SUN and BLOOM FARMS

VERMICOMPOST: Benefits, Systems, Uses, SALES

Presentation by:
Lucian Toma

VERMICOMPOST: Benefits, Systems, Uses

THE PRESENTER

1 DECADE EXPERIENCE WITH:

- home & community sustainability education & training programs

- food gardens, food forests & small-scale farm design

- business & life coaching for small farmers & garden entrepeneurs

SUN and BLOOM FARMS

VERMICOMPOST: Benefits, Systems, Uses

PRESENTATION AGENDA

- WHAT IS IT
- WHY USE IT
- HOW TO USE IT
- HOW TO MAKE IT
- HOW TO SELL IT

VERMICOMPOST: Benefits, Systems, Uses

WHAT IS VERMICOMPOST

Vermicompost is a humus-like material obtained from the decomposition of organic materials with the use of specialized decomposing worms.

Like conventional compost, vermicompost provides many benefits to agricultural soil, including:

- increased ability to retain moisture,
- better nutrient-holding capacity,
- better soil structure,
- and higher levels of microbial activity.

According to research, vermicompost is produced significantly faster and is greatly superior to conventional aerobic compost.

SUN and BLOOM FARMS

VERMICOMPOST: Benefits, Systems, Uses

COMPARED TO CONVENTIONAL COMPOST

- **Higher Level of Plant-Available Nutrients** (Hammermeister et al., 2004)
- **Higher Level of Beneficial Microorganisms** (Ingham 2020)
- **Ability to Stimulate Plant Growth** (Atiyeh at al, 2002)
- **Ability to Suppress Disease** (Arancon, 2004)
- **Ability to Repel Pests** (Ingham, 2008 & 2020)
- **Fast Production and Scalability** (Munroe, 2006).

VERMICOMPOST: Benefits, Systems, Uses

USES

As 10% to 40% of the growing medium mix. Seed starting or incorporated in permanent rows.

As top dressing or fertilizer straight on top of the soil (1 inch or less) and soaked in with irrigation. 1 or 2 times during the plant life cycle (at planting and before fruiting)

As vermicompost extract (or non-aerated tea) 1 to 10 volume ratio - approximately 2 cups of vermicompost per gallon of water. Can be diluted 1 to 4 volume ratio further. Use 5 to 20 gallons per acre. Can be used as the only fertilizer and pesticide every 2 weeks as a soak or spray.

As vermicompost tea (or aerated tea) 1:10 volume ratio - approximately 2 cups of vermicompost per gallon of water, with a source of sugars and minerals added, and brewed/aerated for 12 to 24 hours. Can be diluted 1 to 4 volume ratio further. Use 5 to 20 gallons per acre. Can be used as the only fertilizer and pesticide every 2 weeks as a soak or spray. This is the most material effective and beneficial use of vermicompost.

SUN and BLOOM FARMS

VERMICOMPOST: Benefits, Systems, Uses

COMPONENTS & CONSIDERATIONS

- Decomposing Worms
- Food / Feedstock
- Bedding Material
- Grit
- Moisture
- Airflow
- Temperature
- Space
- Chemistry

VERMICOMPOST: Benefits, Systems, Uses, Income

COMPONENTS & CONSIDERATIONS

Decomposing Worms

- Must be Epigeic - in nature, these worms live in the surface litter and feed on decaying organic matter. They do not have permanent burrows like endogeic and anecic earthworms.
- *Eisenia fetida* is considered the best vermicompost worm commonly known as the “compost worm”, “manure worm”, “redworm”, and “red wiggler”, and is an extremely tough and adaptable worm, indigenous to most parts of the world.

VERMICOMPOST: Benefits, Systems, Uses, Income

COMPONENTS & CONSIDERATIONS

Decomposing Worms

- Must be Epigeic - in nature, these worms live in the surface litter and feed on decaying organic matter. They do not have permanent burrows like endogeic and anecic earthworms.
- *Eisenia fetida* is considered the best vermicompost worm commonly known as the “compost worm”, “manure worm”, “redworm”, and “red wiggler”, and is an extremely tough and adaptable worm, indigenous to most parts of the world.

