



Science on the Farm: an Overview of Student/Faculty Research Projects Utilizing the Dickinson College Organic Farm

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Snake Ecology Research

**Prof. Scott Boback,
Biology**

- Construction of shelters to improve habitat
- Population and species diversity monitoring
- Mark recapture experiments
- Comparison to wild habitats



Honeybee Orientation Behavior

Prof. Tony Pires
Neuroscience

- Analysis of bee orientation to food sources
- Mark and recapture experiments
- Habituation / Priming responses
- Analysis of food source quality



Bluebird Nesting Behavior

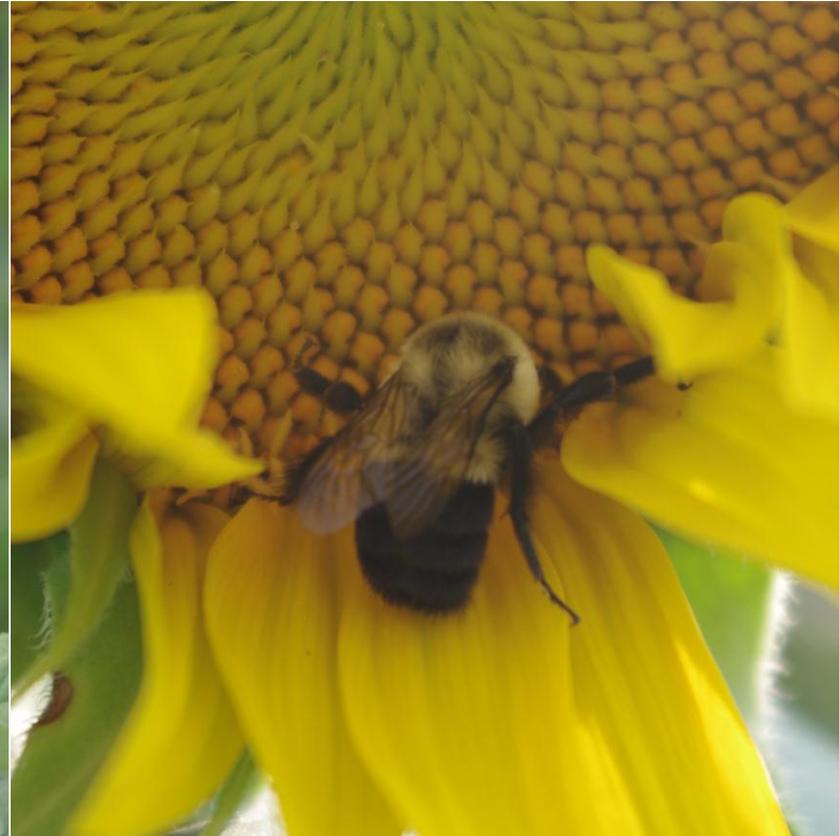
Prof. Gene Wingert
Environmental Science

- Construction of nesting boxes for trail
- Integrated pest management approach
- Species competition for nest boxes
- Correlations between habitats and species occupying boxes
- Nest boxes as winter habitat for mice



Native Pollinator Studies

- Analysis of species diversity and population density
- Testing efficacy of pollination



Other Projects

- 1) Environmental Science: Alliance for Aquatic Resource Monitoring (ALLARM) stream quality monitoring near the farm.
- 2) Earth Sciences: Well field-based hydrogeology research.
- 3) Biochemistry: Alteration of plant biochemical pathways to increase resveratrol content of grapes.
- 4) Food Production: First year seminar raised, slaughtered, and cooked broiler hens.



**Alliance for Aquatic
Resource Monitoring**



Vermicompost Extract: Testing its Impact on Tomato Productivity and Disease Resistance and Preliminary Microbial Characterization

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3. Dickinson College Farm, Boiling Springs, PA

