ANALYTICAL CHEMISTS
and
BACTERIOLOGISTS
Approved by State of California

SOIL CONTROL LAB

42 HANGAR WAY
WATSONVILLE
CALIFORNIA
95076
USA

Soil Control Lab
42 Hangar Way
Watsonville Ca 95076
www.compostlab.com

Account No.:
6110049-1-4826
Group: Nov.06.A No. 10
CODE: Part-compost

John Ashbee
CSR Vermicast Industries Inc.
37 Brownstone Lane
Etobicoke, ON M8X 2Z6 Canada

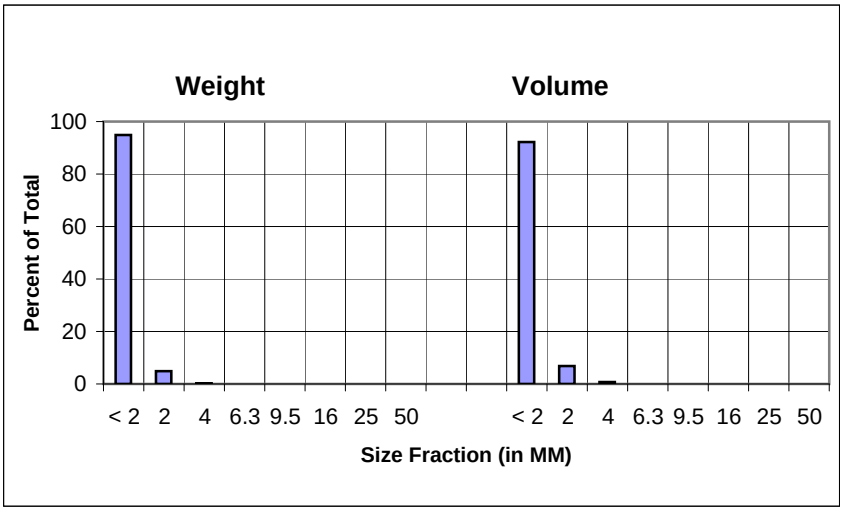
DATE RECEIVED: 02 Nov. 06
SAMPLE ID: Worm Castings
SAMPLE ID. No.: 1 6110049

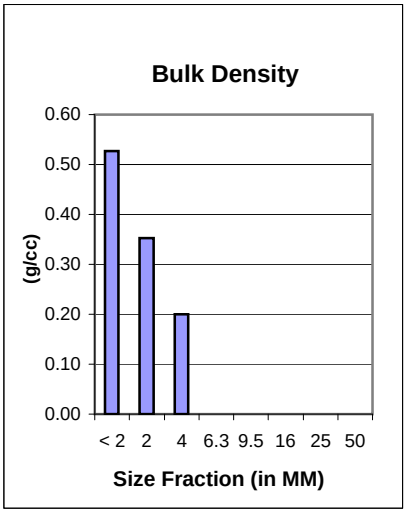
Sieve Size & Volume Distribution, Bulk Density and Inerts

Method: TMECC 02.02-B

MM	Inches	Percent by Weight	Percent by Volume	Bulk Density (g/cc)
> 50	> 2.0	0.0	0.0	0.00
25 to 50	1.0 to 2.0	0.0	0.0	0.00
16 to 25	0.64 to 1.0	0.0	0.0	0.00
9.5 to 16	0.38 to 0.64	0.0	0.0	0.00
6.3 to 9.5	0.25 to 0.38	0.0	0.0	0.00
4.0 to 6.3	0.16 to 0.25	0.3	0.8	0.20
2.0 to 4.0	0.08 to 0.16	4.8	6.9	0.35
< 2.0	< 0.08	94.9	92.3	0.53

Bulk density description:
< 0.35(g/cc) = light materials; 0.35 to 0.60 = mid-weight materials; > 0.60 = heavy materials





Percent (> 4mm fraction): Glass, Plastic, Metal and Sharps. Method: TMECC 02-02-C

