

Technology Brief

EVALUATION OF COMPOST FACILITY RUNOFF FOR BENEFICIAL REUSE -- PHASE 1 & 2

Background

The Clean Washington Center (CWC) funded a two phase project to examine compost facility runoff. The runoff is a pollutant for many of the same qualities that would make it a plant nutrient. Nutrients in the runoff can have a detrimental effect on surrounding surface waters because of the increased plant growth caused by the presence of nitrogen, phosphorus, and potassium. These nutrients are all considered beneficial when added at correct rates to agriculture, gardens, and house plants. Runoff is a major problem for compost facilities. For these reasons, the CWC is interested in developing a marketable product from the runoff.

Phase one of the project consisted of visiting several facilities, collecting samples during three storm events, and analyzing them for several constituents (BOD, TSS, pH, nutrients, salinity, fecal coliform, color, and a few metals, as shown in Table 1). With the lab data, it was possible to determine if the material had nutrients in quantities that would be desirable in a commercial product. Comparisons were made to several organic nutrient supplement products currently available on the market, and the runoff compared quite favorably. Estimates of the nutrient content of a concentrated product were made. In addition, we looked at estimates for commercial value (based on the N:P:K of the products and the concentrated runoff).

E&A Environmental Consultants, Inc. (Bothell, WA), conducted growth trials to determine if the runoff would have positive or detrimental effects on plants. Plants were grown and measured for bud/flower production and green mass (marigolds) and root and green mass (radishes). A summary of the results as compared to MiracleGro and to plain water is shown in Table 2.

Phase two of the project examined concentrating techniques to produce a thick and commercially viable product. Tests were conducted at Cedar Grove composting. Techniques examined included using residual heat from the composting process and blending pond solids with blower condensate.



Key Words

Materials: Compost Facility Runoff.

Applications: Organic fertilizer.

Market Goals: Develop a marketable organic fertilizer product from compost facility runoff.

Abstract: To examine the beneficial reuse of compost facility runoff.

Table 1 - Runoff Ranges from Four Facilities

Parameter	Range (mg/l*)
BOD₅	20 - 3,200
Total solids	1,100 - 19,600
Volatile solids	430 - 9,220
Color (color units)	1,000 - 70,000
Fecal (MPN/100ml)	200 - 24,000,000
Copper (ppb)	33 - 821
Zinc (ppb)	107 - 1,490
Nutrients:	
Ammonia N	32 - 1600
TKN	14 - 3,000
Nitrate+nitrite N	0 - 8
Total phosphorus	4 - 170
Ortho phosphate	0 - 90
pH (standard units)	6.7 - 9.5
Conductivity	887 - 16,500
Chloride	52 - 2,100
Potassium	167 - 4,640

Comparison to Other Commercially Available Organic Products

Many organic nutrient supplements are available on the market. As a matter of investigation and comparison, several of these products were examined in order to determine how a compost tea product from Cedar Grove would measure up. Products were either in a liquid form or an emulsion (semi-liquid) state.

Table 2 - Growth and Potassium Treatment Differences

Plant Group	Root Growth		Flowers and Buds		Potassium Applied	
	Weight (g) Avg.	% Difference From Fertilizer	Number Average	% Difference From Fertilizer	mg/plant Average	% Difference From Fertilizer
Fertilizer Group	2.80	0%	11.0	0%	14.5	0%
Application 1	5.24	87%	13.2	20%	79.8	450%
Application 2	8.64	208%	12.4	13%	39.9	175%
Application 3	3.36	20%	11.2	2%	16.0	10%
Control Group	2.50	-11%	9.6	-13%	0.0	-100%

Each product required reconstitution in water to dilute to an appropriate nutrient content, with doses ranging from 1 tablespoon per gallon to 1/2 cup per gallon. Foxfarm™ consisted of worm castings, bat guano, mined potash, and kelp. Alaska Fish Fertilizer™ was an emulsion of fish industry byproducts. Maxicrop™, SeaSpray™, and Concern™ were all liquefied seaweed (kelp).

As can be seen, a whole range of N:P:K ratios is represented by these products. Most of the products also show analysis data for organic, water soluble nitrogen and ammonia nitrogen. During conversations with local retailers, several people expressed that the kelp products were “like magic” and they often recommended them because of their high trace mineral and growth hormone content. None of the three kelp products included in this study had information on the label about these constituents, but since sellers recognize that these are healthy for plant growth, it may be advantageous to analyze and label the compost tea product.

Table 3 shows the five available products and the liquid from two sources at Cedar Grove. Thick material was taken off the

pond bottom and analyzed. In addition, the liquid coming off the compost blowers (which draw ambient air through the piles) as condensate was sampled and analyzed. An extrapolation was made to show what the nutrient content would be if the liquid is concentrated.

The analysis for the solids drawn off the bottom of the pond showed that the material was approximately 20% solids (a semi-solid state) with a N:P:K ratio of 2:0.3:0.7. This material may be suitable for sale as is, depending upon the pathogen content. The blower condensate, which is generally stronger than the runoff from the rest of the facility, also eventually ends up in the detention basin pond. This material adds much of the BOD₅ content to the pond. This, in turn, increases the strength of the discharge to the sewer system. If the blower condensate could be diverted from reaching the pond, the strength of the discharge would go down. An analysis of the blower liquid showed that if it was concentrated to 16% solids, it would have an N : P : K ratio of 3.2 : 0.1 : 1. Economic feasibility issues should be addressed to compare the cost of the concentration to market value.

Table 3 - Product Descriptions

Product	Description	Product State	N	P	K
Foxfarm	Worm castings, bat guano, mined potash, kelp	Liquid	0.8%	0.3%	1.0%
Alaska Fish	Fish emulsion, 4% chlorine	Emulsion	5.0%	1.0%	1.0%
Maxicrop	Liquefied seaweed, 1% chlorine	Liquid	0.1%	0.0%	1.0%
SeaSpray	Kelp concentrate	Liquid	0.0%	0.3%	0.5%
Concern	Fish and kelp	Liquid	3.0%	2.0%	2.0%
Cedar Grove	Solids drawn off of pond bottom	19.8% solids	2.0%	0.3%	0.7%
Cedar Grove	Blower condensate	0.5% solids	0.100%	0.060%	0.30%
		1% solids	0.200%	0.004%	0.049%
		2% solids	0.400%	0.007%	0.098%
		4% solids	0.800%	0.014%	0.200%
		8% solids	1.6%	0.028%	0.400%
		16% solids	3.2%	0.056%	0.800%

For More Information

For a copy of the report, *Evaluation of Compost Facility Runoff for Beneficial Reuse -- Phase 2 (CM-98-1)*, or *Evaluation of Compost Facility Runoff for Beneficial Reuse -- Phase 1 (CM-97-4)*, call the CWC subscription line at (206) 587-5520. For more information call CWC at (206) 464-7040, email info@cw.org, or visit the CWC Internet Website at www.cw.org.

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