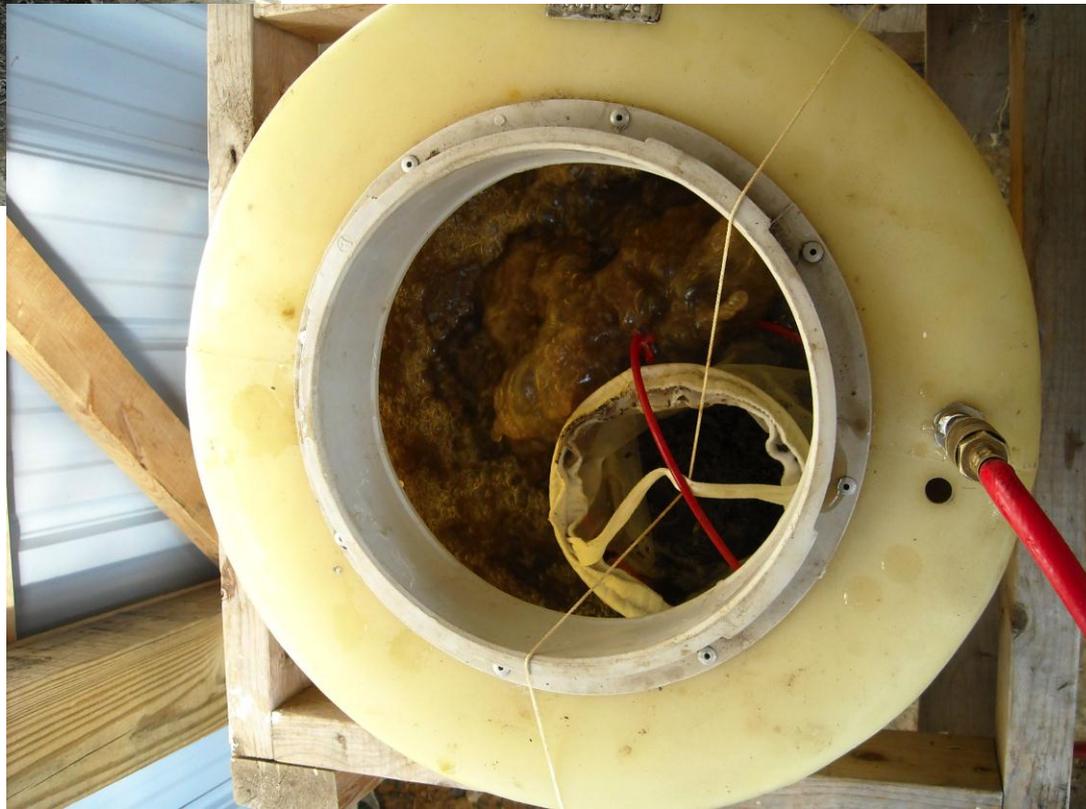


Vermicompost Research Goals

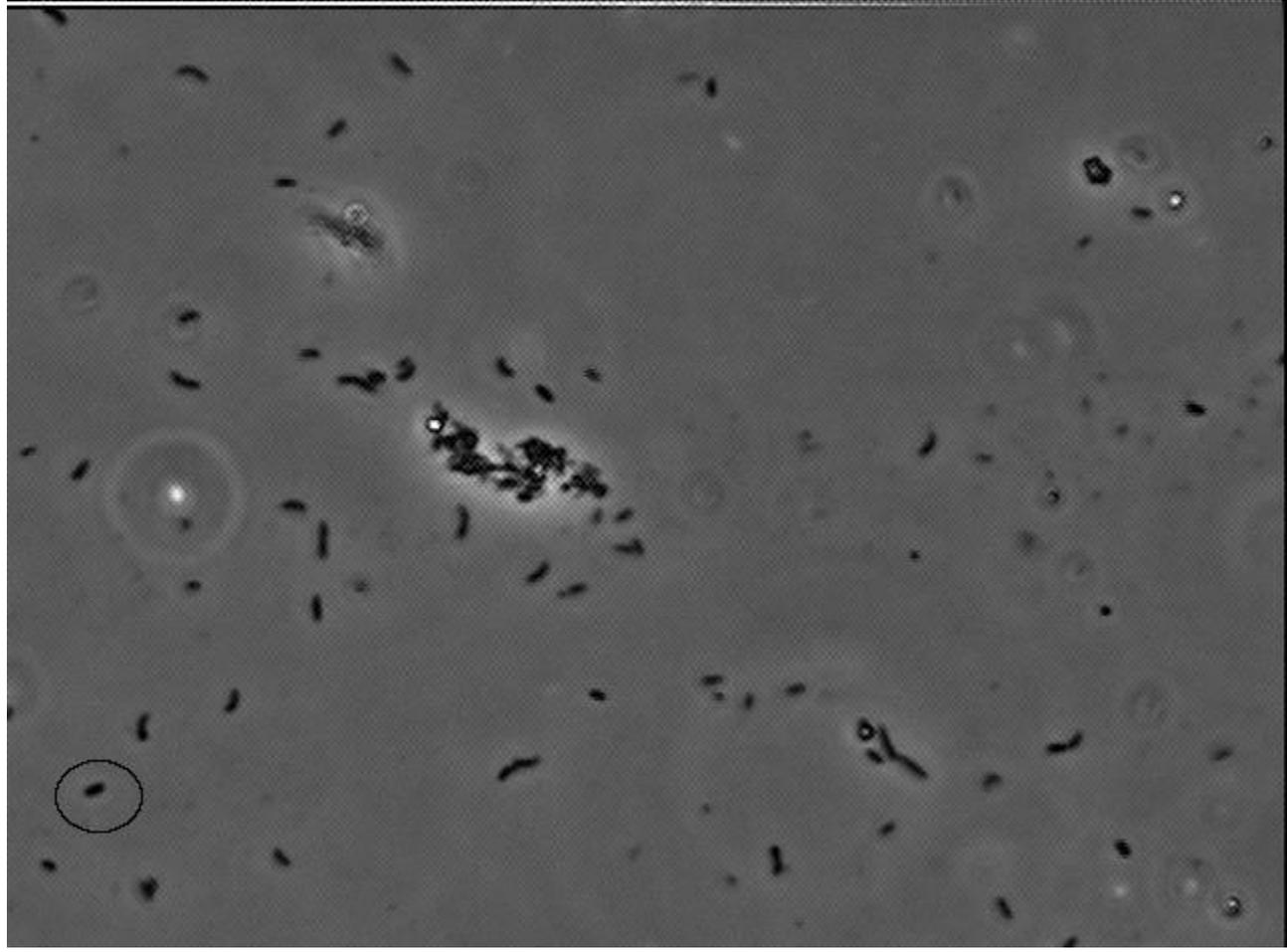
- To compare vermicompost extract and Serenade MAX spraying in the suppression of tomato fungal disease and in the promotion of plant health and productivity.
- Characterization of bacteria and other organisms associated with vermicompost extracts.
- To apply results to the disease management strategies in use at the Dickinson College Farm.