Plastic: < 0.5	Glass: < 0.5	Metal: < 0.5	Sharps: None Detected

Analyst: Frank Shields

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Account No.:
6110049 1 4826
Group: Nov.06.A No. 10
CODE: Stability-compost
CODE: Maturity-compost

John Ashbee
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DATE RECEIVED: 02 Nov. 06
SAMPLE ID: Worm Castings
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STABILITY

Carbon Dioxide Evolution Rate		**Respiration Rate**	**Biological Available Carbon**
	Test Conditions:	(as received)	(carbon made the limiting factor)
	Pre-incubated:	3 day-20 deg.C	3 day-36 deg. C
	Incubation:	36 deg.C	36 deg.C
	Moisture adjustment:	saturated	saturated
	pH	Not adjusted	6.5 to 7.5
	Porosity	Not provided	#20 quartz sand
	Nutrients	Not provided	NPK+trace
	TMECC Method	05.08-B	05.08-F
RESULTS:	mg CO2-C/g OM/day	7.9	8.0
	mg CO2-C/g OC/day	13	13
	mg CO2-C/g TS/day	3.4	3
INTERPRETATION:	Very Stable	< 2	< 2
	Stable	2 to 8	2 to 8
	Moderately Unstable	8 to 15	8 to 15
	Unstable	15 to 40	15 to 40
	Very Unstable	> 40	> 40

RESPIRATION RATE
Optimizing moisture with pre-incubation to simulate maximum biological activity in a source pile.
BIOLOGICAL AVAILABLE CARBON
Optimizing all conditions (except carbon) makes rate of degradation limited by the available carbon in the compost. Purpose is to simulate condition of end use in an agriculture environment where nutrients, porosity, pH adj. and moisture are provided from the grower or receiving soil when optimizing conditions for plant growth.

MATURITY

GERMINATION & GROWTH	TMECC 05.05-A	
Emergence (relative to control) %	100	100
Relative Seedling Vigor %	100	100
Description of plants:	healthy	healthy
Test Conditions:%Compost:%Vermiculite (v/v)	50%:50%	25%:75%

Positive Control: Sunland Garden Products (Watsonville, CA) potting mix: Negative Control:Vermiculite
This test uses cucumber, a salt tolerant plant, grown in high concentrations of compost.
Composts that show phytotoxic effects under test conditions may not show toxic effects when used in actual field conditions. High salts, acid or alkali pH, and ammonia toxicity can be corrected with added dilution or adjustments resulting from mixing with receiving soil. Composts showing phytotoxic effects should be used with caution.

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Account No.:
6110049 - 1 - 4826
Group: Nov.06.A No. 10
CODE: Nutrients-compost

John Ashbee
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Etobicoke, ON M8X 2Z6 Canada

DATE RECEIVED: 02 Nov. 06
SAMPLE ID: Worm Castings
SAMPLE ID No: 1 6110049

		Wet wt. Basis	Dry wt. Basis	TMECC Method
Nutrients-Primary + Secondary				
Total Nitrogen:	%	1.3	2.2	4.02-D
Ammonia (NH_4-N):	mg/kg	18	31	4.02-C
Nitrate (NO_3-N):	mg/kg	1012	1713	4.02-B
Organic Nitrogen (Org.-N):	%	1.2	2.1	Calc.
Phosphorus (as P_2O_5):	%	0.57	0.96	Calc.
Phosphorus (P):	mg/kg	2500	4234	4.03-A
Potassium (as K_2O):	%	1.0	1.7	Calc.
Potassium (K):	mg/kg	8391	14208	4.04-A
Calcium (Ca):	%	2.8	4.8	4.05
Magnesium (Mg):	%	0.37	0.62	4.05
Sulfate (SO_4):	mg/kg	191	323	4.12-D/IC
Nutrients - Trace elements				
Copper (Cu):	mg/kg	28	47	4.05-Cu
Zinc (Zn):	mg/kg	100	170	4.05-Zn
Iron (Fe):	mg/kg	4959	8396	4.05-Fe
Manganese (Mn):	mg/kg	155	262	4.05-Mn
Boron (B):	mg/kg	15	25	4.05-B
Salts, pH, Bulk Density, Carbonates				
Sodium (Na):	%	0.21	0.35	4.05-Na
Chloride (Cl):	%	0.25	0.42	04.05/IC
pH Value:	units	7.24	NA	04.11-A
Electrical Conductivity (EC5 dw):	mmhos/cm	4.376	7.410	04.10-A
Bulk Density :	lb/cu ft	36	22	SCL
Carbonates (as $CaCO_3$) :	lb/ton	113	191	04.08-A
Organic Matter:	%	25.7	43.5	05.07-A
Organic Carbon:	%	15.6	26.3	4.01
Ash:	%	33.3	56.5	3.02
C/N Ratio	ratio	12	12	calc.
Moisture:	%	40.9	0.0	3.09