SUN and BLOOM FARMS

VERMICOMPOST: Benefits, Systems, Uses

COMPONENTS & CONSIDERATIONS

Food / Feedstock

Food	Advantages	Disadvantages	Notes
Cattle manure	Good nutrition; natural food, therefore little adaptation req'd	Weed seeds make pre-composting necessary	All manures are partially decomposed and thus ready for consumption by worms
Poultry manure	High N content results in good nutrition and a high-value product	High protein levels can be dangerous to worms, so must be used in small quantities; major adaptation required for worms not used to this feedstock. May be pre-composted but not necessary if used cautiously	Some books (e.g., Gaddie & Douglas, 1975) suggest that poultry manure is not suitable for worms because it is so "hot"; however, research in Nova Scotia (GEORG, 2004) has shown that worms can adapt if initial proportion of PM to bedding is 10% by volume or less.
Sheep/Goat manure	Good nutrition	Require pre- composting (weed seeds); small particle size can lead to packing, necessitating extra bulking material	With right additives to increase C:N ratio, these manures are also good beddings
Hog manure	Good nutrition; produces excellent vermicompost	Usually in liquid form, therefore must be dewatered or used with large quantities of highly absorbent bedding	Scientists at Ohio State University found that vermicompost made with hog manure outperformed all other vermicomposts, as well as commercial fertilizer
Rabbit manure	N content second only to poultry manure, there- fore good nutrition; contains very good mix of vitamins & minerals; ideal earth-worm feed (Gaddie, 1975)	Must be leached prior to use because of high urine content; can overheat if quantities too large; availability usually not good	Many U.S. rabbit growers place earthworm beds under their rabbit hutches to catch the pellets as they drop through the wire mesh cage floors.
Fresh food scraps (e.g., peels, other food prep waste, leftovers, commercial food processing wastes)	Excellent nutrition, good moisture content, possibility of revenues from waste tipping fees	Extremely variable (depending on source); high N can result in overheating; meat & high-fat wastes can create anaerobic conditions and odours, attract pests, so should NOT be included without pre-composting	Some food wastes are much better than others: coffee grounds are excellent, as they are high in N, not greasy or smelly, and are attractive to worms; alternatively, root vegetables (e.g., potato culls) resist degradation and require a long time to be consumed.
Pre-composted food wastes	Good nutrition; partial decomposition makes digestion by worms easier and faster; can include meat and other greasy wastes; less tendency to overheat.	Nutrition less than with fresh food wastes (Frederickson et al, 1997).	Vermicomposting can speed the curing process for conventional composting operations while increasing value of end product (GEORG, 2004; Frederickson, op. cit.)
Biosolids (human waste)	Excellent nutrition and excellent product; can be activated or non- activated sludge, septic sludge; possibility of waste management revenues	Heavy metal and/or chemical contam- ination (if from municipal sources); odour during application to beds (worms control fairly quickly); possibility of pathogen survival if process not complete	Vermitech Pty Ltd. in Australia has been very successful with this process, but they use automated systems; EPA- funded tests in Florida demonstrated that worms destroy human pathogens as well as does thermophillic composting (Eastman et al., 2000).
Seaweed	Good nutrition; results in excellent product, high in micronutrients and beneficial microbes	Salt must be rinsed off, as it is detrimental to worms; availability varies by region	Beef farmer in Antigonish, NS, producing certified organic vermicompost from cattle manure, bark, and seaweed6
Legume hays	Higher N content makes these good feed as well as reasonable bedding.	Moisture levels not as high as other feeds, requires more input and monitoring	Probably best to mix this feed with others, such as manures
Grains (e.g., feed mixtures for animals, such as chicken mash)	Excellent, balanced nutrition, easy to handle, no odour, can use organic grains for certified organic product	Higher value than most feeds, therefore expensive to use; low moisture content; some larger seeds hard to digest and slow to break down	Danger: Worms consume grains but cannot digest larger, tougher kernels; these are passed in castings and build up in bedding, resulting in sudden overheating (Gaddie, op cit)
Corrugated cardboard (including waxed)	Excellent nutrition (due to high-protein glue used to hold layers together); worms like this material; possible revenue source from WM fees	Must be shredded (waxed variety) and/or soaked (non- waxed) prior to feeding	Some worm growers claim that corrugated cardboard stimulates worm reproduction
Fish, poultry offal; blood wastes; animal mortalities	High N content provides good nutrition; opportunity to turn problematic wastes into high-quality product	MUST be pre- composted until past thermophillic stage	Composting of offal, blood wastes, etc. is difficult and produces strong odours. Should only be done with in- vessel systems; much bulking required.

VERMICOMPOST: Benefits, Systems, Uses

COMPONENTS & CONSIDERATIONS

Bedding Material

- High Absorbency
- *Good Bulking Potential*
- *Low Protein and/or Nitrogen content (high Carbon to Nitrogen ratio)*

Add a grit Material (sand, soil, egg shells) for "digestive" Help!

