USING COMPOSTS TO IMPROVE TURF ECOLOGY

We are just beginning to learn about all the benefits compost can offer.

by F. DAN DINELLI, CGCS

North Shore Country Club participated in a two-year study of composts. Observations included a strong suppression of dollar spot disease from some of the compost materials.

IT IS SAID that *if any of the billions of organisms inhabiting the soil had hands, the fate of the world would be in them.* Although the world of soil microbiology holds many mysteries, scientists are learning more each day about the amazing role of soil diversity and health.

As the superintendent at North Shore Country Club (Glenview, Illinois), I became interested in applying compost as a soil amendment after reading about research suggesting its many agricultural benefits. Dr. Michael Boehm, of Ohio State University, and Dr. Eric Nelson, of Cornell University, have conducted research about the effects of compost on turfgrass. Generally, researchers and practitioners recognize that incorporating high-quality compost does several things:

1. Adds food for nearly every kind of organism needed by healthy soil.

2. Adds diversity of organisms to the soil.

3. Encourages plant growth-promoting substances in soils. Compost can also have an effect on soil structure, nutrient cycling, disease suppression, nematodes, and other biological activity.

In fact, the use of composts on turf is not new. In a 1917 USGA-sponsored book given to me by my grandfather, Frank Dinelli (retired greenkeeper at Northmoor Country Club), *Turf For Golf Courses*, by Charles V. Piper and Russell A. Oakley, there is a chapter devoted to "Manures, Composts, and Other Humus Materials." Because compost is not widely used on golf courses, I wanted to participate in

further research prior to investing in the process at North Shore Country Club.

Phase I: Experimentation

In 1996, we got that opportunity by participating in a two-year study of various composts and organic materials under the direction of Dr. Michael Cole, of the University of Illinois, and GreenCycle, Inc., operator of several composting facilities based in Northfield, Illinois. The study was a replicated 10 ft. × 10 ft. plot design on our fifth fairway comprised of creeping bentgrass and *Poa annua* maintained at ½". Our main objective was to observe any disease symptom differences between the research plots.

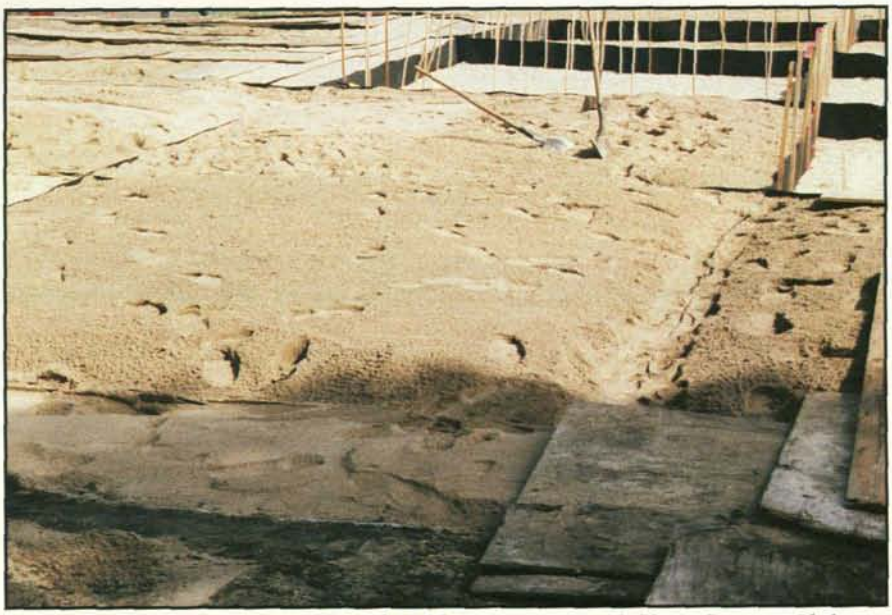
Our first application was in the fall of 1996 to see if the compost produced snow mold suppression. None of the materials demonstrated any noticeable snow mold suppression; however, plots treated with compost had a notably earlier green-up and recovery rate versus the control plots. The applications were repeated in the late spring of 1997. Observations through the remaining growing season showed strong dollar spot suppression (up to 80% reduction), improved turf color and density, and increased earthworm castings. While the initial objective of snow mold suppression was not observed, the experiment to test organic products to improve overall turf ecology proved quite successful.

Phase II: Implementation

Based on favorable results after two seasons of field evaluation of compost topdressing, we implemented the strategy on all our fairways. During our normal coring of fairways, the process involves:

1. Coring with hollow tines.
2. Breaking up the soil cores with a vertical mower.
3. Topdressing with compost.
4. Mixing the soil with compost as it is matted into the surface with a section of chain-link fence.
5. Blowing the remaining tufts of turf and thatch into rough via a three-point-hitch blower.
6. Picking up debris in the rough with an out-front rotary mower fitted with a bagging attachment.
7. Irrigating the area.

