In-Situ Vermicomposting

Reduce food waste

Improve harvest

Soil detoxification
Developing New Apparatus for In-situ Vermicomposting and Varying Diet Parameters to Understand Optimal Conditions for Soil Fertilization

Nataliya Ryzhenko, Lab Manager and CLAS, science and fine art student.
What is In-Situ Vermicomposting?

Vermicomposting is a process of decomposition of organic material with the aid of earth worms.

As the worms digest food, they convert organic waste and bedding into water-soluble nutrient-rich compost that can be used by the plants grown in the connected container. The liquid that contains nutrients is called compost tea.
Why Vermicomposting?

• Vermicomposting is ideal for organic and sustainable farming. In-situ vermicomposting was found to be the most effective fertilization mechanism compared to compost and chemical fertilizer [1].

• Earthworms also help decrease soil contamination with heavy metals, such as Cu, Ni, Cd, Pb and Zn. This method is used to treat sewage sludge [2].
Goals of the project

• Develop an apparatus for in-situ vermicomposting that can be used in a kitchen setting.

• Investigate what different food waste produces best growth and fruiting.
Requirements

• Container for worm farm must be sealed with a lid, with air holes to allow oxygen to enter the box, while minimizing odors.
• Bedding and food must be within 6.0-7.0 pH.
• Moisture level should be above 50%.
• Optimal temperature between 60F and 77F.
• Appropriate diet should not contain meat, diary, citric, spicy or cooked foods.
• Compost tea should leak freely into plant section of the container.
Materials and Methods

1. Two boxes (A and B) with sections for worm farm and plants were set up.
2. Control plant box (C) was positioned in close proximity but with no access to compost tea.
3. We chose tomatoes, cucumbers, squashes, dill and arugula for this experiment
4. Worms used were red wrigglers (*Eisenia fetida*).
5. Sensors were positioned to measure temperature, moisture level and pH.
6. Worms in box A received beans as main part of their diet. Worms in box B received mostly vegetable and fruit peelings.
7. We recorded plant growth progress.
Group A
Group B
Control Group C
Measurements

• Measurements of the plant height (cm) and stem diameter (mm) were recorded for seven plants from each replication at 1, 7, 14, 21, and 28 days after transplanting the plants.
Results

**Tomato Height Chart**

- **Plant Height, cm**
  - Day 1: Box A (0), Box B (5), Box C (10)
  - Day 7: Box A (5), Box B (10), Box C (15)
  - Day 14: Box A (10), Box B (15), Box C (20)
  - Day 21: Box A (15), Box B (20), Box C (25)
  - Day 28: Box A (20), Box B (25), Box C (30)

**Tomato Stem Growth**

- **Plant Stem Diameter, mm**
  - Day 1: Box A (0), Box B (5), Box C (10)
  - Day 7: Box A (5), Box B (10), Box C (15)
  - Day 14: Box A (10), Box B (15), Box C (20)
  - Day 21: Box A (15), Box B (20), Box C (25)
  - Day 28: Box A (20), Box B (25), Box C (30)

**Cucumber Height Chart**

- **Plant Height, cm**
  - Day 1: Box A (0), Box B (5), Box C (10)
  - Day 7: Box A (5), Box B (10), Box C (15)
  - Day 14: Box A (10), Box B (15), Box C (20)
  - Day 21: Box A (15), Box B (20), Box C (25)
  - Day 28: Box A (20), Box B (25), Box C (30)

**Cucumber Stem Growth**

- **Plant Stem Diameter, mm**
  - Day 1: Box A (0), Box B (5), Box C (10)
  - Day 7: Box A (5), Box B (10), Box C (15)
  - Day 14: Box A (10), Box B (15), Box C (20)
  - Day 21: Box A (15), Box B (20), Box C (25)
  - Day 28: Box A (20), Box B (25), Box C (30)
Results Discussion

• Both vermicomposting fertilized plant sets (boxes A and B) had better results than control (box C).