Bedding Material	Absorbency	Bulking Pot.	C:N Ratio[4]
Horse Manure	Medium-Good	Good	22 - 56
Peat Moss	Good	Medium	58
Corn Silage	Medium-Good	Medium	38 - 43
Hay – general	Poor	Medium	15 - 32
Straw – general	Poor	Medium-Good	48 - 150
Straw – oat	Poor	Medium	48 - 98
Straw – wheat	Poor	Medium-Good	100 - 150
Paper from municipal waste stream	Medium-Good	Medium	127 - 178
Newspaper	Good	Medium	170
Bark – hardwoods	Poor	Good	116 - 436
Bark -- softwoods	Poor	Good	131 - 1285
Corrugated cardboard	Good	Medium	563
Lumber mill waste -- chipped	Poor	Good	170
Paper fibre sludge	Medium-Good	Medium	250
Paper mill sludge	Good	Medium	54
Sawdust	Poor-Medium	Poor-Medium	142 - 750
Shrub trimmings	Poor	Good	53
Hardwood chips, shavings	Poor	Good	451 - 819
Softwood chips, shavings	Poor	Good	212 - 1313
Leaves (dry, loose)	Poor-Medium	Poor-Medium	40 - 80
Corn stalks	Poor	Good	60 - 73
Corn cobs	Poor-Medium	Good	56 - 123

SUN and BLOOM FARMS

VERMICOMPOST: Benefits, Systems, Uses

COMPONENTS & CONSIDERATIONS

Airflow & Moisture

- Worms are oxygen breathers and cannot survive anaerobic conditions
- Worms breathe through their skin and need moisture - no lower than 40%, anywhere between 70 and 90 % is great

VERMICOMPOST: Benefits, Systems, Uses

COMPONENTS & CONSIDERATIONS

Temperature

- Worms are active over 50 F (even though they can survive freezing too), they like it over 60 F, multiply well over 70 F, and will try to escape anything over 85 F

Space

- Vermicompost worms operate in no more than 1 to 1.5 ft of material and therefore they require ample horizontal space with 0.5 pound per square foot being ideal and 1 pound per square foot the maximum.

	 Urbalive Worm Farm	 Urban Worm Bag	 Can O Worms	 Maze Worm Farm	 Vermihut Plus	 Worm Factory 360
Summary	Stylish, award-winning bin has all the features and looks great in your home.	Continuous Flow Through (CFT) system is a great option for processing waste & harvesting castings.	One of the first worm bins for home composting, it's more expensive than others in its class but has several well- designed features.	Compact but expandable worm bin with a small footprint and a unique feature set.	One of the original, budget worm bins - a solid option that can get the job done.	Another of the original worm bins with the basic features needed to vermicompost at home.
Price	$189	$129	$100	$130	$100	$132
Customer Rating[1]	4.5	4.5	4.5	4.1	4.3	3.3
Dimensions	20" x 15" x 24"	27" x 27" x 32	20" x 20" x 26"	15" x 15" x 11"	17" x 17" x 33"	18" x 18" x 16"
Weight (empty)	11 Lbs	7 Lbs	14 Lbs	6 Lbs	13 Lbs	11 Lbs
Colors	Gray, Ivory, or Lime	Brown/Black	Black	Black with Lime Lid	Green	Black, Green, Terracotta
Expandable?	Yes	No	Yes	Yes	Yes	Yes
# of Trays (Ship)	2	n/a	2	2	5	4
Max. Worm Population[2]	6.5 Lbs	7.5 Lbs	9 Lbs	4.5 Lbs	12-14 Lbs	12-14 Lbs
Weekly Waste Capacity[3]	10 Lbs	12 Lbs	13.5 Lbs	7 Lbs	20-22 Lbs	18-20 Lbs
Expandable To	4 Trays	n/a	4 Trays	4 Trays	5 Trays[4]	5 Trays[4]
Max. Worm Population (Expanded[2])	12-14 Lbs	7.5 Lbs	16-18 Lbs	8-10 Lbs	12-14 Lbs	14-16 Lbs
Weekly Waste Capacity (expanded)[3]	18-20 Lbs	12 Lbs	24-26 Lbs	12 Lbs	20-22 Lbs	22-24 Lbs

