Organics Like It Hot — Natural Turf Management, Part 6

By Marc McMullen

Since the late 1960s, when the first reported signs of turfgrass disease resistance were discovered, the turfgrass industry has been challenged to find new ways of suppressing increasingly resistant types of disease pathogens. Growing concerns about the effects of pesticides on the environment have made the use of new, improved fungicides a difficult direction for the turfgrass industry to head.

A new direction the turfgrass industry is taking is in the development of disease resistant cultivars of turfgrasses. Another path of study has led the industry to the use of natural organic fertilizers and composted materials for disease suppression. This direction emphasizes the use of organic fertilizers and composted materials not only as a nitrogen source, but also as a way to increase in the soil "antagonistic microorganisms" that can aid in the biological control of turfgrass pathogens.

Natural Organic Fertilizers

With natural organic fertilizers, you apply a nitrogen source that is contained in complex organic compounds. These compounds must first be decomposed by microorganisms in the soil before they can be used by turfgrass plants. Since the decomposition is moisture and temperature dependent, it increases as soil temperature rises.

This dependency on microorganisms to break down the organic compounds results in slower nitrogen release rates. Beard (1973) documented that characteristics commonly associated with organic carriers include:

(a) a medium initial release rate,
(b) low water solubility,
(c) minimum foliar burn potential,
(d) higher costs per unit of nitrogen,
(e) reduced loss by leaching,
(f) lower nitrogen analysis and
(g) longer residual periods of four to eight weeks.

These characteristics can be put to good use to control nitrogen release and burn potential during the higher temperatures of the summer months.

The aim of fertilization in the summer is to maintain growth at lower rates. In the fall, natural organic fertilizers can use the lower temperatures to have a slow release mechanism and aid in the hardening-off process when limited shoot growth and maximum root growth are the goals.

One of the reasons natural organic fertilizers are not used in large quantities is that they are thought to produce a lower quality of turf than synthetic nitrogen sources. This can be true during the initial ratings and clippings yields. In research done at the University of Massachusetts, slow release natural organic materials including Hagerstown sludge (5-2-0), Milorganite (6-2-0), and Ringer Turf Restore (10-2-6) were compared to ureas (45-0-0) for quality and clipping yields.

The synthetic nitrogen carrier started out as a superior source of growth and quality. As the experiment continued into mid-July, the Hagerstown sludge product showed superior clipping yields and quality ratings. The increase in quality and clippings can be attributed to the increased nitrogen released as the soil microorganisms decomposed the organic compounds. The increase in yield and quality can also be attributed to the rise in soil temperature from early June to mid-July.

Another problem associated with some natural organic fertilizers is high levels of heavy metals. Realizing this, the Environmental Protection Agency regulates the amounts of heavy metals in these organic fertilizers.

Many other fertilizers also contain these heavy metals, but are not required to meet the stringent quality control standards like natural organic fertilizers. Mackintosh and Cooper (1993) documented that fertilizers derived from leather tankage material may contain chromium at levels greater than 15,000 ppm, compared to sludge-based fertilizers that typically contain less than 100 ppm. Fertilizers derived from ironite have been found to contain more than 20,000 ppm of arsenic, compared to less than ten ppm in sludge-based fertilizers. Rock phosphate mined to manufacture super phosphate for blended fertilizers can contain cadmium levels around 100 ppm, while sludges typically contain less than ten ppm of cadmium.

The thought that natural organic fertilizers are high in heavy metals might be a concern, but these heavy metals can also show up in higher levels in many other types of fertilizers.

The fact that these organic fertilizers are slow release can also be a positive factor in the heat of the summer and during hardening off in the late fall.

Disease Suppression

Natural organic fertilizers and/or composted materials have been shown to suppress some turfgrass pathogens. This occurs due to the presence of microbial organisms. Gallant (1993) documented that these microorganisms are antagonists that, when found in sufficient numbers, can interfere with the activities of plant pathogens. Composted materials therefore not only strengthen turfgrass, but also provide microbial antagonists that can suppress diseases.

Organic fertilizers can lead to disease suppression on many types of grasses. On bentgrass greens, Soika and Sanders (1990) documented that excellent suppression of brown patch was obtained with Ringer Experimental I, Ringer Experimental 2, Sustane and ASC 66912. Ringer Experimental I and ASC 66912 provided suppression of dollar spot that was statistically different from the check and not statistically different from the Dyrene standard. Plots treated with Dyrene and ASC

66912 were rated highest in overall turf quality.

