf Res. Inst. 47: Spring dead spot of couch grass (*Cynodon dactylon*) turf caused by the fungus *Leptosphaeria narmari* is controlled by regular applications of either thiram or nabam. To be successful, thiram (80% w/w) at 4.3 oz or nabam (30% w/v) at 17 fl oz/ 1,000 sq ft should be applied to turf every 4 weeks from the beginning of the last month of summer until early spring. The fungicides are applied in 30 gal water/1,000 sq ft and then washed in with the same quantity of water. These fungicide treatments have given control in the field for four years. A comparison of temperatures that favor the growth of couch grass and *L. narmari* showed that spring dead spot will most likely occur when temperatures are between 10 and 20 C.

Comments on Abstracts

Leptosphaeria is the ascospore stage of a *Helminthosporium* fungus. The fungal agent of spring dead spot in the U.S.A. has not been determined, although *Helminthosporium spiciferum* (= *Cochliobolus spiciferus*) is one fungus commonly isolated. Therefore, at this time it is not certain that the two diseases are identical.

Your Editors have not forgotten where we are and who comprise most of our readers. We do find these abstracts on spring dead spot of special interest because they offer some explanation to the mystery of this disease. The degree of application this may have for our turfgrass friends to the South, who grow bermudagrass, will be of interest. Also, these research reports should give support to probing more of our northern disease problems. For those who ask, "Where is New South Wales?", the answer is "Australia."

R. E. Engel

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