Fusarium Blight

continued

blight was reduced by clipping removal (Table 4). The basis for this relationship is not clearly understood; however, it does appear that clipping removal with mowing should be considered on highly fertilized sites where *Fusarium* blight has been a recurring problem.

Table 4. Effects of Clipping Removal and Fertilization on Fusarium *Blight Incidence in Kenblue Kentucky Bluegrass Turf*

Fertilization[a] (lb. N/1,000 sq. ft./yr.)	*Fusarium* blight rating[b]	
	Clippings removed	Clippings returned
2	1.3	1.2
5	1.5	1.7
8	1.5	3.7

[a] *A 10-6-4 (N:P_2O_5:K_2O) analysis water-soluble fertilizer was applied in equal amounts in April, May, August, and September for two years.*
[b] *Visual ratings of disease were made using a scale of 1 through 9 with 1 representing no disease and 9 representing no disease and 9 representing complete necrosis of the turf.*

A final cultural factor of importance in controlling *Fusarium* blight is irrigation. This is most evident during midsummer stress or drouthy periods when light watering has been instrumental in reducing disease symptoms and promoting turfgrass survival. A turf with a deteriorated root system cannot survive prolonged stress periods unless supplemental irrigation is frequent enough to prevent dessication of the plants. Although this practice is inconsistent with traditional principles of turfgrass culture, it may be necessary for the survival of a severely diseases turf.

In conclusion, there are two fundamental approaches
to controlling *Fusarium* blight in Kentucky bluegrass. The "environmental-oriented" approach is to adjust the cultural program by avoiding excessive nitrogen fertilization during spring, providing adequate moisture for turfgrass survival during stress periods through irrigation, performing appropriate cultivation practices to control thatch and alleviate soil compaction and applying effective fungicides properly. The "plant-oriented" approach involves the introduction of superior Kentucky bluegrass varieties that, under local conditions, do not appear to be adversely affected by the *Fusarium organism.*

LITERATURE CITED

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The Role of Nematodes in the Development of Fusarium Blight

by J. M. Vargas, Jr.

Extensive surveys were made to determine if factors other than *Fusarium roseum* and *Fusarium tricinctum* were involved in the development of *Fusarium* blight. The surveys revealed that high populations of nematodes, especially the nematodes *Tylen-chorhynchus dubius* and *Creconemoides* spp., occured in *Fusarium*-blighted turfs.

A greenhouse study was conducted to determine what role, if any, the stunt (*T. dubius*) nematode played in the development of *Fusarium* blight. In this study, only *T. dubius* was able to produce most severely stunted top growth and root system, the two characteristic symptoms normally associated with *Fusarium* blight-infected turfgrass plants. The *F. roseum*-treated plants had reduced root and top growth, but the reduction was not significant when compared to the untreated controls. It appeared that the nematode was the dominant pathogen in the *F. roseum/T. dubius* interaction, which is responsible for *Fusarium* blight in Michigan. It must be remembered that Michigan is really borderline for *Fusarium* blight development. Michigan does not have the long periods of hot, humid weather normally associated with *Fusarium* blight development in more southern areas. In fact, our *Fusarium* blight outbreaks usually occur during periods of drought stress, whether it is hot and dry or cool and dry. Our worst outbreaks have been in late September and early October when the daily temperature did not go above the high 70's. So while the nematodes may be important in Michigan and other northern edges of the *Fusarium* blight region, they may not be as important in the more southern regions.

Before we had determined that nematodes were involved in the disease interaction, we had obtained control of the disease with the systemic fungicide Tersan 1991, but only where we drenched the material into the root zone. We originally thought this was related to the upward translocation in the plant of the systemic fungicide. These results were puzzling in light of the involvement of the nematodes in the development of the disease. Upon further investigation, Tersan 1991 was shown to be a nematicide in addition to a systemic fungicide. We now believe if it is drenched into the root zone and grass plants roots will pick it up and prevent nematodes from feeding. Tersan 1991, of course, can also protect the plant from infection by the *F. roseum* fungus. If *Fusarium* blight is an interaction between a nematode and a fungus, with the nematode being the dominant pathogen, then one should be able to control the disease with nematicides Dasanit and Oxymal. However, it appears that they must be applied early in the season, before the *Fusarium* blight symptoms begin to appear.