These reports showed that the diseases were not suppressed completely, but if conditions were right, some organic fertilizers could suppress the dollar spot and brown patch pathogens as well as fungicides.

This type of result was obtained in a similar study at the University of Rhode Island. Hull, Jackson, Liu and Alliare (1991) documented in a test with eight composted organic wastes and two organic nitrogen fertilizers that incidence of dollar spot was reduced somewhat by fertilizers having higher levels of soluble N.

This does not necessarily show that organic fertilizers suppress the dollar spot pathogen, since one of the cultural management practices to reduce dollar spot is to increase nitrogen. So, it is hard to say whether the disease is reduced by the antagonistic microorganisms produced by the organic fertilizers or by the increase of nitrogen in the soil.

But, in the case of brown patch an increase of nitrogen does not reduce the pathogen. Actually, a higher amount of nitrogen can increase the severity of the disease. Therefore, there may be some antagonistic microorganisms produced by the organic fertilizers working to resist the brown patch pathogen.

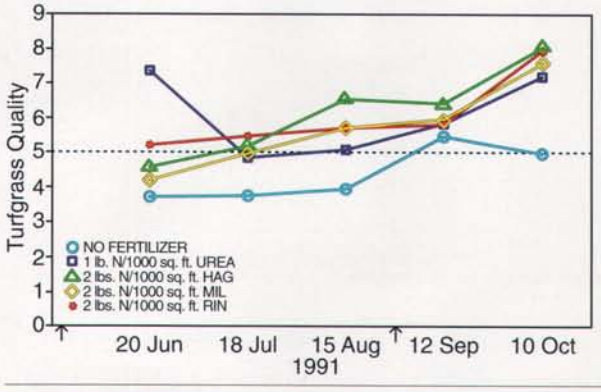

Figure 1. Turfgrass quality in response to fertility programs. Arrows indicate fertilizer applications.

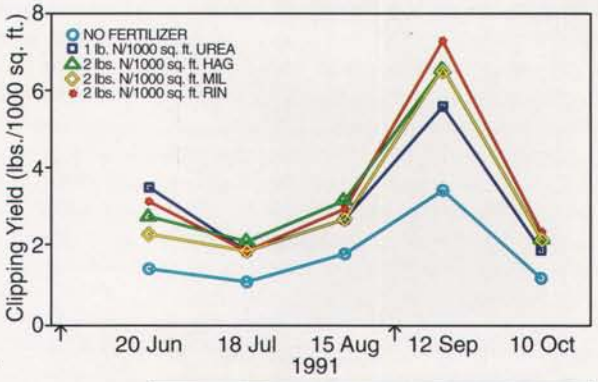

Figure 2. Clipping yield in response to fertility programs. Arrows indicate fertilizer applications.

Topdressing Strategies

With more and more golf courses on frequent topdressing programs, studies have been done to test disease suppression using either organic fertilizers or composted materials. As topdressing materials are added frequently to tees and greens, organic fertilizers and composted materials can be incorporated into the

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topdressing to suppress diseases and decrease the amount of fungicides needed to control these pathogens.

Nelson and Craft (1989) documented in a study on creeping bentgrass greens that topdressings amended with either Ringer Compost Plus, Ringer Greens Restore or Sustane were effective in suppressing brown patch. Control of brown patch with these materials was as good as a high rate of the fungicide Banner. Also, topdressing prepared from a sludge and leaf compost significantly reduced brown patch severity as compared with untreated plots.

Most composts used in this study were one year old or younger. These immature composts were ineffective, particularly the sewage sludge composts.

A similar study also was done on an annual bluegrass putting green for dollar spot suppression. Nelson and Craft (1989) documented that only topdressing amended with Ringer Compost Plus and Ringer Greens Restore significantly suppressed dollar spot development. The level of disease control was as good as that provided by Banner. Topdressing formulated with composts were ineffective in suppressing dollar spot. It was concluded that some organic fertilizers may reduce damage from dollar spot when applied to putting greens as a topdressing. The amount of disease suppression may have increased if the rates of nitrogen were increased.

