SUMMARY
Development of an effective soil microbial enhancer and organic fertilizer

DATA
2002 (part of field dissertation involving extensive field research)

SOURCE
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Commercially competitive organic fertilizer/soil microbial enhancer

One of the significant problems associated with organic turfgrass management programs has been the inability to develop and maintain the needed high levels of overall turf quality and aggressiveness (recuperative potential) when using natural organic fertilizers. The literature published regarding the positive soil structure/building and disease reduction effects of organic fertilizers and amendments on professional turf is voluminous, as well as the negative aspects of usage volumes, mower/roller pickup, bulk storage, foul smell, seasonal effectiveness and cost. In view of these disadvantages, the most desirable natural organic fertilizer/amendment should include: The highest level of *natural organic* nitrogen available; the lowest C/N ratio possible (preferably under 4 for more rapid microbial breakdown and nitrogen availability); easy application (preferably a liquid soluble/flowable spray application to avoid particle pickup during mowing and to enhance response time or a very fine greens grade granular); and high microbial populations and activities after application. EcoOrganics, Inc. has developed and tested a line of soybean-based natural organic materials. The central product was named "SoylMicrobial" due to the very rapid and extensive enhancement of soil microbial populations. It is formulated as a wettable powder which forms a suspension for spray applications. It has one of the highest natural organic nitrogen levels in the industry (13-2-1) allowing, for the first time, the ability for spray-applied spoon-feeding. It is a 100 percent natural organic derived through a complex extraction of soybeans – not a by-product of the meat/fowl industry. Use of a totally food-grade product eliminates the foul smell, and a no "salt index" allows for mid-summer applications. Importantly, research shows it provides rapid and extensive enhancement of soil microbial populations. Turf quality ratings for USGA greens profiles showed no observable differences between SoylMicrobial and Inorganic treatments indicating, for the first time, that a 100 percent natural organic material can perform equally as well as an inorganic material during a nitrogen "spoon feeding" program, particularly to USGA sand greens (Fig. 1). Applications of SoylMicrobial result in extremely rapid and large increases in existing soil microbial populations compared to Milorganite and inorganic nitrogen treatments (Fig. 2). This rapid response is again due to the low C/N ratio of the material and application as a flowable liquid spray (flowable powder) which carries the material into the soil more effectively, as well as having a much larger surface area for microbial activity. These results suggest that the elevated microbial activities enhance degradation of native soil organic matter as well as overlying mat and thatch. Research is now in progress to further quantify these results in addition to potential weed control characteristics. A roster of six different flowable, greens grade and coarser fairway and rough granular products should reduce disease and thatch pressures, result in more rapid increases in color and density and become components of strong IPM programs.

Figure 1. Enhancement of microbial populations in response to Soy/Microbial, Inorganic and Milorganite applications on a USGA sand green profile

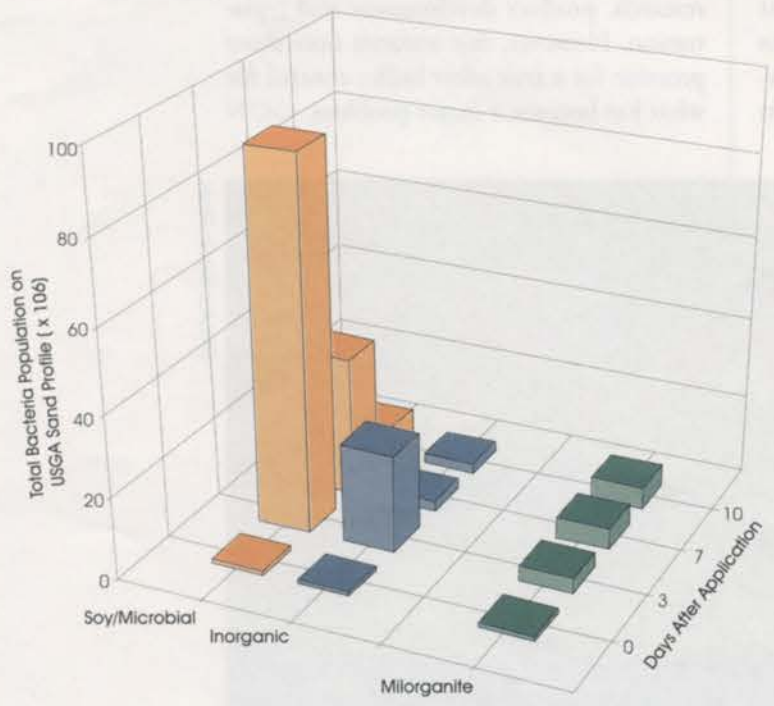
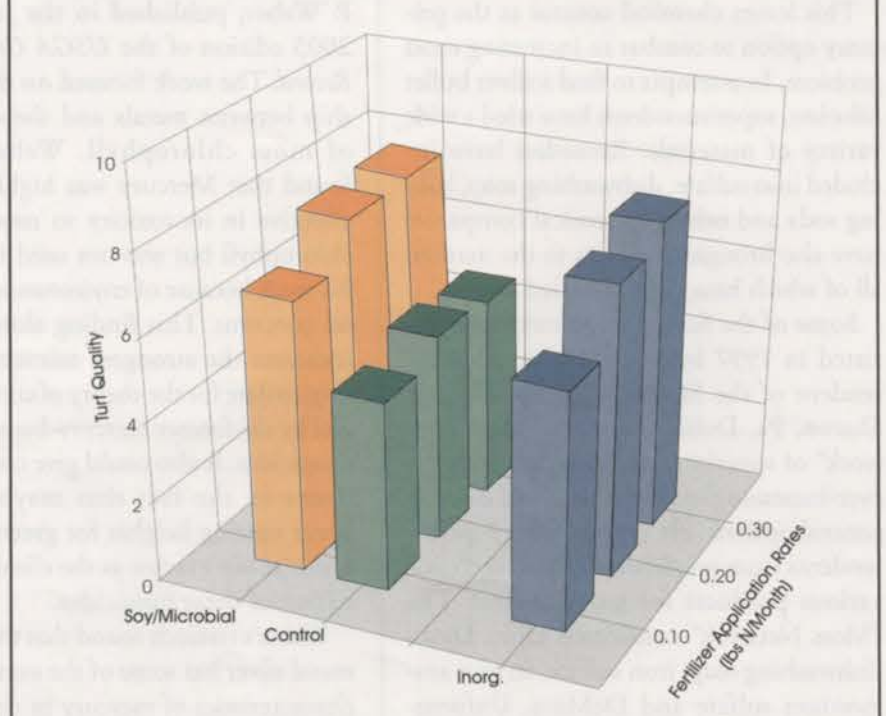


