

NATURE WILL FIND A WAY

Common myths about soil microbiology.

by MIKE KENNA, Ph.D.

TOO OFTEN, we fall into the trap that the system is broken and we need to add something to it or manage it differently to make it better. Advertisements and secondhand stories abound about the increased use of microorganism products on putting greens. This turf tip deals with three common myths about putting green soil microbiology that are used to persuade people to apply microorganisms to their greens.

Myth #1: A product is needed because microorganisms cannot establish in the harsh environment of a sand rootzone. A two-year research project at Clemson University by Dr. Horace Skipper investigated the number and diversity of microorganisms found in amended sand bentgrass greens at the Charlotte Country Club, in Charlotte, N.C.

In Figure 1, the average of eight sampling periods for six microorganism categories and a combined total of all microbes are reported. Note that this is a log scale rather than a linear scale. If it were a linear scale, this graph would be impossible to draw. In other words, if one unit on the scale is equal to one inch, a million would be 16 miles, and a billion would reach nearly 16,000 miles. For example, the average gram-positive bacteria found were 100,000 per gram of soil. If a linear scale were used, the bar would have to extend 100,000 inches or 1.6 miles.

For most all of these soil bacteria categories, there were one million to 10 million colony-forming units found in a single gram of soil (Figure 1). More importantly, there was a total of 10 billion colony-forming units in a single gram of soil. This represents only a small fraction of the soil microbe species that scientists can easily culture and identify at this time. ∴ Microorganisms easily establish themselves in sand-based greens.

Myth #2: Fumigation will kill all the beneficial microorganisms in putting greens. Dr. Monica Elliott at the University of Florida demonstrated that for every soil bacteria category, except the fluorescent pseudomonads, microorganism levels were equal to or greater than the pre-fumigation levels and

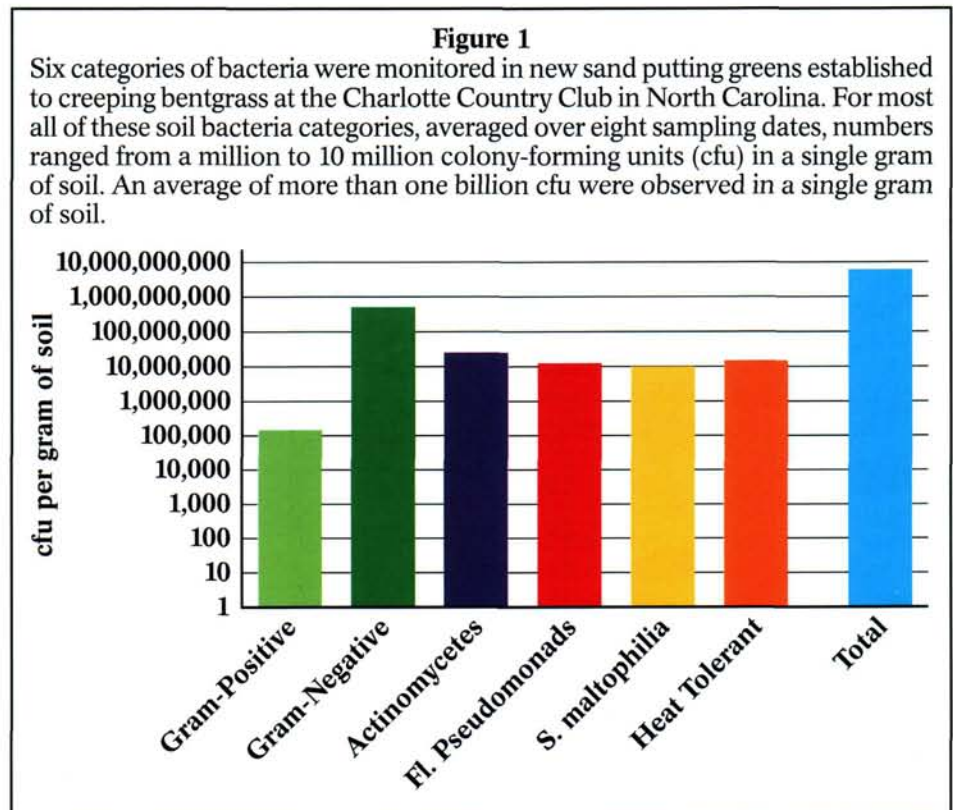


Table 1

Number of bacterial colony-forming units per gram of soil found in a sand putting green before fumigation and 23 days after treatment.

