

The Magic Microbes: Myth or Reality?

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✓ What are microbes - and what can they do?

- ◆ Bacteria
- ◆ Viruses
- ◆ Fungi
- ◆ Algae
- ◆ Nematodes

✓ Why would we want to add microbes?

- ◆ To make a "sterile" root zone environment "healthier"
- ◆ To "repair" or "improve" soil conditions
What do microbes do to improve soil?

➡ Enhance aggregation of soil particles by "gluing" them together

➡ Greater aggregation should increase porosity, infiltration, and percolation rates

➡ Greater aggregation should decrease bulk density (compaction)

North Carolina State University Study (Charles Peacock and Paul Daniel)

- ➡ Tested a number of natural organic and synthetic organic fertilizers on bentgrass and bermudagrass
- ➡ Examined bulk density, hydraulic conductivity, CEC, humic content over a 3-year period
- 📁 "There were no fertilizer effects on soil properties,..."
- 📁 Selection of nitrogen fertilizers should not be based "on any expected short- or long-term benefits for soil characteristics."

Golf Course Management, October 1995.

Benefits of Soil Organic Matter

- Slow-release source of N, P, and S for plants and microbes
- Increases soil water-holding capacity
- Acts as a buffer against soil pH changes
- Dark color contributes to soil heating
- Enhances soil structure by cementing sand, silt, clay together
- Binds micronutrient ions in the soil
- Organic constituents in humic substances may act as plant biostimulants

◆ To speed organic matter decomposition

Summary of U. Wisconsin studies on thatch management with BioGroundskeeper (W. Kussow, 1993, *Wis. Turf. Res. Rep.*, Vol. XI)

- Reduced bent-Poa thatch ONLY when used with supplemental nitrogen
- No discernible effects on the depth of Kentucky bluegrass thatch

◆ Management of insect pests

- X Fungal endophytes
 - + chinch bugs, webworms, billbugs
- X *Bacillus* products
 - + *B. popilliae* (milky dis./Japanese beetles)
 - + *B. thuringiensis* var. *israeliensis* (mosquitoes)
 - + *B.t.* var. *japonensis* (white grubs)
- X Entomopathogenic nematodes
 - + *Steinernema carposcopsae* (caterpillars)
 - + *Steinernema glaseri* (grubs)
 - + *S. riobravis* and *scapterisci* (mole crickets)
 - + *Heterorhabditis bacteriophora* (Japanese beetles)

X *Beauveria bassiana*

◆ Management of disease problems

- X Gray snow mold control
Typhula phacorrhiza
- X Dollar spot
Enterobacter cloacae
Fusarium heterosporum
Trichoderma harzianum (BioTrek 22G)
- X Summer patch
Enterobacter cloacae
Bacillus subtilis
Serratia marcescens
Stenotrophomonas maltophilia
- X Brown patch
Trichoderma harzianum (BioTrek 22G)
- X Dollar spot, brown patch, *Pythium* root rot necrotic ring spot, summer patch
Composts, natural organic fertilizers

How do Composts Work?

- ☞ Increased microbial activity in root zone
- ☞ Bacterial production of anti-fungal compounds
- ☞ Colonization (taking up space)
- ☞ Variable success
Successful when disease pressure is low

- ◆ Supplement fertilization programs
 - + *Azospirillum brasilense* (AzoKote, BioJect Systems)
- ◆ Environmental concerns
- ✓ **What kind of microbe sources are available?**
 - x Organic matter sources, composts, fertilizers
 - x Bioinsecticides
 - x Biofungicides
 - x Nitrogen-fixing organisms
 - x Microbial "stimulants"
- ✓ **Can microbe applications make a difference?**
Yes, no, not always... WHY???
 - ◆ Pathogen biotypes/strains may differ, change
 - ◆ Host biotypes may differ from region to region
 - ◆ Soils, climate, biological differences
 - ◆ Variable pest pressure
 - ◆ Time of season may influence effectiveness
 - ◆ What works in the lab may not work in the field
 - ◆ Statistics can be deceiving
 - ◆ "Acceptable" control is often a subjective measurement

Legitimate? What to look for...

- ☞ Patents
- ☞ E.P.A. and/or State registration
- ☞ *True* university testing - and results!
- ☞ Industry track record (testimonials)
- ☞ Respect for the "competition"
INTEGRITY & PROFESSIONALISM