VERMICOMPOST: Benefits, Systems, Uses

COMPONENTS & CONSIDERATIONS

Other important parameters

- Ph - 7 is ideal but can take range from 5 to 9
- Very sensitive to salt
- Urine from manures can end the vermicompost journey
- Deworming medicine, detergents, industrial chemicals, pesticides …
- Tannins from plants (like cedar and fir)

VERMICOMPOST: Benefits, Systems, Uses

SYSTEM TYPES

WINDROWS

1. Static pile windrows (batch)
2. Top-fed windrows (continuous flow)
3. Wedges (continuous flow)

VERMICOMPOST: Benefits, Systems, Uses

SYSTEM TYPES

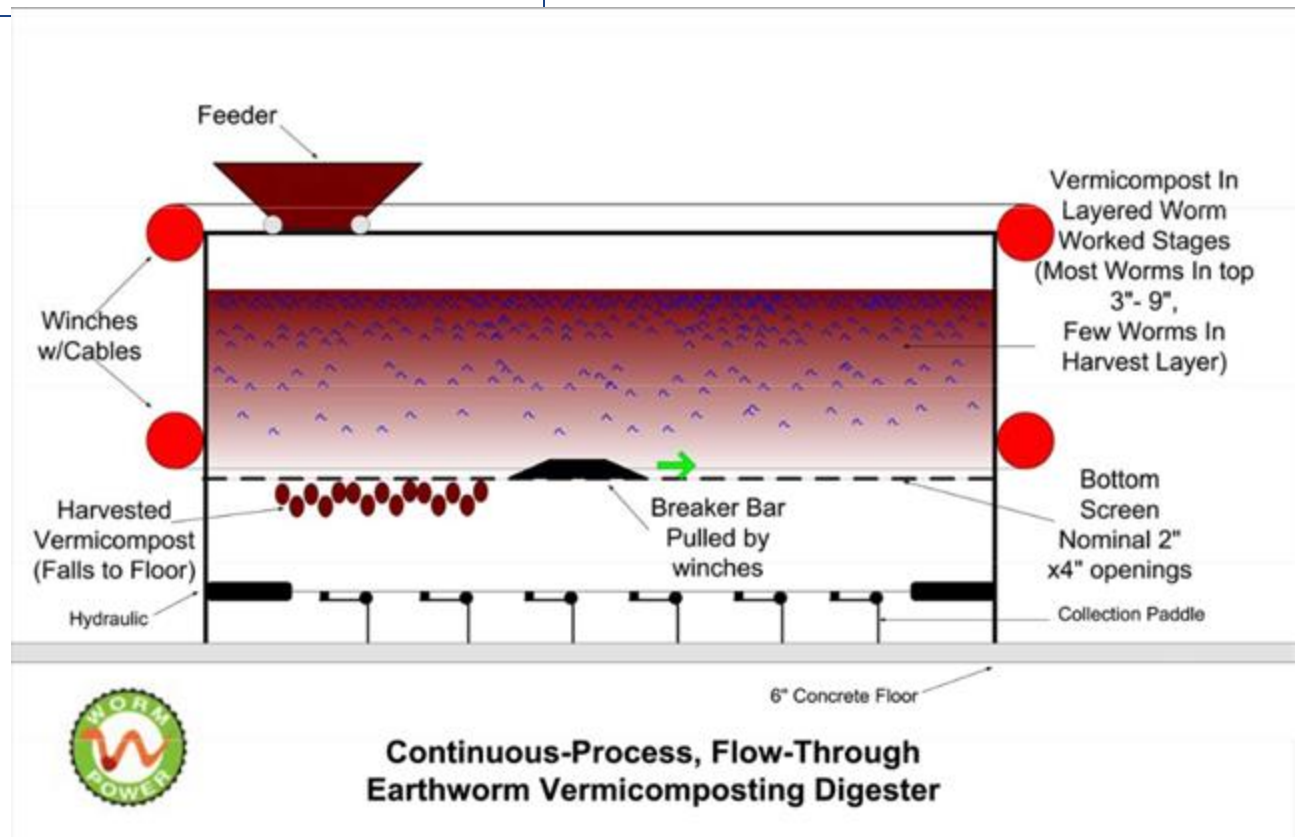
Beds and BINS

SUN and BLOOM FARMS

VERMICOMPOST: Benefits, Systems, Uses

SYSTEM TYPES

The Flow Through Reactor



VERMICOMPOST: Benefits, Systems, Uses, Income

CAUTION

FRUIT FLIES CAN BE A PROBLEM IN THE MIDWEST!
COVERING FEEDSTOCK WITH BEDDING MATERIAL PROPERLY AND TAKING OTHER PRECAUTIONS ARE A MUST!

