ORNAMENTALS NORTHWEST ARCHIVES

Sept.-Oct.-Nov. 1979
Vol 3, Issue 5
Pages 27-29,44

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FERTILITY AND ITS RELATIONSHIP TO TURFGRASS DISEASES[1]

Turfgrasses are used for a variety of recreational, beautification and utilitarian reasons. For most of these uses, turfgrasses are highly maintained. This maintenance starts with the initial site and cultivar selection and is followed by mowing, fertilization and pest control practices.

After initial site and cultivar selection, fertilizers are the most important management tool for the maintenance of quality turf. All of us are aware that when we fertilize our lawns they grow faster, require more frequent mowings and become darker green. But fertilizing also affects form and density of turfgrasses, turfgrass weediness, extent of rooting, extent of injury from disease, insects, drought, heat and cold, and the rate of thatch buildup.

I would like to briefly discuss fertility and its relationship to some of the common turfgrass diseases in the Pacific Northwest. First I would like to introduce you to a basic principle in the study of plant diseases know as a plant disease triangle (Figure 1).

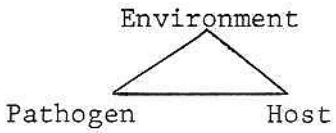


Figure 1

This triangle simply illustrates that diseases are the results of the interactions between pathogens, hosts and their environments.

Although fertility greatly affects the host, in our case turfgrasses, it can also influence the environment and the pathogen. Since fertility influences the different components of our plant disease triangle, we should be able to modify the incidence and severity of diseases on turfgrass through proper management of fertility. Indeed this has been shown to be true.

It is very important to know what the potential diseases are before specific recommendations can be made regarding fertility. The prevalence of the major turfgrass diseases throughout the year in western and eastern Washington are shown in Tables 1 and 2.

TABLE 1. Prevalence of major turfgrass diseases in western Washington.

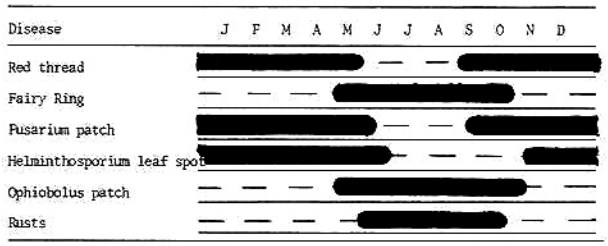
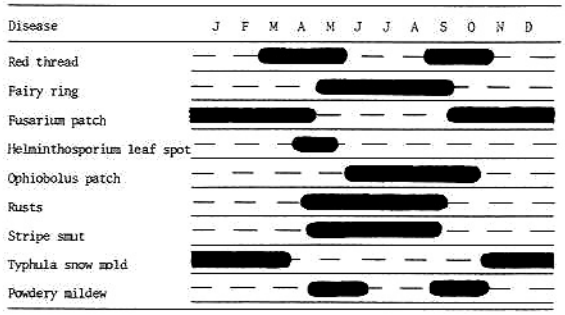


TABLE 2. Prevalence of major turfgrass diseases in eastern Washington.



I would now like to discuss two common turfgrass diseases in the Pacific Northwest and the relationship between fertility and these diseases. Most of this information comes from research conducted by Drs. Chuck Gould, Roy Goss and Stan Brauen at Washington State University's Western Washington Research and Extension Center in Puyallup.

Fusarium patch

This disease is caused by the fungus *Fusarium nivale* and nitrogen, potassium and sulfur have been shown to affect its development. High rates of nitrogen generally increase the incidence of *Fusarium* patch (Table 3) .

TABLE 3. Effects of nitrogen on the Incidence of *Fusarium* patch.

Nitrogen lb/1000 ft ^{2}	*Average No.* of *Fusarium* spots/plot
20	48
12	22
6	12
0	11

Since *Fusarium* is generally more active in the fall or early spring, heavy applications of nitrogen should be avoided during this time of year. Along with rates and timing, the type of nitrogen fertilizer is also important. Generally the use of ammonium sulfate and Milorganite have resulted in less disease than nitrate types of nitrogen, urea and urea formaldehyde.

