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004 EPA STAR Graduate Fellowship Conference *Next Generation Scientists—Next Opportunities*

Sustainable Use of Vermicompost in Containerized Crop Production

The Problem

High density hog production produces waste in excess of traditional treatment capacities – sometimes resulting in nutrient runoff into the watersheds [mainly nitrogen (N) and phosphorus (P)] and causing degraded surface water quality.

Objectives

Evaluate the feasibility of using vermicomposted hog waste as a containerized crop potting media amendment to **INCREASE:**

WATER USE EFFICIENCY
NUTRIENT USE EFFICIENCY

The Solution

Use the following biological processes to cycle nutrients and prevent runoff:

- **Earthworms**: oxidize hog waste and produce worm castings
- **Containerized crops** (nursery & greenhouse): incorporate worm castings into growing media to increase water and nutrient efficiency

Background

EUTROPHICATION

- The physical, chemical, and biological changes that occur when surface waters receive nutrient inputs (N and P) from natural erosion and runoff.

- Nutrient enrichment of surface waters negatively impacts the ecosystem:

- Algae blooms
- Low oxygen
- Fish kills
- Loss of biodiversity
- Negative impacts aquatic industries (commercial and recreational)

HOGS - #1 agricultural commodity in NC
- >10 million hogs
- >52,000 tons waste/day

Lagoons & spray fields
Traditional waste management approach

How do lagoons and spray fields contribute to eutrophication?

- Lagoons overflow during heavy rains

- Lagoons fail due to age or improper construction
- Volume of hog waste exceeds nutrient utilization of crops grown on spray fields

VERMICOMPOSTING
A proven technology in which earthworms process (eat) hog waste and produce a "value-added material" (castings).

Vermicompost (VC)
- End product of earthworm activity
- Rich with microbes, humus, & plant available nutrients

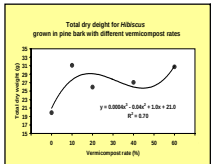
NURSERY/GREENHOUSE
#1 crop commodity in NC
- $987 million wholesale receipts (2000)
- Worm castings may increase water and nutrient use efficiency
- Provide growers with another Best Management Practice (BMP)

First Year Study

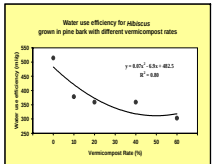
Study design: RCB w/ 4 blocks
Treatments: Pine bark with 0%, 10%, 20%, 40%, 60% VC
Crop: *Hibiscus* 'Luna Blush'
Measured variables:
- Net photosynthesis
- Total dry tissue weight
- Volume irrigation water applied
- Volume water leached (0.2 LF)

Results:

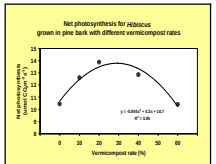
Water Use Efficiency (WUE) = Volume irrigation water / total dry tissue weight



- Max growth with 10%VC
- 10%VC had 50% greater growth than 0%VC



- WUE ↑ with ↑VC rates
- Max WUE at 50%
- 10%VC used 30% less water per gram of tissue than 0%VC



- Net photosynthesis (Pn) measured pre-irrigation at 10 am.
- Pn maximized at 29%VC

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