To Calculate lbs/ton: (%Nutrient) x (20)
To Calculate lbs/ton: (mg/kg Nutrient/10,000) x (20)
To Calculate lbs/cu yd: (%Nutrient/100) x B.D. x 27
To Calculate lbs/cu yd: (mg/kgNutrient/1,000,000) x B.D. x 27

Analyst: Frank Shields

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Account No.:
6110049-1-4826
Group: Nov.06.A No. 10
CODE:Met-compost
CODE:Fecal-compost

John Ashbee
CSR Vermicast Industries Inc.
37 Brownstone Lane
Etobicoke, ON M8X 2Z6 Canada

DATE RECEIVED: 02 Nov. 06
SAMPLE ID: Worm Castings
SAMPLE ID. No.: 1 6110049

Metals & Bacteria

Metals			Units	MDL	% Recovery	Date Tested
Arsenic (As):		3	mg/kg dw	1 mg/kg	88	07 Nov. 06
Cadmium (Cd):		1	mg/kg dw	1 mg/kg	95	07 Nov. 06
Chromium (Cr):		13	mg/kg dw	1 mg/kg	98	07 Nov. 06
Copper (Cu):		47	mg/kg dw	1 mg/kg	87	07 Nov. 06
Lead (Pb):		21	mg/kg dw	1 mg/kg	115	07 Nov. 06
Mercury (Hg):	Less than	1	mg/kg dw	0.1 mg/kg	105	07 Nov. 06
Molybdenum (Mo):		2	mg/kg dw	1 mg/kg	99	07 Nov. 06
Nickel (Ni):		8	mg/kg dw	1 mg/kg	106	07 Nov. 06
Selenium (Se):	Less than	1	mg/kg dw	1 mg/kg	95	07 Nov. 06
Zinc (Zn):		170	mg/kg dw	1 mg/kg	103	07 Nov. 06
Cobalt (Co)		3	mg/kg dw	0.5 mg/kg		
Total Solids (TMECC 03.09)		59.1	%	0.05%		3 Nov. 06
Bacteria						
Fecal Coliform		80	MPN / gram dry wt.			02 Nov. 06
Salmonella	Less than	3	MPN / 4 grams dry wt.			02 Nov. 06

Pollutant Loading Rate:
Multiply mg/kg dry weight values times 0.0536 to give you kilograms pollutant per 100 metric ton compost as-received based on a moisture content of 40.94 percent.

Method (metals): EPA 3050B / EPA 6010
Method (metals): TMECC 04.12-B / 04.14-A
Method (Mercury Hg) TMECC 04.06 / EPA 7471
Method (Fecal Coliform): Standard Methods 9221E
Method (Salmonella): TMECC 04.02-A

Analyst: Frank Shields

Account No.:		Date Received	02 Nov. 06
6110049 - 1 - 4826		Sample i.d.	Worm Castings
Group:	Nov.06.A No. 10	Sample I.d. No.	1 6110049

INTERPRETATION: Page one of three

Is Your Compost Stable?

