



Preliminary Study to Determine the Feasibility of Composting as a Treatment Option in Achieving Class A Status for Reed Bed Biosolids

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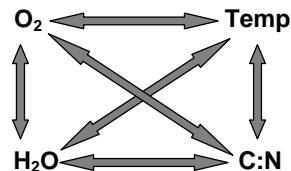
Background

Using reed beds to dewater sludge and decrease the nutrient concentration is a proven technology that is being practiced throughout the country. The reeds (*Phragmites australis*) have been classified as a highly invasive plant species in New Jersey and disposal of any material containing these plant rhizomes is regulated. At the Western Monmouth Utilities Authority (WMUA) facility the reed beds are being used for more than 10 years and the beds are now full to their capacity. A cost effective and safe treatment option is being investigated so that the beds can be reused. The current project was initiated by the WMUA to determine the potential for treating their biosolids to kill *Phragmites* rhizomes.



Composting as a Treatment Option:

Composting is a controlled, aerobic biological decomposition of organic matter with the production of heat. Controlling of composting process at microbial level involves four interrelated factors i.e., metabolic heat generation, temperature, ventilation and moisture content (1). During composting process temperatures rise to more than 55 degrees centigrade during the thermophilic stage. Land application of sewage sludge is regulated by 40 CFR part 503 (2). This regulation mandates that for compost to meet pathogenic destruction requirements the material has to be heated to 55 degrees centigrade for three consecutive days followed by 40 degrees centigrade for an additional 16 consecutive days.



Preliminary Objectives of the Study

- 1) Design and implement experiments to determine the efficacy of composting WMUA reed bed biosolids to kill *Phragmites* rhizomes,
- 2) Determine the environmental conditions that achieve maximum efficiency of the composting treatment through testing various environmental parameters such as organic matter content, carbon:nitrogen ratio, insulating materials, bulking material content, moisture content, temperature, and ventilation.

Preliminary Field Experiments

A field pile was set up initially to determine if aeration through mechanical mixing would help in composting the pile. A windrow pile with dimensions 26 feet length, 17 feet at base, 6 feet height and 12 feet crown was set up with the material collected from the reed beds. The material was mixed thoroughly using a mechanical mixer. Temperature was observed weekly over a period of four weeks. But, no temperature increase was observed over this time period.



Biosolids Characterization

The reed bed biosolid samples were analyzed at Rutgers University Soil Testing laboratory to characterize the physical and chemical properties of the material.

pH: 4.55

Total Kjeldahl Nitrogen: 0.80%

Nitrate-N: 170 ppm

Ammonium-N: 80 ppm

Organic Matter: 43.72%; Organic Carbon: 25.36%

Moisture Content: 60%

Laboratory Experiment

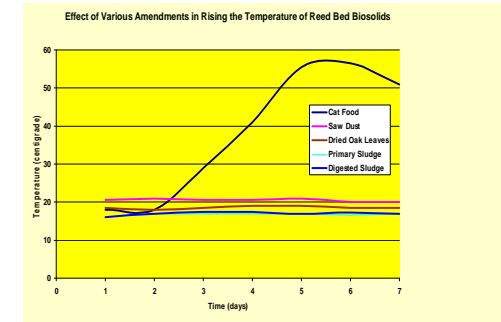
Insulated 1 gallon Reactors were set up.

Continuous Aeration was provided; Adjusted to 60% moisture content. Amendments Tested: Primary Sludge (10% v/v), Digested Sludge (10% v/v), *Phragmites* above ground biomass (50% v/v) (both fresh and dried) dried oak leaves (66% v/v), cat food (50% v/v) (positive control)



Results

As of now cat food helped rise the temperature of the reed bed material to thermophilic stage (>55 degrees centigrade) within 5 days. Different amendments at different ratios to the reed bed material are currently being tested.



Future Goals

- 1) Optimizing the composting process at laboratory scale with as many amendments as possible
- 2) Determining an inexpensive and environmental friendly amendment and up scaling to field conditions that would help the reed bed biosolids to self heat

Implications of the Project

Successful identification and optimization of composting process to kill *Phragmites* rhizomes would be helpful in solving the problem of reed bed biosolids disposal throughout the country.

References cited

- Initially it was found difficult to completely insulate the system. Once the system was insulated properly different environmental parameters such as moisture content, pH, aeration were tested at different levels to determine the parameter that is limiting the composting process
- 1) Strom, P.F. 1985. Effect of Temperature on Bacterial Species Diversity in Thermophilic Solid-Waste Composting. Applied and Environmental Microbiology. 50(4):899-905
- 2)

Acknowledgements

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