The Red Wiggler Worm *Eisenia fetida*





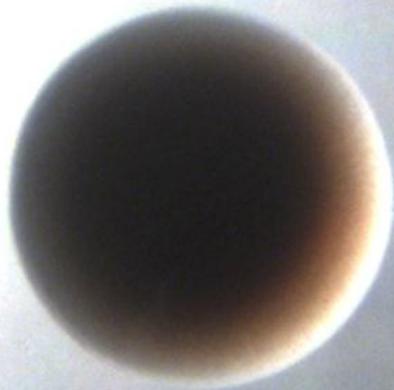


Petri plates of bacteria grown from vermicompost (top) vs. Serenade (bottom)

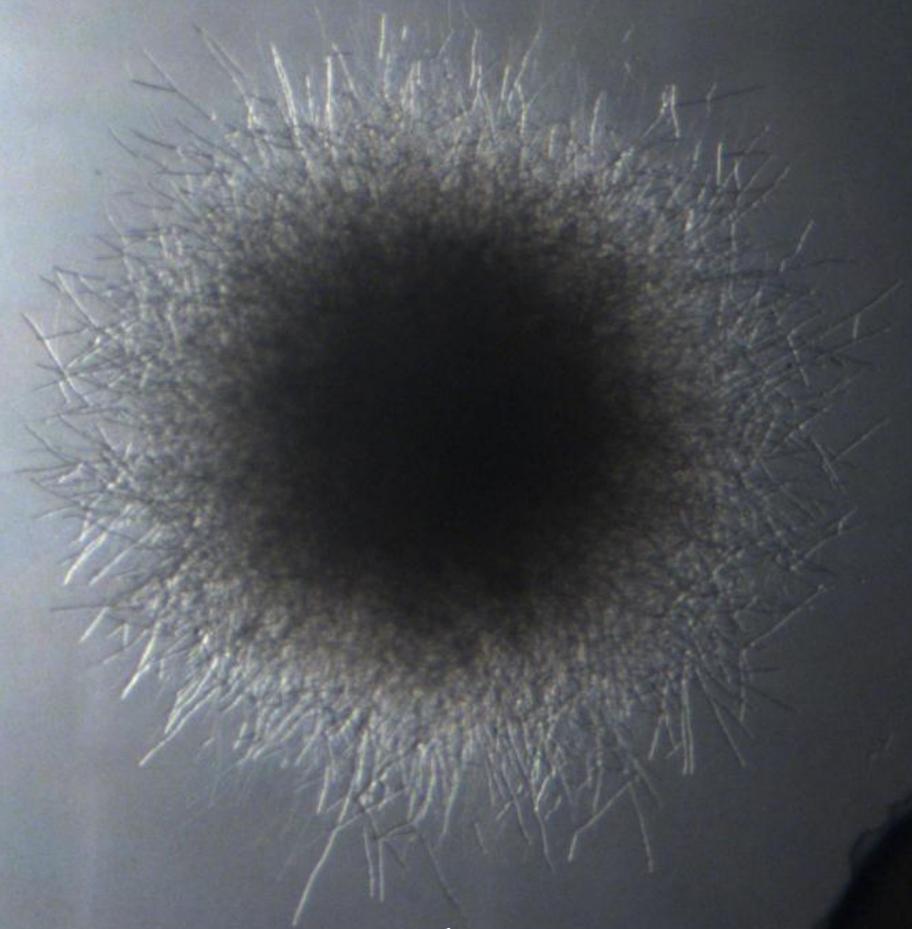


Serenade =