Respiration Rate — Biodegradation Rate of Your Pil

7.9 mg CO2-C/ g OM/day

< Stable >|< Moderately Stable >|< Unstable >|< High For Mulc

Biological Available Carbon (BAC) — Optimum Degradation Rate

8 mg CO2-C/ g OM/day

< Stable >|< Moderately Stable >|< Unstable >|< High For Mulch

Is Your Compost Mature?

AmmoniaN/NitrateN ratio

0 Ratio

VeryMature>|< Mature >|< Immature

Ammonia N ppm

31 mg/kg dry wt.

VeryMature>|< Mature >|< Immature

Nitrate N ppm

1712.8 mg/kg dry wt.

< Immature >|< Mature

pH value

7.24 units

< Immature >|< Mature >|< Immature

Cucumber Germination

100 percent

< Immature >|< Mature

Is Your Compost Safe Regarding Health?

Fecal Coliform

80 MPN/g dry wt.

< Safe >|< High Fecal Coliform

Salmonella

Less than 3 per 4 g **dry wt.**

<Safe (none detected) >|< High Salmonella Count(> 3 per 4 gram

Metals US EPA 503

Pass dry wt.

<All Metals Pass >|< One or more Metals Fail

Does Your Compost Provide Nutrients or Organic Matter?

Nutrients (N+P2O5+K2O)

4.9 Percent dry wt.

<Low >|< Average >|< High Nutrient Content

AgIndex (Nutrients / Sodium and Chloride Salts) ((N+P2O5+K2O) / (Na + Cl))

6 Ratio

Na & Cl >|< Nutrient and Sodium and Chloride Provider >|< Nutrient Provider

Plant Available Nitrogen (PAN) — Estimated release for first season

17 lbs/ton wet wt.

Low Nitrogen Provider>|< Average Nitrogen Provider >|<High Nitrogen Provider

C/N Ratio

12 Ratio

< Nitrogen Release >|< N-Neutral >|< N-Demand>|< High Nitrogen Demand

Soluble Available Nutrients & Salts (EC5 w/w dw)

7.410 mmhos/cm dry wt.

SloRelease>|< Average Nutrient Release Rate >|<High Available Nutrien

Lime Content (CaCO3)

191 Lbs/ton dry wt.

< Low >|< Medium >|< High Lime Content (as CaCO3)

What are the physical properties of your compost?

Percent Ash

56.5 Percent dry wt.

< High Organic Matter >|< Average >|< High Ash Content

Sieve Size % > 6.3 MM (0.25")

0.0 Percent dry wt.

All Uses >|< Size May Restrict Uses for Potting mix and Golf Courses

Account No.:		Date Received	02 Nov. 06
6110049 - 1 - 4826		Sample i.d.	Worm Castings
Group:	Nov.06.A No. 10	Sample I.d. No.	1 6110049

INTERPRETATION:

Is Your Compost Stable?

Respiration Rate

7.9 Moderate-selected use mg CO2-C/g OM/day

The Respiration Rate (RR) measures the biodegradation rate of the organic matter in the sample as received. Only moisture and temperature are optimized. The RR is determined by measuring the rate at which CO2 is released under optimiz moisture and temperature conditions

Biological Available Carbon

8 Moderate-selected use mg CO2-C/g OM/day

The Biological Available Carbon (BAC) measures the rate at which CO2 is released under optimized moisture, temperature, poros nutrients, pH and microbial conditions. If both the RR and the BAC test values are close to the same value, the pile is optimiz for composting. If both values are high the compost pile just needs more time. If both values are low the compost has stabiliz and should be moved to curing. BAC test values that are higher than RR indicate that the compost pile has stalled. This could due to anaerobic conditions, lack of available nitrogen due to excessive air converting ammonia to the unavailable nitrate f lack of nitrogen or other nutrients due to poor choice of feedstock, pH value out of range, or microbes rendered non-act

Is Your Compost Mature?

