Effects of BAT 506 NTX on Yard Trimming and biosolids Composting in Florida

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INTRODUCTION

Soils in Florida are generally sandy, low in organic matter concentration, low cation exchange and water holding capacity, therefore poor native fertility (Anon., 1995). Addition of organic matter tends to enhance their overall ability to retain both nutrients and water (Ozores-Hampton et al., 1998).

In 1999, 26.2 million tons of solid waste was produced in Florida [about 9.5 lb per person per day], which was twice the national average (Glenn, 1999). About 12 million tons of MSW, 3 million tons of YT, and 0.5 million tons of animal manure could be composted annually (Ozores-Hampton, 2002). Recent information indicates there are over 40 operating composting facilities in Florida (Glenn, 1999), including 35 YT composting facilities (Glenn, 1999). Since a significant (50 to 65%) reduction in waste volume occurs during biological decomposition, 8 million tons (7.3 million t) of compost would be produced annually if all biodegradable material in Florida was composted (Ozores-Hampton, 2002).

Florida is a major production center for horticultural products, with over 400,000 acres of vegetables and 700,000 acres of citrus under cultivation each year (FASS, 1997). Compost can be incorporated as a soil amendment for vegetables, fruit trees, and nursery crops; used to replace soil removed with nursery trees and sod; applied as a mulch, to decrease evapo-transporation and control weeds; or used as all or part of potting media. One of the most important potential contributions of compost in sensitive ecosystems such as tropical and subtropical soils is minimizing fertilizer leaching or runoff. This has become a critical issue in many areas and has resulted in much negative publicity for agriculture.

Objective

To reduce composting costs and/or times and increase compost quality (organic matter and/or nutrient levels) by using BAT 506 NTX during the windrow composting process.

MATERIALS AND METHODS

Experiment at R&D Soil Builder, Inc. Compost Facility

The composting facility is located in Immokalee, FL (Figure 1). The facility implements the ‘windrow composting’ method to process yard trimming and biosolids. The feedstock’s are locally generated and transported to the facility. The experiment began on May 30, 2002 and finished in August 21, 2002. The study included two windrow or treatments. The first windrow was treated with BAT 506 and turned 8 times over a twelve week period at 1 (3 times), 28, 70 and 80 (2 turns) days after treatment

[(DAT); Figure 2]. A control windrow (Figure 3) was no treated with BAT 506 and was turned 22 times over a twelve weeks based on temperature levels (Table 1). The system used long, narrow piles typically 125 feet long and 9 feet wide and 4.5 feet high. The bulk density of the material was 747 cy3 = 125 cy3 or 47 tons with 94 oz or _ gals per row of BAT. Application rate was 2 oz/ton of BAT 506. A windrow turning machine was used to turn the windrow piles. During the composting process the following variables were collected: temperature (3 sub-samples per treatment), number of turning, moisture, nitrogen (N), carbon (C), C:N (1 and 84 DAT), NH_4, NO_3, nitrite-N, sulfate, and chloride (84 DAT).

The Soil and Water Science Laboratory, University of Florida, Immokalee, analyzed for moisture, N, C, C:N and Woods End (Mt Vernon, ME) for NH_4, NO_3, nitrite-N, sulfate, and chloride. There were three replications per treatment. Data was analyzed by Anova and mean separation by Duncan's Multiple Range Test.

Experiment at C&B Farms, Inc. Compost Facility

The composting facility is located in Hendry County, FL (Figure 4). The composting method was a 'windrow composting' with yard trimming and urea. The feedstock's were locally produced, ground and transported to the facility. The experiment began on July 15, 2002 and finished in October 15, 2002. The study included two treatments: 1) application of BAT 506 NTX by micro sprinklers with 2 turns in 12 weeks, 2) control with no application of BAT 506 NTX turning periodically. The system was using long, narrow piles 900 feet long and 27 feet wide and 11 feet high. Bulk density of the material was 565 cy3= 6,600 cy3 or 1,865 tons per pile with 3,730 oz or 30 gals of BAT per pile. The application rate of BAT 506 was 2 oz/ton. A Scat windrow turning machine was used to turn the windrow piles. During the composting processes the following variables were collected: moisture, number of turning, N, C, and C: N (1 and 90 DAT).

The Soil and Water Science Laboratory, University of Florida, Immokalee, analyzed for moisture, N, C, C:N.

RESULTS AND DISCUSSIONS

Experiment at R&D Soil Builder, Inc. Compost Facility

The highest temperatures during the composting process were found in the control treatment during first five weeks (Figure 5). Temperatures were lower and similar for both treatments for the rest of the time. Temperatures were higher than 131^{o} F during the first 15 days required to kill the pathogens in the biosolids under 503 regulations in both treatments.

The chemical properties of the materials before and after composting are presented in Table 2. There was not a significant C:N reduction during the composting process. Moisture, N, and C content were similar between the treatments before and 84 DAT. The 506 treated rows retained C where the untreated rows lost nearly 20% of the C. This difference was almost certainly caused by the release of CO_2 during turning of the control. Thus the reduced turning allowed by treatment with 506 resulted in an end product with a higher organic value. Ammonium and sulfate were higher in BAT 506 treatment than the control 84 DAT. This may have been due to less off-gassing of these nutrients due to reduced numbers of turns. It is likely that less reduction of sulfates to sulfide occurred in the treated materials as is claimed by the manufacturer of BAT 506 NTX. However, as sulfate was not measured on day 1, and sulfides were not measured 84 DAT, this cannot be stated with certainty. Nevertheless, the level of sulfate remaining in the treated material was nearly 3 times that in the untreated materials creating strong anecdotal evidence. No significant differences were found in NO_3, nitrite-N, and chloride 84 DAT.

Experiment at C&B Farms, Inc. Compost Facility

The chemical properties of the materials before and after composting are presented in Table 3. Moisture and N content were similar between the treatments before and 90 DAT. Higher N content was obtained after 90 days of composting. Carbon content was similar before treatment application, but application of Bat 506 had higher C content 90 DAT than the control. The control materials lost nearly 20% of their carbon content, where the BAT 506 treated materials retained 96% of their carbon. Again, this may be explained by less frequent turning of the treated materials resulting in less off-gassing of CO_2. Consequently, the treated materials retained more organic fraction. There was a significant C:N reduction during the composting process, although there were not differences between the treatments.

CONCLUSIONS

Applications of BAT 506 can produce a similar or higher quality compost product with less number of turnings. Therefore, meaningful and potentially vital reductions may be achieved in the cost of the composting process. Additionally, a significant reduction in flies on and around the 506 treated materials was observed in the first few days after biosolids and yard waste were mixed together, thus creating a more desirable composting environment.

REFERENCES

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Table 1. Dates and number of turnings in biosolids and yard waste project.

Dates	Number of turn BAT 506	Number of turn Control
5/30/02	3	4
6/05/02		3
6/10/02		3
6/18/02		2
6/28/02	1	2
7/03/02		1
7/08/02		1
7/15/02		1
7/25/02		1
7/30/02	2	1
8/07/02		1
8/14/02	2	1
8/21/02		1
Total number of turnings	8	22