Bacillus subtilis

Vermicompost Extract Colonies on Agar Plates

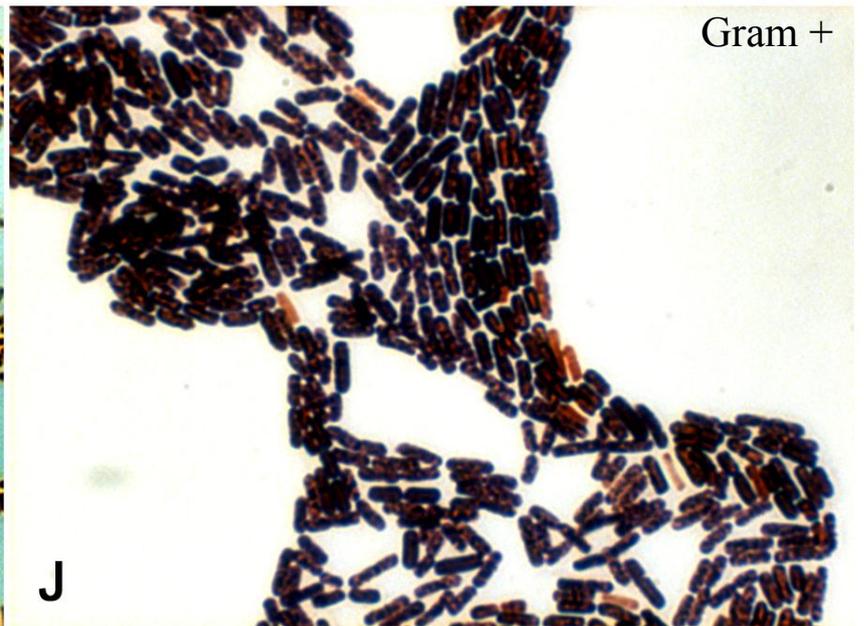
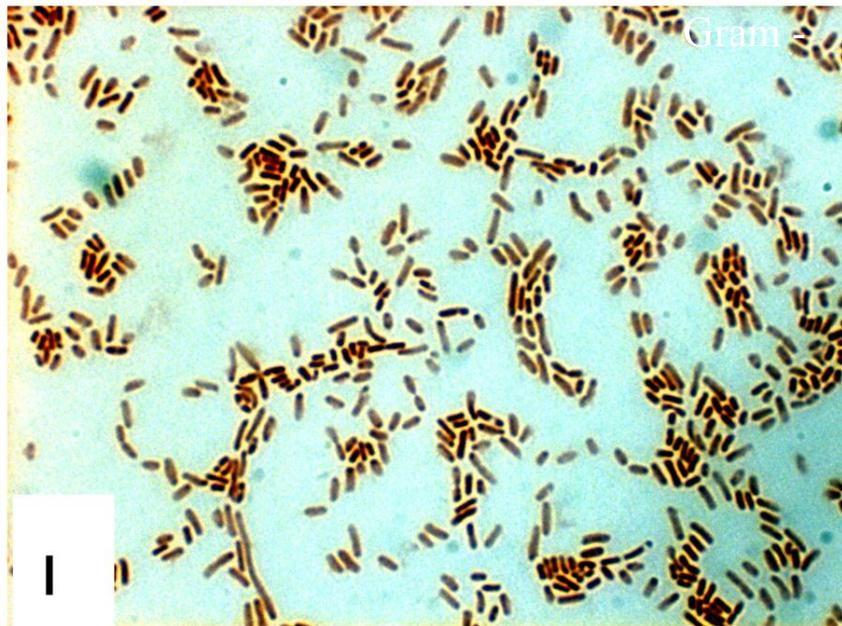
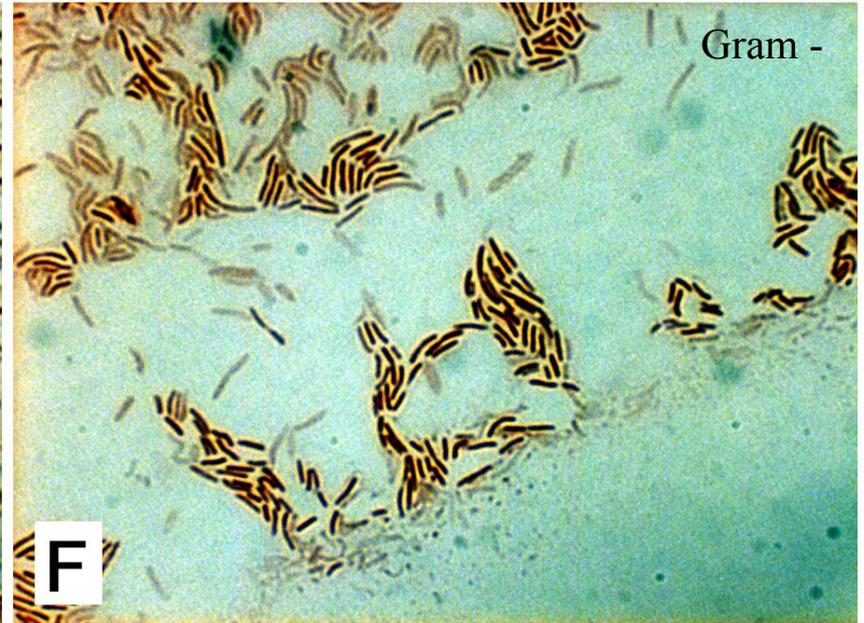
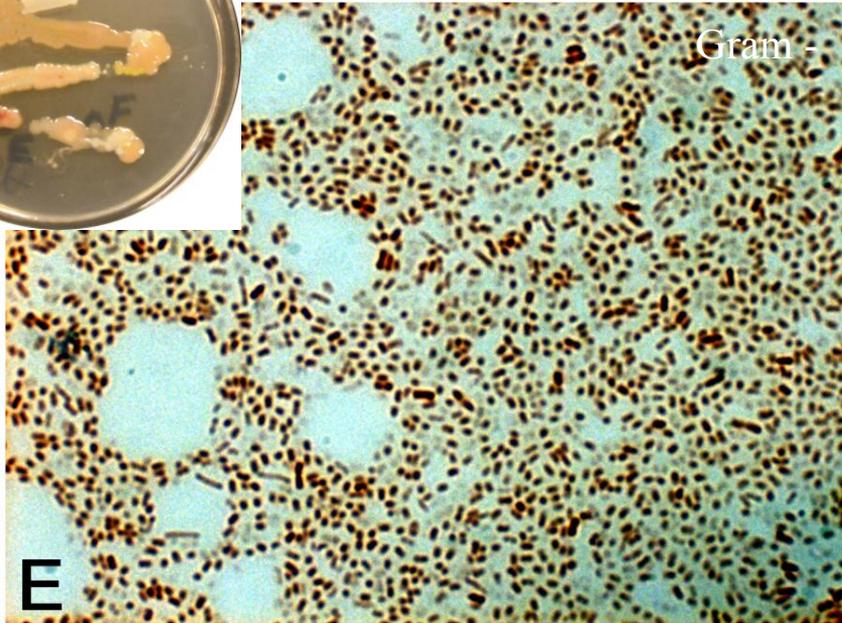