AmmoniaN:NitrateN ratio

0 very mature

Ammonia N ppm	
31	very mature
Nitrate N ppm	
1713	mature
pH value	
7.24	mature

Composting to stabilize carbon can occur at such a rapid rate that sometimes phytotoxins remain the compost and must be neutralized before using in high concentrations or in high-end uses. Thi step is called curing. Typically ammonia is in excess with the break-down of organic materials resulti in an increase in pH. This combination results in a loss of volatile ammonia (it smells). Once this toxi ammonia has been reduced and the pH drops, the microbes convert the ammonia to nitrates. A l ammonia + high nitrate score is indicative of a mature compost, however there are many exceptior For example, a compost with a low pH (<7) will retain ammonia, while a compost with high lime conte can lose ammonia before the organic fraction becomes stable. Composts must first be stable befo curing indicators apply

Cucumber Bioassay

100 Percent

Cucumbers are chosen for this test because they are salt tolerant and very sensitive to ammo and organic acid toxicity. Therefore, we can germinate seeds in high concentrations of compost measure phytotoxic effects without soluble salts being the limiting factor. Values above 80% for both percent germination a vigor are indicative of a well-cured compost. Exceptions include very high salts that affect the cucumbers, excessive concentratic of nitrates and other nutrients that will be in range when formulated to make a growing media. In addition to testing a 1:1 comp vermiculite required mix, we also test a diluted 1:4 mix to indicate a more sensitive toxicity lev

Is Your Compost Safe Regarding Health?

Fecal Coliform

80 / g dry wt.

Fecal coliforms can survive in both aerobic and anaerobic conditions and is common in all initi compost piles. Most human pathogens occur from fecal matter and all fecal matter is loaded in fecal coliforms. Therefore fe coliforms are used as an indicator to determine if the chosen method for pathogen reduction (heat for compost) has met requirements of sufficient temperature, time and mixing. If the fecal coliforms are reduced to below 1000 per gram dry wt. assumed all others pathogens are eliminated. Potential problems are that fecal coliform can regrow during the curing phas during shipping. This is because the conditions are now more favorable for growth than during the composting proce

Salmonella Bacteria

Less than 3 / 4g dry wt.

Salmonella is not only another indicator organism but also a toxic microbe. It has been used in th case of biosolids industry to determine adequate pathogen reduction.

Metals

Pass

The ten heavy metals listed in the EPA 503 regulations are chosen to determine if compo can be applied to ag land and handled without toxic effects. Most high concentrations of heavy metals are derived f woodwaste feedstock such as chrome-arsenic treated or lead painted demolition wood. Biosolids are rarely a proble

Does Your Compost Provide Nutrients or Organic Matter?

Nutrients (N+P2O5+K2O)

4.9 Average nutrient conten

This value is the sum of the primary nutrients Nitrogen, Phosphorus and Potassium. Reported units are consistent with tho found on fertilizer formulations. A sum greater than 5 is indicative of a compost with high nutrient content, and best used to sup nutrients to a receiving soil. A sum below 2 indicates a low nutrient content and is best-used to improve soil structure via addition of organic material. Most compost falls between 2 and

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INTERPRETATION:

AgIndex (Nutrients/Na+Cl)

6 Average nutrient ratio Composts with low AgIndex values have high concentrations of sodium and/or chlori compared to nutrients. Repeated use of a compost with a low AgIndex (< 2) may result in sodium and/or chlori acting as the limiting factor compared to nutrients governing application rates. These composts may be used on well-drair soils and/or with salt-tolerant plants. Additional nutrients form another source may be needed if the application rate is limite sodium or chloride. If the AgIndex is above 10, nutrients optimal for plant growth will be available without concern of sodium an chloride toxicity. Composts with an AgIndex of above 10 are good for increasing nutrient levels for all soils. Most composts sc between 2 and 10. Concentrations of nutrients, sodium, and chloride in the receiving soil should be considered when determir compost application rates. The AgIndex is a product of feedstock quality. Feedstock from dairy manure, marine waste, indust wastes, and halophytic plants are likely to produce a finished compost with a low AgInd

