Bentgrass Response to Non-Traditional Soil Additives

By Timothy Wegner

INTRODUCTION

The basis for a good stand of turf starts with what it is grown upon. Having soil with good physical, chemical, and biological properties allows for healthier plants and a simpler management program. Many times superintendents are faced with poor soil conditions on their putting greens and are expected to "fix" them. In order to help those unfortunate individuals out, many new products are being developed. The claims range from reclaiming the soil and bringing it back up to acceptable standards, to feeding microorganisms to ensure healthy turf. These products are being referred to here as non-traditional soil additives.

Several of these products were tested. One such product was Sand-Aid. Sand-Aid was developed by Emerald Isle and is a granular sea plant meal containing micronutrients and alginic acid (the key ingredient), which is claimed to reduce nutrient leaching and water losses in sandy soils. In addition, Sand-Aid has been said to promote flocculation, stimulate microbial activity, and improve soil fertility. According to the manufacturer, Sand-Aid works best when used in conjunction with topdressing, aerifying, or verticutting operations.

A second product that was tested was Carbo-Aid. Developed by Aqua-Aid, Inc., Carbo-Aid is a carbohydrate-based microbial food supplement comprised of complex natural sugars and proteins, leather tankage, kelp, humic and fulvic acids. The manufacturer claims it is specially formulated to feed the microorganism in the soil and to ultimately lead to healthier plants. Their theories state that with healthy microbes, thatch accumulation will be reduced, less leaching of nutrients will occur, disease and stress tolerance will increase, and root growth and vigor will rise as well.

The remaining products tested were all developed by a company whose products are all organically based. Their products utilize humates and sea kelp as basic building blocks. Humates are highly compressed prehistoric organic matter, consisting of plant and animal matter that is decomposed over thousands of centuries. Ultimately, the company claims the benefits of their products include the stimulation of microbial activity, chelation of nutrients, improvement of soil structure, and enhanced root and shoot growth.

The philosophy behind the use of sea kelp stems from the fact that kelp provides nutrients, growth stimulants, hormones, carbohydrates, and soil conditioners. With their use, claims are that one will see stronger, healthier plants, greater stress handling abilities, and an increase in nutrient availability.

One of the products tested was "Humact-G+Fe." It is a homogeneous granular humate product containing primary nutrients plus iron and sulfur. The Humact-G is derived from a Florida ore and processed through a proprietary activation process. The company claims this product will provide color and correct iron deficiencies in turfgrass.

A second product tested was "H-15." This is a liquid form of activated humates. This product can either be used alone or in conjunction with other growth and plant protection products. Claims are that this product will lead to decreased plant stress, improved soil, and an overall healthier stand of turf.

Another product, "Root'N Shoot," is a combination of humic acids, seaweed, amino acids, carbohydrates, enzymes, and bacteria. The company claims this product will encourage rooting and promote plant vigor.

A final product that was tested was "Biocatalyst." This is a microbiological substrate solution containing microorganisms and enzymes beneficial to the soil. This product presumably works through inoculating the soil with bacteria designed to enhance nitrogen fertility.

MATERIALS AND METHODS

The non-traditional products were tested on simulated greens constructed in 6-inch diameter PVC cylinders. The growing medium consisted of 12 inches of 80/20 root zone mix over 3 inches of pea gravel.

The greens were assembled on March 7, and 1.75 lb P_2O_5 as Lebanon 13-25-12 was applied as a starter fertilizer (incorporated into the top 1/2 inch of root zone mix). The greens were seeded with 'Providence' creeping bentgrass at a rate of 2.5 lb/M. On March 21 (2 weeks after planting), 1.0 lb N/M was applied as Country Club 18-4-10. Then, on April 7, the non-traditional products were applied in accordance with the manufacturer's suggested application rates and methods (Table 1). On April 12, the bentgrass was stressed for nitrogen, so 0.5 lb N/M was applied as urea; on April 14, the greens were clipped and the clippings were collected, dried, and weighed. The non-traditional products were applied once again. The bentgrass was clipped for the final time on April 21 and the roots sampled using a 12-inch Turf-Tech sampler.

Table 1. Non-traditional product treatments.