Bacterial
colony

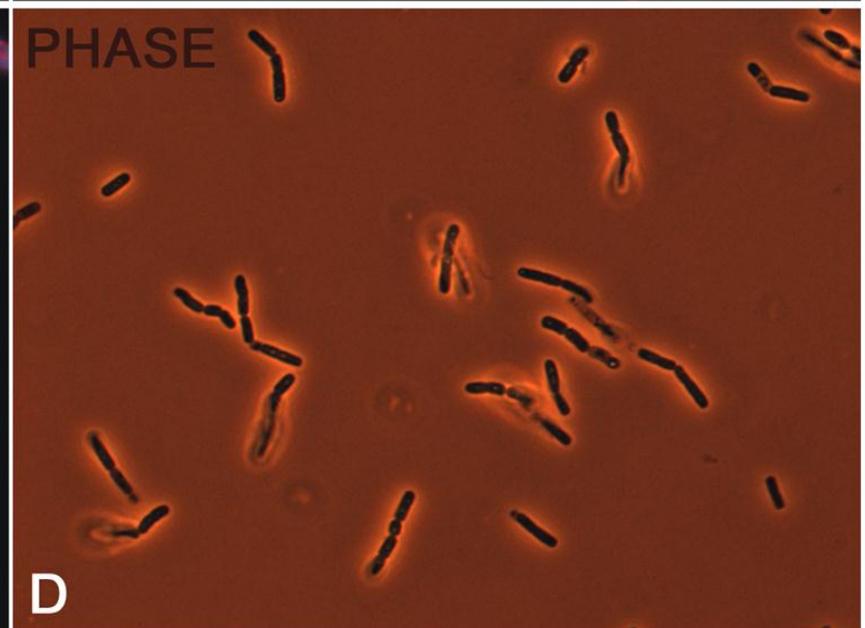
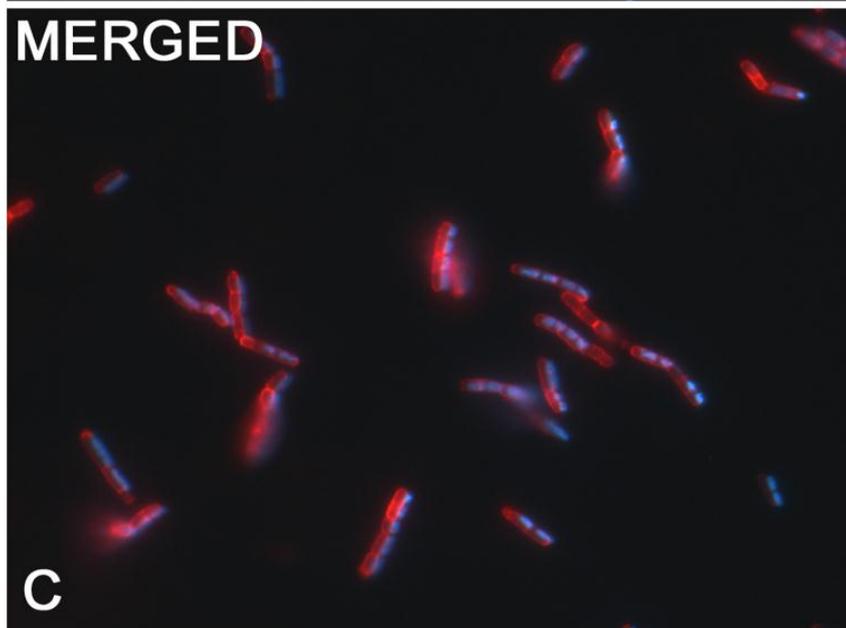
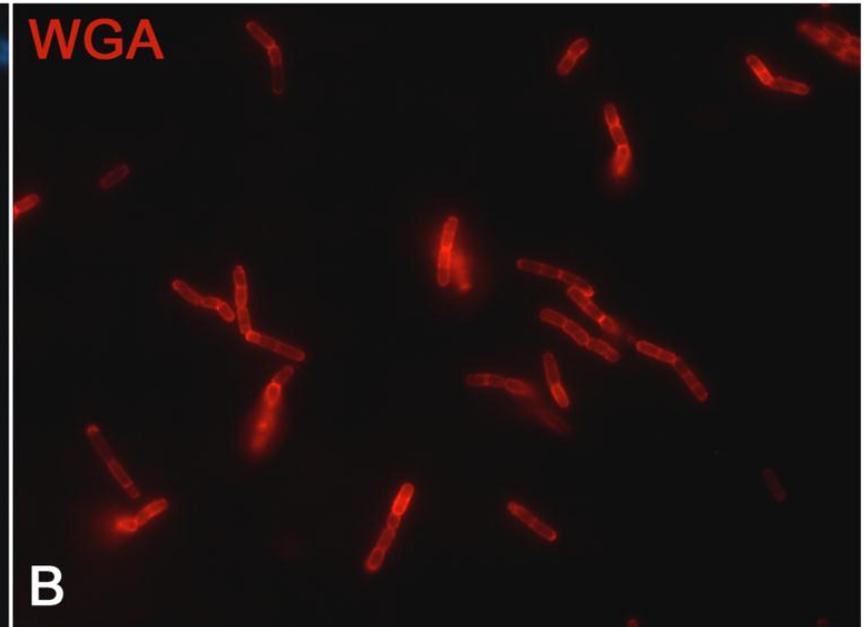
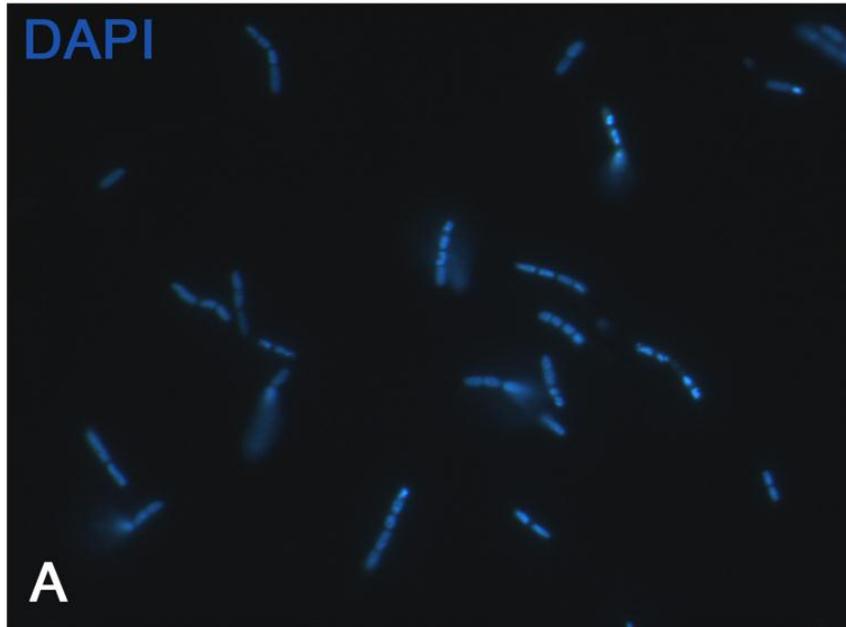