Plant Available Nitrogen

17 High N Provider Plant Available Nitrogen (PAN) is calculated by estimating the release rate of Nitrogen fro the organic fraction of the compost. This estimate is based on information gathered from the BAC test and measured ammonia a nitrate values. Despite the PAN value of the compost, additional sources of Nitrogen may be needed during he growing season to set the Nitrogen demand of the microbes present in the compost. With ample nutrients these microbes can further breakdown orga matter in the compost and release bound Nitrogen. Nitrogen demand based on a high C/N ratio is not considered in the PAN calcula because additional Nitrogen should always be supplemented to the receiving soil when composts with a high C/N ratio are app

C/N Ratio

12 Indicates maturity As a guiding principal, a C/N ratio below 14 indicates maturity and above 14 indicate immaturity, however, there are many exceptions. Large woodchips (>6.3mm), bark, and redwood are slow to breakdown therefore can result in a relatively stable product while the C/N ratio value is high. Additionally, some composts with chicken man and/or green grass feedstocks can start with a C/N ratio below 15 and are very unstable. A C/N ratio below 10 supplies Nitroc while a ratio above 20 can deplete Nitrogen from the soil. The rate at which Nitrogen will be released or used by the microbe indicated by the respiration rate (BAC). If the respiration rate is too high the transfer of Nitrogen will not be controla

Soluble Nutrients & Salts (EC5 w/w dw - mmhos/cm

7.410 Average salts This value refers to all soluble ions including nutrients, sodium, chloride and som soluble organic compounds. The concentration of salts will change due to the release of salts from the organic matter as it degrac volatilization of ammonia, decomposition of soluble organics, and conversion of molecular structure. High salts + high AgInde: indicative of a compost high in readily available nutrients. The application rate of these composts should be limited by the optim nutrient value based on soil analysis of the receiving soil. High Salts + low AgIndex is indicative of a compost low in nutrients v high concentrations of sodium and/or chloride. Limit the application rate according to the toxicity level of thesodium and/or chlo Low salts indicates that the compost can be applied without ristking salt toxicity, is likely a good source of organic matter, and t nutrients will release slowly over time

Lime Content (lbs. per ton)

191 High lime conten Compost high in lime or carbonates are often those produced from chicken manure (layers ash materials, and lime products. These are excellent products to use on a receiving soil where lime has been recommendec soil analysis to raise the pH. Composts with a high lime content should be closely considered for pH requirements when formulat potting mixes

Physical Properties

Percent Ash

56.5 Average ash conten Ash is the non-organic fraction of a compost. Most composts contain approximately 5C ash (dry weight basis). Compost can be high in ash content for many reasons including: excess minerilzation(old compos contamination with soil base material during turning, poor quality feedstock, and soil or mineral products added. Finding the sou and reducing high ash content is often the fastest means to increasing nutrient quality of a compo

Particle Size % > 6.3 MM (0.25")

0.0 Suitable for all uses Large particles may restrict use for potting soils, golf course topdressings, seed-starte mixes, and where a fine size distribution is required. Composts with large particles can still be used as excellent additions to fi soils, shrub mixes and mulches.

Particle Size Distribution

Each size fraction is measured by weight, volume and bulk density. These results are particularly relevent with decisions to scre or not, and if screening, which size screen to use. The bulk density indicates if the fraction screened is made of light weight orga material or heavy mineral material. Removing large mineral material can greatly improve compost quality by increasing nutrient organic concentrations.

Appendix:			
		Estimated available nutrients for use when calculating application rat	
Plant Available Nitrogen (PAN) calculations			lbs/ton
PAN = (X * (organic N)) + ((NH4-N) + (NO3-N))			
X value =	If BAC < 2 then X = 0.1	PAN Available Nitroger	17
	If BAC =2.1 to 5 then X = 0.2	Ammonia (NH4-N)	0.0
	If BAC =5.1 to 10 then X = 0.3	Nitrate (NO3-N)	2.023
	If BAC > 10 then X = 0.4	Available Phosphorus (P2O5*0.64	7
Note: If C/N ratio > 15 additional N should be applie		Available Potassium (K2O	20