DPI-IMB-COMP-1307-ES

Benefits of Impact MB® on Active Composting Rate[1]

Introduction

According to the United States Composting Council, there are over 3,500 composting operations across the US that bioconvert millions of tons of organic residuals into compost products every year. A leading limitation for some of these manufacturing operations is the time required from beginning to finished product, particularly where land area, in-vessel system, or indoor footprint space is at a premium. This can negatively affect the incoming volume of feedstocks, which reduces tipping fee accumulation, as well as slow the sale of finished product, both of which can affect operations revenue. Introducing a technology that increases the rate of the active composting process can potentially alleviate both of these issues, leading to increased revenue for the compost manufacturer. Thus, the study objective was to determine if the application of Impact MB® increases the speed of the composting process.

Materials and Methods

The experimental objective was accomplished by implementation of ASTM D-5388 (Standard Test Method for Determining Aerobic Biodegradation of Materials Under Controlled Composting Conditions). Characteristics of the feedstock/compost are presented in Table 1. Experimental treatments included the Control and the application of Impact MB® at 0.5 oz/yd^3. Impact MB® was mixed with the feedstock/compost and then both treatments were loaded into 5-L, cylindrical-shaped, composting vessels (three vessels per treatment) at the same time period and held at constant moisture (50%) and temperature (58°C ± 2°C) throughout the experimental period. Carbon dioxide (CO_2) free air was then pumped through the vessel and gases exiting the chamber were diverted into adsorption units to measure the CO_2. The experiment ran until each treatment reached biological stability consistent with stable compost (< 8 mg CO_2-C/g OM/day), which took approximately 45 days. Finally, finished compost was unloaded from the vessels and samples were analyzed for quality according to Test Methods for the Examination of Composting and Compost published jointly by the US Composting Council and the US Department of Agriculture (2001). Data generated were subjected to statistical analysis for means separation and statistical differences.

Table 1. Characteristics of Feedstock/Compost

C:N ratio	15:1
pH at start of test	7.8
Dry solids, %	80
Volatile solids, %*	40
Total Nitrogen, %*	1.65

*Reported on a dry weight basis

Results and Discussion

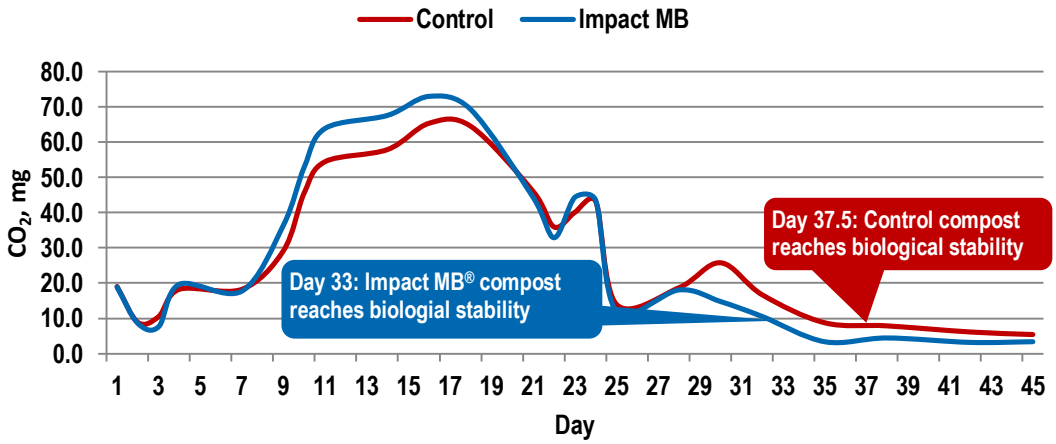
The effect of Impact MB® application on daily CO_2 production is shown in Figure 1 and fits with the microbial activity and resulting respiration typical of compost as it transitions through the three phases of composting. Furthermore, the peaks (e.g., Day 4) in the graph correlate with the weekly mixing of the compost, which typically boosts microbial activity.

The first phase, or mesophilic phase, appears to occur from Day 1 to 9, at which point sufficient activity by the mesophiles elevates the temperature so that the mesophilic bacteria are replaced with thermophilic bacteria. Interestingly, as the compost transitions to the thermophilic phase, the application of Impact MB® results in a more rapid rise in CO_2 by Day 11 (63.9 vs. 45.5 mg). The compost treated with Impact MB® maintains this trend in greater CO_2 production until Day 18, at which point, CO2 production of both treatments begins a dramatic drop, suggesting the thermophilic bacteria have exhausted their substrates and are transitioning to the third and final mesophilic stage.

[1] This experiment was conducted in collaboration with Dr. B. Faucette (Ecosystem Scientist, Decatur, GA 30030, USA) and Soil Control Lab (Watsonville, CA 95076 USA).

Of importance is the fact that compost treated with Impact MB® at 0.5 oz/yd^3 reaches biological stability consistent with stable compost (< 8 mg CO_2-C/g OM/day) 4.5 days faster (P < 0.05) than the Control Compost. For a large scale composter where land area or facility footprint restraints restrict the rate of incoming organic materials, or where product demand is outpacing manufacturing and supply, the application of 0.5 oz/yd^3 of Impact MB® offers a substantial benefit to both feedstock and product sales revenue.

Figure 1. Effect of Impact MB® on Carbon Dioxide Production



The effects of Impact MB® application on compost quality at the end of the 45-day study are presented in Table 2. Although Total N content was similar between the two treatments, compost treated with Impact MB® had 27% more ammonium-N and 76% less nitrate-N than the Control Compost. These differences in nitrogen from Impact MB® support a more stable product that is less likely to leach nitrate-N, as well as benefit both commercial composters dealing with nitrogen-runoff regulations or situations where compost is used to control storm water runoff.

Table 2. Effect of Impact MB® on Finished Compost Quality*

Parameter	Control	Impact MB
Total N, %	2.8	2.9
Ammonium-N, mg/kg	62.0	79.0
Nitrate-N, mg/kg	16.0	3.5
C:N Ratio	12.0	12.0

*Reported on a dry weight basis

Conclusions

- Based on this study, the addition of Impact MB® during composting has the ability to achieve biological stability faster than compost that has not been treated with Impact MB®, thereby decreasing the time of active composting. For a large scale composter where land area or facility footprint restraints restrict the rate of incoming materials, or where product demand is outpacing manufacturing and supply, the addition of 0.5 oz/yd^3 of Impact MB® can offer a substantial benefit to both feedstock and product sales revenues.
- Compost treated with Impact MB® reached biological stability 12% faster (33 vs. 37.5 days). For manufacturers that experience the limitations we identified in the document, this can increase sales by 12%, increase tip fee revenue by 12%, or potentially both. A 12% increase in tipping fees and sales revenue for a composter that processes 100,000 ton/year, receives a $30/ton tipping fee and has an average sales price of $20/cubic yard, represents an additional $480,000 in gross revenue or an ROI of $26 to 1 when considering the investment to treat with Impact MB®.
- Compost treated with Impact MB® had 27% more ammonium-N and 76% less nitrate-N than the Control Compost, which supports a more stable product that is less likely to leach nitrate-N, as well as benefit both commercial composters dealing with nitrogen-runoff regulations or situations where compost is used to control storm water runoff.