Fungal
colony

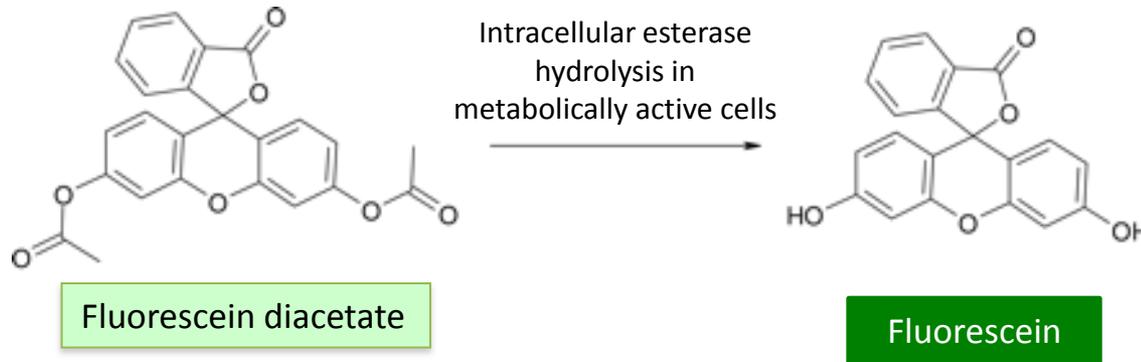
Gram Staining of Vermicompost Colonies



Gram Positive



1) CFDA Staining for Metabolic Activity:



Relatively Cell Membrane Permeant
Relatively Nonfluorescent

Relatively Cell Membrane Impermeant
Relatively Highly Fluorescent

2) SytoxGreen Staining for Dead Cells

SytoxGreen can only enter cells with compromised membrane integrity (dead cells) and its fluorescent intensity is 500 fold higher when the dye is bound to DNA compared to free dye.