• Arugula showed significantly better growth (and even flowering) in box B.
Conclusion

As a result of this project, we have completed a small-scale in-situ vermicomposting setup. We have observed growth and development in control and vermicomposting tea fertilized plants. We have seen better results in plants that received fertilization.
Future Work

The next step is to develop a in-situ vermicomposting setup at the Lesley Community Farm. This will require building beds for the plants and protecting worm farm from predators. A lot of the knowledge we obtained from having a small-scale version will be used in the final setup.

Ask business program students at Lesley University for trying to patent this project.
Acknowledgements

Special appreciation goes to professors Amy Mertl, David Morimoto and Ellen Schon. Many thanks Sean Lutz, the interdisciplinary studies Studio Assistant for his help to kiln the vermicomposting art bio vessels.
Acknowledgements

• Our experimental apparatus was designed and built by Nataliya Ryzhenko, Everett Labrecque and Jack Labrecque.

• We thank CLAS Undergraduate Grant Award Committee 2017-2018 for supporting this project with $600.00 grant.
References


2. Comparative study on physical and chemical characteristics of sludge vermicomposted by Eisenia fetida Fei Liua, Pengfei Zhua, Jianping Xuea. Procedia Environmental Sciences 16 (2012) 418 – 423
DEVELOPING NEW APPARATUS FOR IN-SITU VERMICOMPOSTING

Nataliya Ryzhenko, Lab manager and CIAS student

In-Situ Vermicomposting
Reduce food waste

Why Vermicomposting?
Vermicomposting is a natural, sustainable, and cost-effective method for breaking down organic waste. It involves the use of compost worms, which convert food waste into nutrient-rich compost. This process reduces waste and produces a valuable soil amendment.

Goals of the project
To develop an apparatus for in-situ vermicomposting that can be used in a kitchen setting.

Materials and Methods

Requirements

Group A

In-Situ Vermicomposting
Reduce food waste

Goals of the project

Group B

In-Situ Vermicomposting
Reduce food waste

Materials and Methods

Requirements

Group A

In-Situ Vermicomposting
Reduce food waste

Goals of the project

Group B

In-Situ Vermicomposting
Reduce food waste

Materials and Methods

Requirements

Group A

In-Situ Vermicomposting
Reduce food waste

Goals of the project

Group B

In-Situ Vermicomposting
Reduce food waste

Materials and Methods

Requirements

Group A

In-Situ Vermicomposting
Reduce food waste

Goals of the project

Group B

In-Situ Vermicomposting
Reduce food waste

Materials and Methods

Requirements

Group A

In-Situ Vermicomposting
Reduce food waste

Goals of the project

Group B

In-Situ Vermicomposting
Reduce food waste

Materials and Methods

Requirements

Group A

In-Situ Vermicomposting
Reduce food waste

Goals of the project

Group B

In-Situ Vermicomposting
Reduce food waste

Materials and Methods

Requirements

Group A

In-Situ Vermicomposting
Reduce food waste

Goals of the project

Group B

In-Situ Vermicomposting
Reduce food waste

Materials and Methods

Requirements

Group A

In-Situ Vermicomposting
Reduce food waste

Goals of the project

Group B

In-Situ Vermicomposting
Reduce food waste

Materials and Methods

Requirements

Group A

In-Situ Vermicomposting
Reduce food waste

Goals of the project

Group B

In-Situ Vermicomposting
Reduce food waste

Materials and Methods

Requirements

Group A

In-Situ Vermicomposting
Reduce food waste

Goals of the project

Group B

In-Situ Vermicomposting
Reduce food waste

Materials and Methods

Requirements
• Develop an apparatus for in-situ vermicomposting that can be used in a kitchen setting.
• Investigate what different food waste produces best growth and fruiting.

Requirements
• Container for worm farm must be sealed with a lid, with air holes to allow oxygen to enter the box, while minimizing odors.
• Bedding and food must be within 6.0-7.0 pH.
• Moisture level should be above 50%.
• Optimal temperature between 60F and 77F.
• Appropriate diet should not contain meat, acidic, spicy or cooked foods.
• Compost tea should leak freely into plants of the container.