Bacterial Group	Pre-Fumigation	23 Days	
		Control	Methyl Bromide
<i>Colony-Forming Units Per Gram of Soil</i>			
Total	6.9	6.6	7.0
Fl. Pseudomonads	2.5	1.6	0.0
S. maltophilia	2.6	0.8	3.1
Gram positive	2.3	0.7	5.2
Gram negative	5.1	4.6	5.3
Actinomycetes	3.2	3.0	1.9

untreated control 23 days after treatment (Table 1).

A similar study on bermudagrass greens repeated at Clemson University and the University of Florida found the same results. All six categories of bacteria, including the fluorescent pseudomonads, reached levels of one to 100 million colony-forming units per

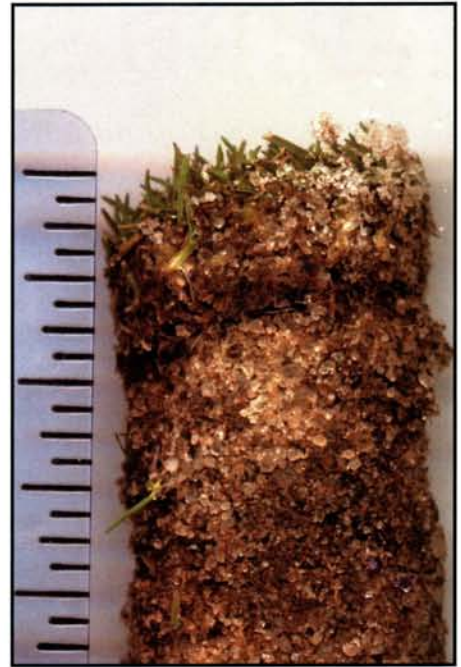
gram of soil in less than two years after fumigation (Figure 2). ∴ Fumigation does not sterilize the soil.

Myth #3: Repeated use of fungicides will kill all the beneficial soil microbes in a putting green. Dr. Gary Harman at Cornell University conducted a three-year study comparing an untreated control with repeated applications of

eight fungicides (Figure 3). The products included Daconil, Chipco, Subdue, Banner, Bayleton, Prostar, and Sentinel. There were no significant decreases for the soil microbes measured during each of the two-month sampling periods for the years this study was conducted. ∴ Fungicide use does not have a significant effect on numbers of soil microorganisms.

Conclusions

Do not be fooled by false advertising or sales pitches. Scientific research indicates that microorganisms establish quickly and thrive in high-sand root-zones because they grow in association with plant roots. They have evolved over millions of years to have this close relationship with plants, *not* soil particles.



Scientific research indicates that microorganisms grow in association with plant roots and establish quickly and thrive in high-sand rootzones.

Second, fumigation does not kill all the beneficial microorganisms. There are billions of microbes that lie dormant in the soil and are not awakened until an actively growing root provides them a home.

Last, fungicide applications have an insignificant effect on numbers of microorganisms. This is most likely due to the way fungicides adsorb to turfgrass leaves, which in turn makes it difficult for them to move downward into the soil. Systemic fungicide products would have even less effect on soil microorganisms.

Remember, a proper rootzone that maintains 45% mineral, 3-5% organic matter, 20-30% air-filled pore space, and no more than 20-30% water-filled pore space will provide an adequate growing environment for putting green cultivars. In turn, this will promote the growth of billions of naturally occurring microbes in just a single gram of soil. You will be able to maintain this naturally occurring balance with adequate sunlight, proper irrigation and nutrition, and using common sense to provide reasonable mowing height and cultivation regimes.

So tell the sales people who insist you have a problem that we do not need their magic because . . . *nature will find a way!*

DR. MIKE KENNA is the director of research for the USGA Green Section.