Another study of disease suppression using organic fertilizers was done on a perennial ryegrass stand. Nelson and Craft (1989) documented that topdressing amended with Sustane significantly suppressed red thread development as compared to untreated plots. Topdressing formulated with composts were ineffective in suppressing red thread. It was concluded that some organic fertilizers may reduce damage from red thread when applied as a topdressing.

Eric Nelson (1992) did an extensive amount of research on the suppression of diseases using topdressings amended with organic fertilizers and composts. There was no one product that significantly suppressed all types of diseases. The

Table 2
Biological Suppression of Various Turfgrass Diseases With Compost-Amended Topdressings[a]

	% Disease Control				
Topdressing Amendment	Dollar Spot	Brown Patch	Red Thread	Typhula Blight	Pythium Root Rot
None	—	—	—	—	—
Greens Restore[b]	65.7*	66.7*	8.5	0.0	47.4
Sustane	30.3	75.0*	78.7*	15.2	52.6*
Sludge Compost A	34.3	41.7*	14.9	69.7*	57.9*
Brewery Compost	10.1	25.0	36.2	69.7*	36.8
Leaf Compost	4.5	38.9	0.0	—	—
Horse Manure Compost	0.0	0.0	0.0	54.5*	—
Sludge Compost B	0.0	8.3	0.0	—	—
Fungicide Standard[c]	97.0*	88.9*	—	33.3	42.1

[a] Determined 30, 13, 27, and 19 days post-application for Dollar Spot, Brown Patch, Red Thread and Pythium Root Rot, respectively. Gray snow mold evaluated in the spring (April), 6 months after the last fall application.

[b] Greens Restore is an uncomposted organic fertilizer composed of plant and animal meals.

[c] Fungicide standard for all diseases except Pythium Root Rot consisted of Banner applied at the rate of 4 oz./1,000 ft^2. For Pythium Root Rot. Subdue was applied at the rate of 2 oz./1,000 ft^2.

Numbers followed by an (*) indicate statistically significant levels of disease control as compared with untreated plots.

likely reason is that each product nurtures a different type of antagonistic microorganism, and these microorganisms are specific to one type of disease. If this is true, then reproduction of these microorganisms could produce a biological method of suppressing that specific disease. Also, where the organic fertilizers do suppress diseases, they do as well if not better than the fungicide standard for that disease. Thus, if you used the right organic fertilizer for a specific disease, you could reduce the amount of fungicide needed to control it.

If the composted material is older, it seems to suppress higher amounts of diseases. Nelson (1991) documented that suppression of a number of turfgrass diseases by composts occurs if the compost is well aged or mature. Our research indicates that the level of disease suppression in mature composts is due to the intense microbial activity associated with these composts.

Composts Coming of Age

Composts, if managed properly, can be a beneficial part of turfgrass management. With the increased pressure on limiting the amount of organic wastes (mostly leaves and grass clippings), compost piles can be an alternative to the local landfill.

If the compost pile is allowed to mature and the right microbial activity is present, compost can be a source of disease suppression and a reduction of fungicide usage.

The use of natural organic fertilizers can have many benefits in comparison to the normal sources of nitrogen. Natural organic fertilizers are slow release sources of nitrogen with low foliar burn potential. Used at the right rates, they can give as good, if not better, quality ratings and clipping yields than synthetic sources.

The amount of heavy metals that was once a big drawback to organic fertilizers is now greatly reduced. The use of some organic fertilizers and even some mature composted materials in either amended topdressing form or as a straight nitrogen source can be a tool in disease suppression.

As environmental concerns mount and more and more of the pesticides we take for granted are removed from our shelves, biological means of suppressing diseases will need to increase. With the use of organic fertilizer, fungicide use can be reduced and the cost of turf management reduced.

The type of microbial activity produced by organic nitrogen sources needs to be researched more, so the results in disease suppression can be more practical. Until this occurs, the use of organic fertilizers will remain minimal. ❑

Table 2
Fertilizer Products Used in the Study

Product	Nitrogen Source
Hagerstown (5-2-0)	Heat-dried sewage sludge
Milorganite (6-2-0)	Heat-dried sewage sludge
Ringer Turf Restore (10-2-6)	Hydrolyzed poultry feather meal, blood meal, wheat germ and bone meal.
Urea (45-0-0)	Synthesized from ammonia and carbon dioxide