DAPI

A

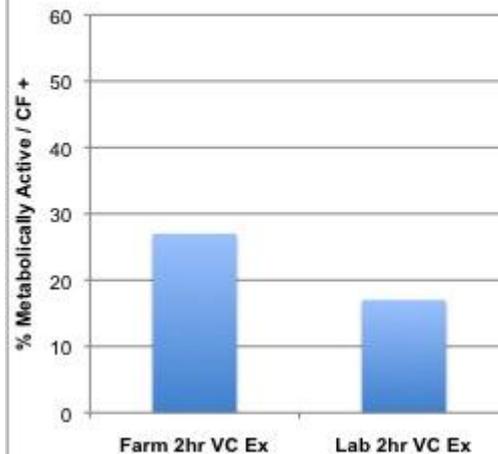
CFDA

B

MERGED

C

Analysis of % Metabolically Active Cells in VC Extracts

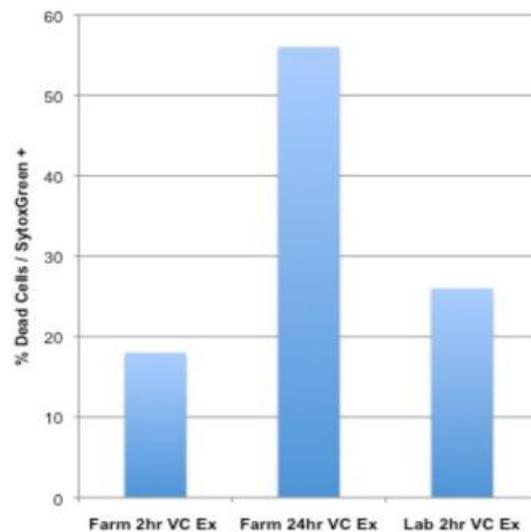


DNA

Sytox Gr

Merged

Analysis of % Dead Cells in Farm and Lab-Generated VC Extracts

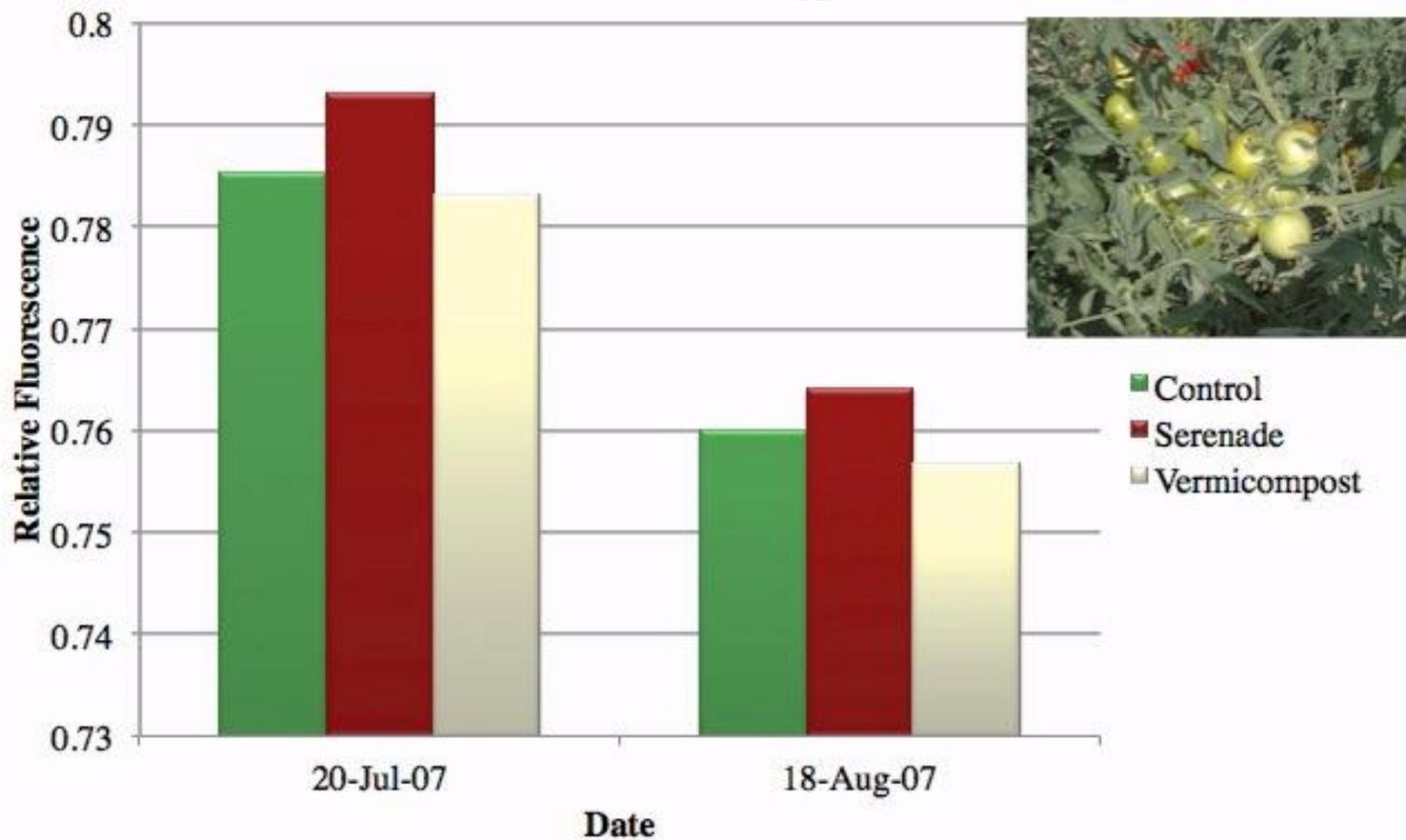




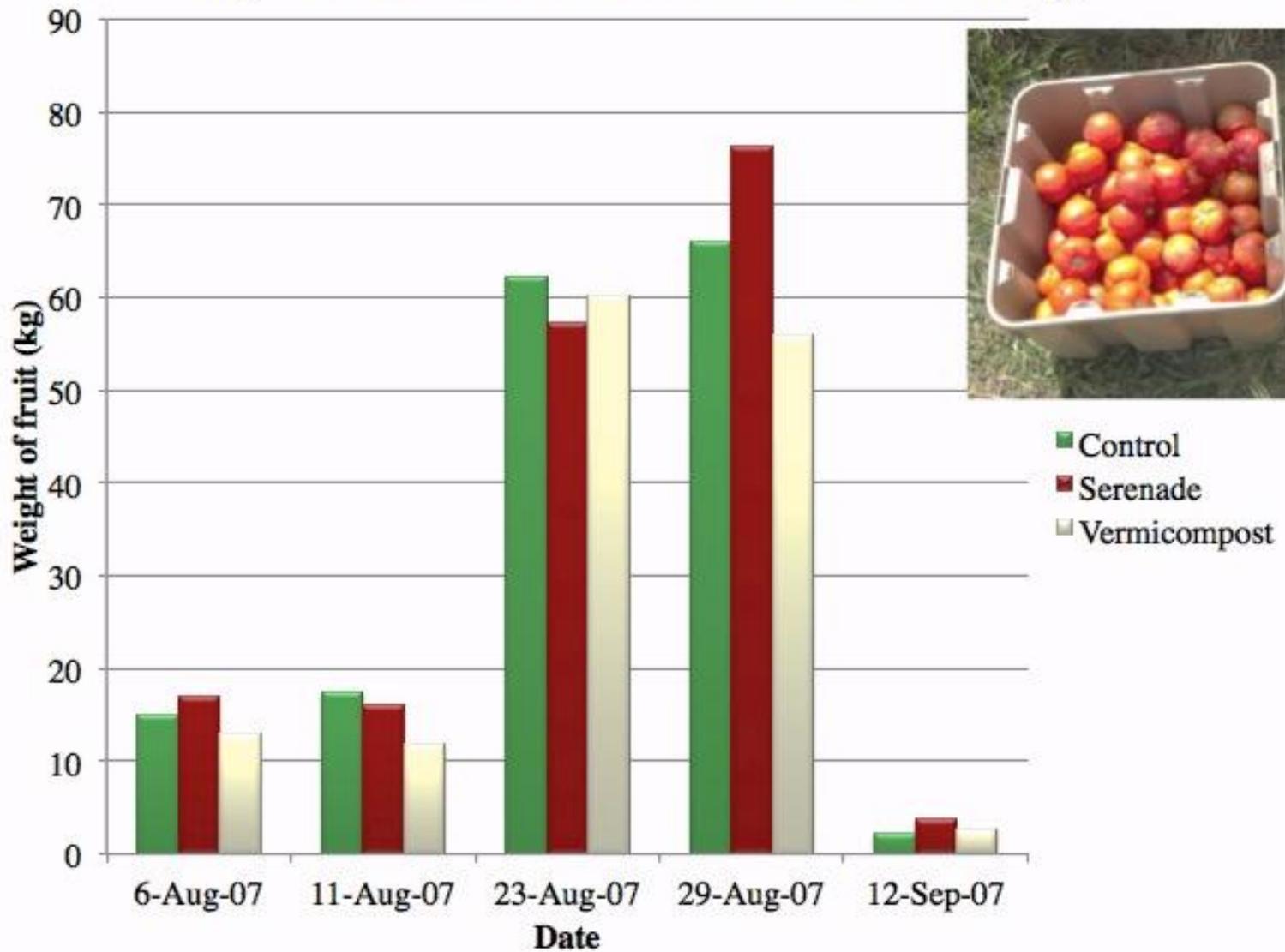




Photosynthetic Efficiency of Plants From Each Treatment Type



Weight of Fruits Harvested from Each Treatment Type



CONCLUSIONS

1. There was no significant difference observed between the VC-Ex, Serenade MAX and Control treated plants in terms of the following parameters:
 - Fruit production as measured by the wet weight of harvested fruit. Note that the amount of harvested fruit was severely limited by two extreme weather events at the height of the harvest period.
 - Plant health as measured by photosynthetic efficiency (Fig 10).
 - Disease resistance as measured by infestation with early blight - *Alternaria solani*.
2. Preliminary microbial characterization of VC-Ex:
 - Contains a diverse collection of bacteria, fungi, protozoa and nematodes.
 - The majority of bacterial colonies are rod-shaped and Gram negative.
 - Metabolically active bacteria constituted 20-30% (Fig 8).
 - Viable bacteria constituted some 80-90% (Fig 9).

FURTHER STUDIES

The future potential uses of vermicompost will involve using it in potting soil mixtures for lettuce seedlings grown in a greenhouse. We will compare the physical and chemical attributes of the vermicompost potting soil to regular compost potting soil and commercial potting soil. We will also assess plant germination, growth, and production.

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