VERMICOMPOST: Benefits, Systems, Uses, Income

INCOME

1. Saving on, amendments, fertilizers and pesticide costs
2. Higher, better yields
3. New market - can help with organic certification
4. New market - worms for sale (agricultural & fishing markets)
5. New market - vermicompost and related agricultural products (extracts & teas)

SUN and BLOOM FARMS

VERMICOMPOST: Benefits, Systems, Uses, Income

CONCLUSIONS

WORMS ARE EASY TO MAINTAIN

COMPOSTING CAPACITY GROWS EXPONENTIALLY – PROFIT$ CAN TOO

ANY SYSTEM TYPE IS SCALABLE

SHELF STABLE IN “SOLIDS” FORMAT (SOME BOTTLED LIQUIDS ALSO)

VERMICOMPOST: Benefits, Systems, Uses, Income

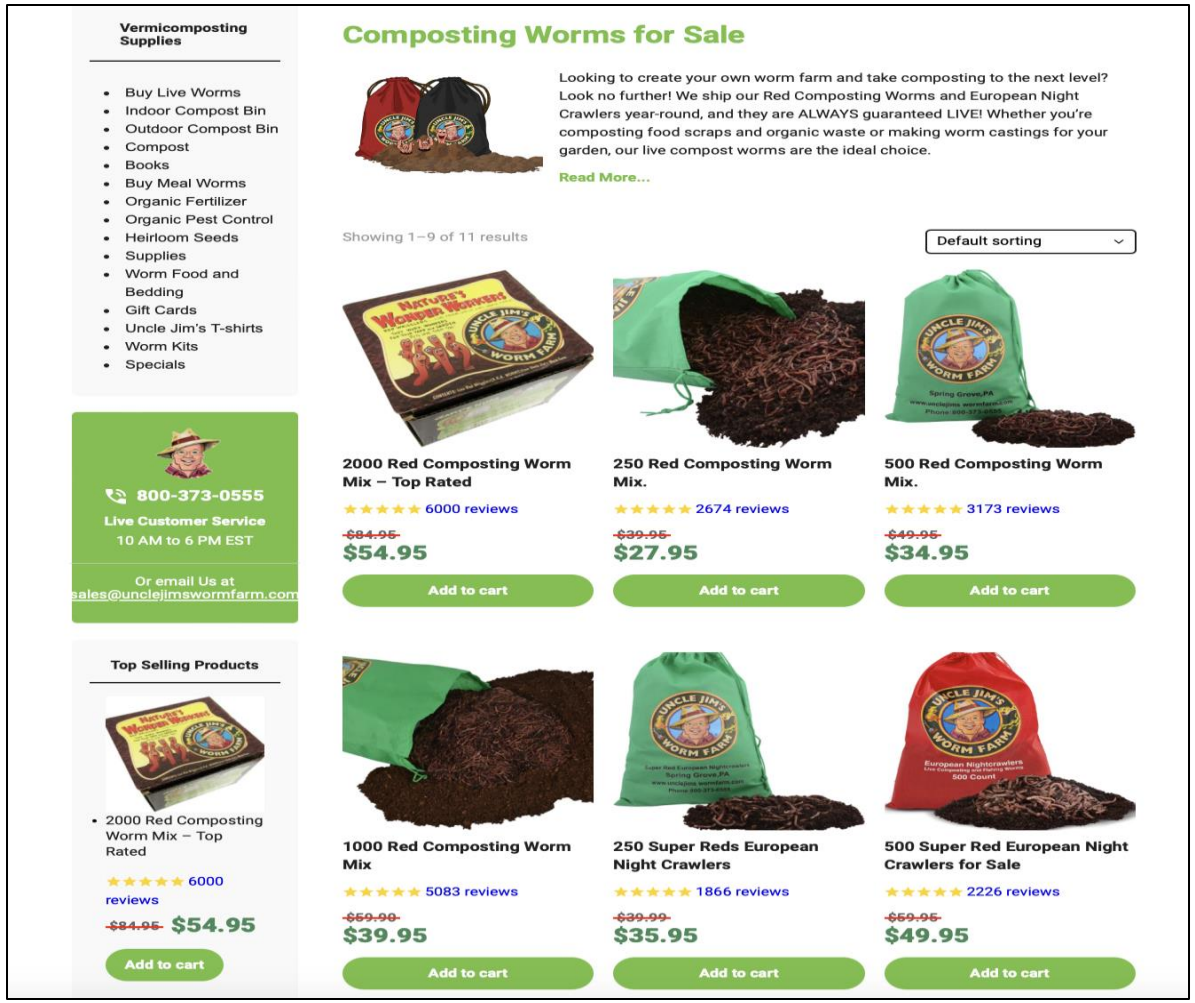
SALES CHANNELS

ONLINE EXAMPLES:

- UNCLEJIMSWORMFARM.COM ($10 MILLION / YEAR COMPANY)

- MEMESWORMS.COM (BREAKING THE $1 MILLION)

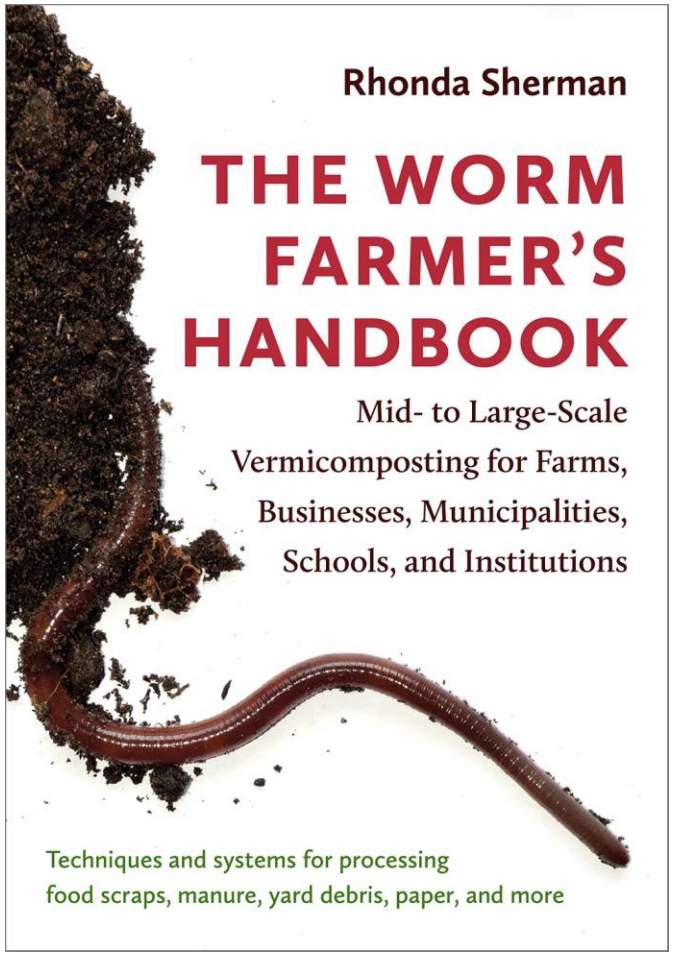
-ELM DIRT (MISSOURI – GRANT FUNDED)



SUN and BLOOM FARMS

VERMICOMPOST: Benefits, Systems, Uses, Income

GET STARTED RESOURCES



SUN and BLOOM FARMS

VERMICOMPOST: Benefits, Systems, Uses

REFERENCES

References

- Arancon, N. (2002). “The influence of humic acids derived from earthworm-processed organic wastes on plant growth”. Bioresource technology Journal - Volume 84.
- Atiyeh, R.M, S. Subler, C.A. Edwards, G. bachman, J.D. Metzger, and W. Shuster. 2000. “Effects of vermicomposts and composts on plant growth in horticultural container media and soil”. In Pedo biologia, 44, pp. 579-590.
- Edwards, C.A., Arancon, N.Q., Emerson, E., Pulliam, R. 2007. “Suppression of Plant Parasitic Nematodes and Arthropod Pests by Vermicompost Teas”. Biocycle Dec. 2007 (61-63).
- Hammermeister, A.M., P.R. Warman, E.A. Jeliazkova, R.C. Martin. 2004. “Nutrient supply and lettuce growth in response to vermicomposted and composted cattle manure”. Submitted to Bioresource Technology, Dec, 2004.
- Ingham, E. and Rollins C.A. (2008) “The Field Guide II for Compost Tea”
- Munroe, G. (2006). “Manual of On-Farm Vermicomposting and Vermiculture”. Organic Agriculture Centre of Canada Publications
- Powers, M. (2020) “Regenerative Soil - The Science & Solutions”