We have been coring fairways this way for several years. Adding the extra step of compost topdressing has not significantly impacted the workload. The cleanup is about the same and we can still get our targeted 9 holes (15 acres) done in one day. Part of our IPM cultural program is poling, by dragging a chain over the fairways each morning to remove leaf moisture. This process also manages earthworm casting buildup.



Research plots were constructed on the fifth fairway at North Shore Country Club using various compost and organic materials.

The materials did not exhibit any suppression of snow mold (left), but earlier green-up was observed with the composted plots versus the control (right).

Phase III: Results

To date, the results are much the same as in the test plots: improved turf density and color, rapid healing of cored turf, dollar spot suppression, increased earthworm castings, and thatch reduction. We continue to monitor the impacts of compost use on turf and maintain computerized spreadsheets to evaluate our results. With time and continued applications, we hope to document improved soil structure and suppression of other diseases.

Selecting Quality Compost is Key

Selecting quality compost is very important; you have to do your homework. Compost products are not standardized, so the challenge is in obtaining consistent, high-quality compost. The procedure we use to assure that the compost we obtain is optimal for our turf involves a series of tests. We

Compost is used in many areas throughout the golf course, including the fairway topdressing program, as well as in the soil and seed mix for divot repair.

analyze chemical, physical, and biological activity of the compost material. The following factors are tested in each analysis.

Chemical Analysis

- Carbon:nitrogen ratio of <20:1, best at 15:1.
- pH at 6.5 - 8.5.
- None to trace amounts of sulfide, ammonium, and nitrite.
- Low concentrations of soluble salts, especially sodium.
- We strive towards elemental balance and recommended ratios favoring the high side of potassium and calcium.
- Biosolids need to meet US EPA's Part 503 technical rule for biosolids. All biosolids need to be tested for coliform and other diseases. Biosolids composted properly have been heated sufficiently to kill viruses, coliform, and other diseases. Metals in biosolids are often high and this should be considered.

Physical Analysis

- Fine texture < or = ⅛".
- Light, crumbly structure, parent material non-visible.
- Moisture at 30-40%.
- Dark brown to black in color.

Microbiological Analysis

Microbiological analysis should show high biological activity in all functional groups and high diversity. The following six functional groups tested are:

- Heterotrophic (aerobic) bacteria.
- Yeasts and molds (fungi).
- Nitrogen-fixing bacteria.
- Actinomycetes.
- Anaerobic bacteria.
- Pseudomonads.

In addition, compost needs to be free of contaminants, such as weed seeds, plant parts, pathogens, stones, plastic, glass, wood, nails, etc. Compost also needs to be *mature*, testing > 50% on the maturity index. *In house* maturity tests can be performed by planting grass seed in a pot, utilizing the intended compost as the growing medium, to observe seedling health and establishment. Another method is to fill a plastic bag with moist intended compost and allowing it to sit sealed in the sun for a few days. Upon opening the bag, the compost should have an earthy smell, not an offensive smell from ammonia or sulfur.

Following these procedures will help ensure favorable results. Adverse effects can result when utilizing poor-quality compost. Starting slowly and testing small areas first is always helpful. Developing a working relationship with local composters will help in understanding their product.

Additional Uses for Compost

In addition to our fairway compost topdressing program, we also use compost in our soil and seed mix for divot repair. Compost is used as topdressing while overseeding turf. In 1998, a 7,000 sq. ft. experimental putting green was constructed using 20 different root zone mixes. Each mix used sand meeting USGA guidelines in a USGA root zone profile with various organic and inorganic amendments. The 90/10 sand/compost plots out-performed the others in seedling establishment and development. We continue monitoring other effects as the putting green matures. Compost tea is made and applied as a protective biofilm and to deliver plant growth promoting substances.

Another use of the compost material is to brew a compost tea. The compost is placed in a bulk fertilizer bag and then placed in water. A compressor is used to circulate the water during a five-day period. The liquid is then applied to promote plant growth.

The Bottom Line

To apply compost topdressing to fairways we purchased a TY-Crop MH-400 for $20,000. This material hauler/topdresser is used for other tasks as well, such as rapid refill of materials while topdressing greens and tees and applying sand in bunkers. The compost we currently use is a 50/50 mix of yard trimming compost and biosolids. Our cost for yard trimming compost is $14.00/cubic yard. For us now, biosolids are freely available (EPA permits are needed). The rate used is approximately 17 yards (7 tons)/acre = ⅛" layer. Total material cost is $119/acre. We offset some costs by reducing our other fertility inputs and decreasing fungicide treatments as part of our IPM program.

All Composts Are Not Created Equal

Understanding the chemistry, biology, and science of compost is complicated. Parent material used, how it's managed during composting, and storage can all have a huge effect on the finished product and results. Our efforts have certainly paid off. Results using composts have been positive, and the turf ecology is improving under our growing conditions.

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