Figure 2. Seasonal Turf Quality comparison of Soy/Microbial with Inorganic fertilizer on a silt-loam native soil.



SUMMARY
Ground rubber as a drainage layer medium under greens

DATA
2001-2004. Research site near University Ridge golf course, Madison, Wis.

SOURCE
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Recycled rubber as a drainage layer medium under greens

Research has led to the development of an innovative technology to remove toxic compounds in landfills by replacing gravels in the leachate collection system with shredded tires, which have significant capability to adsorb toxic compounds. To see if this research could have possible use on golf course greens, confetti-sized pieces of scrap tires (ground rubber) were placed in 4-inch thick layers between the layers of sand, peat root mix and subgrades commonly used beneath golf greens. The greens were then soaked with water spiked with nitrate. The results showed that fields with a 10-centimeter layer of tire chips released about 58 percent less nitrate than samples without rubber layers (crumb rubber used in the sublayer compared with pea gravel). Nor was pH of infiltrated water altered with the crumb rubber sublayer addition. In addition, the health of the plots suggests the rubber layers did not alter the turfgrass quality or growth in terms of quality, color or density of turfgrass among three configurations (see Table 1). While the research focused on nitrates, because many golf greens are built near groundwater level or wetlands, it is believed ground rubber would also adsorb a range of pesticides and fertilizers as demonstrated in laboratory-scale experiments. The layer of ground rubber under the greens and fairways in golf courses would also lengthen the playing time due to less freezing and a longer growth period because ground rubber has eight times better insulation value than gravel. Further benefits could include less compaction due to the resilient property of ground tires and easier construction due to the light weight of ground tires in comparison to gravels. Since ground rubber is 1/3 to 1/2 times the weight of soil, it could be used as backfill material for greens constructed in soft foundations and the construction cost is cheaper, although the cost of the material may be higher than for gravels. The research indicates that in areas where the sub-grade soils are porous this technology could prevent groundwater from potential contamination. An added environmental benefit could be a useful market for the 280 million scrap tires generated annually in the United States. While the research was not directed at a means to dispose of scrap tires, but rather to make golf courses environmentally safer and friendlier, the researcher estimates that a rubber layer under the greens for just one 18-hole golf course could require up to 72,000 scrap tires and over 1 million tires if also installed in fairways and drainage systems. In addition to this, ground rubber-based products are already being used on golf courses as a topdressing to improve traffic tolerance and as a soil amendment to improve porosity. GCN

Table 1

Average Turfgrass Quality, Color, and Density for Three Configurations

Treatment	Quality		Color		Density	
	range[d]				0-100%	
	16-Jul	28-Sep	16-Jul	28-Sep	16-Jul	28-Sep
USGA[a]	4.8	6.0	6.0	6.0	93.3	100.0
Rubber Intermediate Layer[b]	5.5	5.7	6.0	5.7	93.3	100.0
Rubber Drainage Layer[c]	5.2	6.0	5.7	6.2	96.7	100.0
Least significant difference ($P < 0.05$)	ns[e]	ns	ns	ns	ns	ns

[a]United States Golf Association sand-based golf course putting green profile.
[b]Fine-ground rubber produced by Tire Grinder, Aurora, IL.
[c]Coarse-ground rubber produced by Tire Grinders, Aurora, IL.
[d]Turf quality and color were rated visually on a one (poor) to nine (best) scale (six acceptable).
[e]ns = not significant.