Treatment	Rates	Method of application
Biocatalyst	0.37 oz/M	Sprayed
H-15	6 oz/M	Sprayed
Root'N Shoot	3 oz/M	Sprayed
Humact G+Fe	6 lb/M	Topdressed
Carbo-Aid	8 oz/M	Sprayed
Sand-Aid	5 lb/M	Topdressed

RESULTS AND DISCUSSION

Bentgrass responses to the non-traditional products were measured as clipping weights collected 7 days after each of the two applications and crown+root weights at the end of the study. When the non-traditional products were applied to bentgrass showing nitrogen stress, the only shoot growth responses observed were to the applications of Biocatalyst and Humact-G+Fe (Table 2). Associated with the growth response to the Humact-G was a marked improvement in bentgrass color. No color change was observed in the Biocatalyst treatment.

Two days prior to the second application of the non-traditional products, all putting greens received 0.5 lb N/M in the form of urea. This quickly eliminated any bentgrass color differences among the treatments. Even so, there was a significant shoot growth response to the Humact-G (Table 2).

Even though the crown+root weights of the bentgrass ranged from 207 to 275 mg (Table 2), none of the treatment differences were significant. In general, the crown+root weights showed the typical reduction associated with a stimulation of shoot growth.

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Table 2. Creeping bentgrass growth responses to non-traditional turf products.

Products applied	Clipping weights: Low N status	Clipping weights: Adequate N status	Root and crown weight
	mg	mg	mg
None	119	286	275
Biocatalyst	199	313	207
H-15	116	290	249
Root'N Shoot	116	257	241
Humact G+Fe	397	677	209
Carbo-Aid	151	252	262
Sand-Aid	136	282	266
LSD (p=0.05)	64	113	64

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The strong bentgrass shoot growth response to the Humact-G raises the question of the nature of the response. Was it purely nutritional or were some other growth-stimulating factors involved? This question was addressed in two ways. One was to analyze the clippings from the control and Humact-G treatments. The other was to determine the nutrient content of the Humact-G itself.

Application of the Humact-G clearly altered the nutritional status of the bentgrass (Table 3). Clippings from this treatment contained 34% more N, 85% more P, 14% more K, and considerably less Fe and Cu than did the clippings from the control treatment. Could the additional N, P, and K in the Humact-G clippings have come from the product itself?

Table 3. Bentgrass clipping analysis for the control and Humact-G+Fe treatments.

Clipping nutrient concentrations	Control	Humact-G
Nitrogen	3.54%	4.75%
Phosphorus	0.40%	0.75%
Potassium	3.29%	3.76%
Calcium	0.67%	0.56%
Magnesium	0.43%	0.44%
Sulfur	0.36%	0.53%
Zinc	89.6 ppm	110 ppm
Manganese	66.7 ppm	83.8 ppm
Iron	624 ppm	176 ppm
Copper	229 ppm	118 ppm

The N content of the Humact-G was measured by way of the Kjeldahl method and the other nutrients in a nitric acid + hydrogen peroxide digestate. The analysis revealed that the Humact-G contained as its main nutrient components 6.27% N, 4.80% P, 2.34% K, 4.44% S, and 4.10% Fe. If one assumes that all the P and K in Humact-G are plant available, the two applications of the product were equivalent to applying 12 lb/M of a 6.3-10.9-2.8 grade of fertilizer. This totals 0.76 lb N, 1.3 lb phosphate, and 0.34 lb potash/M. When this information is combined with the fact that there was no growth response to the liquid humate, H-15 (Table 2), the implication is quite strong that shoot growth response to the Humact-G was to the nutrients contained in the product.

The excessive levels of Fe and Cu in the clippings from the control treatment were reduced by the application of Humact-G (Table 3). This is evidence that the humate has chelation properties. It is a well-established fact that when plants are provided Fe and Cu in ionic forms, uptake is greater than when the nutrients exist as chelates. The reductions in clipping Fe and Cu concentrations in the Humact-G treatment may also have contributed to the shoot growth response to the product.

The bentgrass growth responses observed in this study are clearly very short-term. It is entirely possible that different responses would have been observed had the study been conducted for a longer period of time. The short-term responses measured did not substantiate the majority of the claims made by the manufacturers of the non-traditional products tested and it is quite possible that the response to the Humact-G could have been duplicated by applying a conventional fertilizer.

Editor's Note: Tim Wegner will graduate from the University of Wisconsin-Madison Turf and Grounds Management Program in December 1997. This summer he is interning at the Pine Tree Country Club in Boynton Beach, Florida.