Drought stress appears to be the main factor in symptom development after infection has taken place. This is logical, since you have a weakened grass plant with a poorly developed root system; as soon as drought stress is applied, it will begin to wilt and eventually die. Light, frequently watering of *Fusarium*-blighted turfs during periods of drought stress can prevent *Fusarium* blight symptom development. During hot, dry weather, syringing lightly about midday may also be necessary, and symptom development of the disease can be prevented by following such a watering program. Not enough information is known to make recommendations concerning varieties that are resistant to *Fusarium* blight. However, there is enough evidence to show that Merion, Fylking, and Pennstar are three very susceptible Kentucky bluegrass varieties that should not be used in areas where *Fusarium* blight is a problem.

SUMMARY

The disease *Fusarium* blight appears to be an interaction between nematodes and a fungus in which the nematode is the dominant pathogen. The symptoms of the disease occur during periods of drought stress in warm or cold weather. The disease can be controlled culturally by light, frequent watering during periods of drought stress or chemically with one of the recommended systemic fungicides or nematicides. Check with the turfgrass experts in your area for specific recommendation. CAUTION: Nematicides are exretemly dangerous to human health, and proper clothing and equipment must be worn when applying them. Again, it is advisable to check with an expert in your area before applying nematicides.

Developing Genetic Resistance To Fusarium Blight

by C. Reed Funk

The development of improved levels of a stable, race-nonspecific resistance to *Fusarium* blight should receive high priority in all areas where this disease is a present or potential hazard. This resistance must be combined with other genetic factors involved in the creation of attractive, dependable turfgrass cultivars with good turf-forming properties, tolerance of environmental stress, and good resistance to other important pests. These improved turfgrasses need to be widely adapted and have reduced maintenance requirements.

TYPES OF DISEASE RESISTANCE

Disease resistance in plants has been characterized as either race-specific or race-nonspecific. Race-specific resistance has been widely used in the genetic control of plant disease. It generally is controlled by a single, usually dominant, gene and produces a high degree of resistance to one or more specific races of the disease pathogen. Unfortunately, a variety possessing such resistance may be highly susceptible to other races of the same pathogen. Breeding programs using this race-specific form of disease resistance are frequently faced with the task of continually finding and adding new resistance genes to combat new races of the pathogen. This race-specific resistance has been used extensively in annual crops where new resistant varieties can readily be substituted as resistance in old varieties breaks down. Obviously, it is of much less value in our long-lived perennial turfgrasses.

Race-nonspecific resistance is normally conditioned by the combined action of several genes. It imparts a degree of resistance to all races of the pathogen and is generally relatively stable over long periods of time. In most cases race-nonspecific resistance does not confer the high level of disease resistance normally observed in varieties posessing a race-specific type of resistance. Plant breeding procedures using race-nonspecific resistance are also more difficult. Nevertheless, the development of varieties having the highest possible and most stable forms of race-nonspecific forms of disease resistance should be the primary goal of breeders of perennial species.

PREDISPOSING FACTORS

Observational and experimental evidence suggest that the *Fusarium* blight disease is more serious on turfgrass weakened by one or more environmental stress factors. Factors predisposing the turf to *Fusarium* blight might include the following:

- High temperatures.
- High humidity.
- Recurring drought stress.
- Reduced air circulation.
- Excessive nitrogen.
- Dense, lush growth.
- Thatch.
- Close mowing.
- Nematodes.
- Other diseases.

Varieties better able to tolerate the weakening effects of any of the above factors, which may occur at a critical stage in disease development, are less likely to be seriously damaged by *Fusarium* blight. This might account for much of the variety x test interaction observed in ratings of variety resistance. A variety such as Vantage, which is less tolerant of close mowing than some compace turftypes, may show very little *Fusarium* blight at a 2-inch mowing height but can be weakened by closer mowing to the extent that it becomes moderately susceptible. A variety growing in its area of best adaptation and receiving the management most favorable to its best performance is likely to be damaged less by this disease. The above factors, considered in connection with a highly variable pathogen and our present less than adequate evaluation techniques and information exchange, complicate our understanding of the amount and stability of the genetic resistance available. Nevertheless, we do see substantial variation in the amount of *Fusarium* blight damage to different turfgrass selections. The genetic components of this variation can be used in breeding varieties of improved resistance.

KENTUCKY BLUEGRASS

Kentucky bluegrass, *Poa pratensis* L., is the most important lawn-type turfgrass in the northern half of the United States. It is hardy, attractive, and widely adapted. A number of attractive turf-type bluegrasses with good resistance to the *Helminthosporium* leaf spot and crown rot disease have been developed in recent years. Most of these improved varieties are giving good performance in areas where summer stress conditions are not too severe. Nevertheless, the development of bluegrasses with greater tolerance of the long, hot summers of the transition zone remains a real challenge to the turfgrass breeder. An extensive program to collect and evaluate adapted germplasm from summer stress areas should provide germplasm to produce varieties

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