Elemental sulfur has been found to be very beneficial in reducing *Fusarium* patch in addition to producing denser turf with better color. Part of the benefit from ammonium sulfate presumably comes from its sulfur content. Spring applications of elemental sulfur at the rate of 21b/ 1000 ft^2 have been effective in reducing the severity of this disease (Table 4).

TABLE 4. Effects of elemental sulfur on the incidence of *Fusarium* patch.

Sulfur lb/1000 ft^2	Percent area covered
0.00	22.3
1.15	13.9
2.30	1.3
3.45	0.3

Phytotoxicity has been observed during the summer when 3 lb. of sulfur per 1000 ft^2 has been used. Potassium has been found to have a greater effect on *Fusarium* patch than phosphorus, except at high levels of nitrogen (Table 5).

TABLE 5. Effect of potassium on *Fusarium* patch at different levels of nitrogen. The use of lime has also been shown to increase *Fusarium.*

Potassium lb/1000 ft ^{2}	No. of Fusarium spots lbs N 1000 ft^2		
	6	12	20
0	18	42	61
4	11	15	38
8	2	5	56

The use of lime has also been shown to increase *Fusarium*.

Red thread and rust

Unlike *Fusarium* patch, red thread caused by *Corticium fuciforme* and rust caused by *Puccinia* sp. are typical of diseases where the most practical control on lawn type turf involves the use of nitrogen to stimulate grass growth so that the diseased grass tips are then removed by mowing (Table 6).

TABLE 6. Effect of nitrogen on the incidence of red thread.

Nitrogen lb/1000 ft^2	Average no. of mycelial strands
0	532
2	460
8	61

Although not shown in the preceding table, the incidence of red thread was further reduced by the addition of potassium, particularly at the highest level of nitrogen.

Control of red thread and rust works fine by using nitrogen as long as the grass continues growing. However, when growth slows down, these diseases take over and fungicides are sometimes needed.

Diseases of turfgrasses are just one of many factors to be considered in recommending fertilizers. It has been shown that a balanced ratio of N-P-K (6-1-4) has given the best results in western Washington from the standpoint of cultural characteristics and disease control. It is also recommended that some form of sulfur-containing fertilizer or elemental sulfur be used to control diseases such as *Fusarium* patch. Although interactions between N, P, K and S are complicated with the differences in soil types, previous fertilizer practices, irrigation and climatic differences, it is recommended that a balanced program using the ratios indicated above be used using 8-12 lb. of nitrogen on putting type turf and 6-8 lb. on lawn type turf per year.

Fertilizer practices which reduce the incidence of common turfgrass diseases

***Fusarium* patch**
Avoid nitrate types of fertilizers, urea and urea formaldehyde. Avoid excessive nitrogen during late fall and early spring. Use balanced (6-1-4) ratio of N-P-K plus sulfur.

Helminthosporium leaf spots and blights

Avoid the use of high rates of nitrogen as this favors the disease.

Ophiobolus patch

This disease is greater on areas of low fertility or unbalanced in N, P. and K. Liming increases this disease as does the use of nitrate and urea forms of nitrogen. Application of some form of sulfur, particularly ammonium sulfate, at 2 lb. S/1000 ft^2 applied to lawns in late March, mid April, late June and early September is the only effective control of this disease. Apply 20-20-20 fertilizer at 7 lb/1000^2 ft in early spring and early fall.

Red thread

Use balanced 6-1-4 ratio in western Washington and apply ¼ total amount (8-12 lb. N for putting turf and 6-8 lb. on lawn type turf) in late March, June, September and December or January.

Rust

Adequate, but no excessive nitrogen, using a balanced formula which stimulates growth of leaves may allow the removal of infected leaves before they become unsightly.

Stripe smut

Greater disease occurs on under or over-nourished turf. Soil pH should be maintained at 6.0 to 7.0 rather than on the acid side.

Typhula snow mold

Late fall applications of nitrogen increases this disease. Do not use over ½lb. N/1000 ft^2 in fall and none after November 1. Sewage sludge and ammonium sulfate are recommended for reducing this disease.
