



Evaluation of mushroom compost on yield and soil environment of romaine lettuce grown in the greenhouse
Young Scholar Enhancement Program

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Introduction

- I am Ivy Felts a student at Virginia State University where I am pursuing my B.S. in agriculture. As an undergraduate student, I wanted to acquire as much experience as possible in biological recycling of agricultural wastes using edible fungus (oyster mushroom) to value added products such as mushrooms and the spent mushroom substrate or compost as fertilizer for cultivation of Romaine lettuce. I am enjoying learning about growing romaine lettuce in the greenhouse on mushroom compost and other soil mediums
- The rapidly rowing global population and expansion in the agriculture sector has resulted in the generation of large amount of agricultural wastes which are rich in organic substances such as lignocelluloses. Biological recycling could be a potential strategic solution to increase resource and efficiency while maintaining ecological sustainability
- Bio recycling research utilizes mushroom to convert the abundantly available agricultural wastes to fruiting bodies and spent mushroom substrate or compost with high levels of organic matter and minerals
- Compost possess a great potential to be utilized in the horticultural sector as organic fertilizer to reduce the use of non-renewable resources such as inorganic fertilizers



Pictures of Romaine lettuce germination, Treatment medium preparation, growing and transplanting seedlings, experimental set up on tables arrangement of the potted experiment different plant growth stages and data collection.

Objectives

- Evaluate the effects of spent mushroom substrate/compost, soil and fertilizer on romaine lettuce production in potted experiment in the greenhouse
- Enhancement of knowledge and experiential learning in sustainable agriculture of a sophomore student. Also, an aim to encourage women in agricultural sciences.
- Valorizing of agricultural residues via biological recycling

Materials, Activities and Methods

- The experiment was conducted in a greenhouse at Randolph Research Farm of Virginia State University
- Pasteurized mushroom compost used was purchased from Full Circle Mushroom Compost a commercial producer in Philadelphia

Composition of Fresh Pasteurized Mushroom Compost

As Is	
pH	6.7
Moisture	25.4%
Organic Matter	61.4%
Nitrogen, Total	1.0%
Nitrogen, Ammonium	0.1%
Nitrogen, Organic	0.9%
Phosphorus (P2O5), Total	0.5%
Potassium, (K2O	1.1%
Carbon	13.3%

Treatments were:

- 100%soil+0%compost
- 75%soil+25%compost
- 50%soil+50%compost
- 25%soil+75%compost
- 0%soil+100%compost
- 100%soil+0%compost+NPK(10-10-10)
- 75%soil+25%compost+NPK(10-10-10)
- 50%soil+50%compost+NPK(10-10-10)
- 25%soil+75%compost+NPK(10-10-10)
- 0%soil+100%compost+NPK(10-10-10)

- Compost and Bourne sandy loam (from VSU Randolph Farm) was dried and sieved to pass through a 10 mm standard USDA Sieve.
- The mushroom compost and soil (sandy loam) containing treatments were mixed evenly based on volume (V/V)
- A 10-10-10 NPK fertilizer (Loveland products was also used to compare the fertility levels of compost
- Romaine lettuce (*Lactuca sativa* L.) seeds of *Salivus*, a romaine lettuce cultivar were planted in seed starter trays
- Seedlings germinated from Romaine Lettuce seeds were transplanted one seedling in a 0.6 gallon pot for each treatment group
- The study examined the effects of different concentrations of mushroom compost on the growth of lettuce

Determination of plant growth indicators

- Lettuce head length was measured directly with a ruler and harvested plant heads weight (yield crop) with electronic balance
- The chlorophyll content ($\mu\text{mol m}^{-2}$) was measured using Apogee, MC-100, USA, a portable chlorophyll meter
- Dry matter was determined using forced draft oven

Summary

Head Height

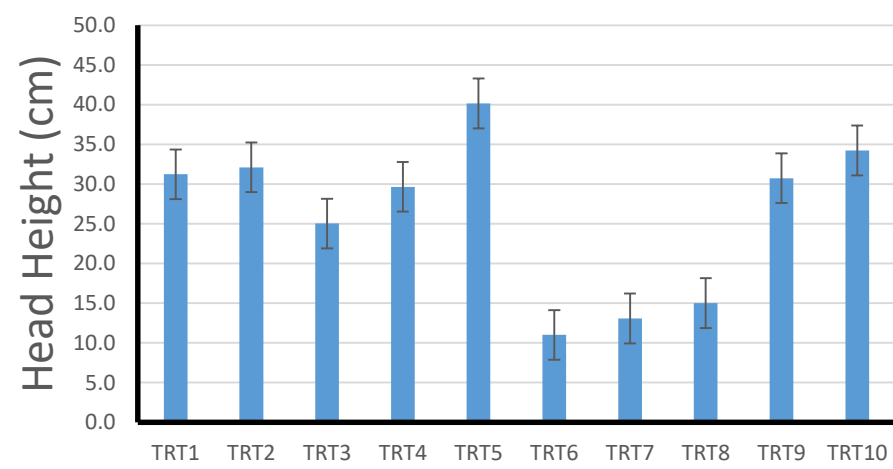


Figure 1: Average chlorophyll content measured in each treatment.

Ratio of Dried to Fresh Weight

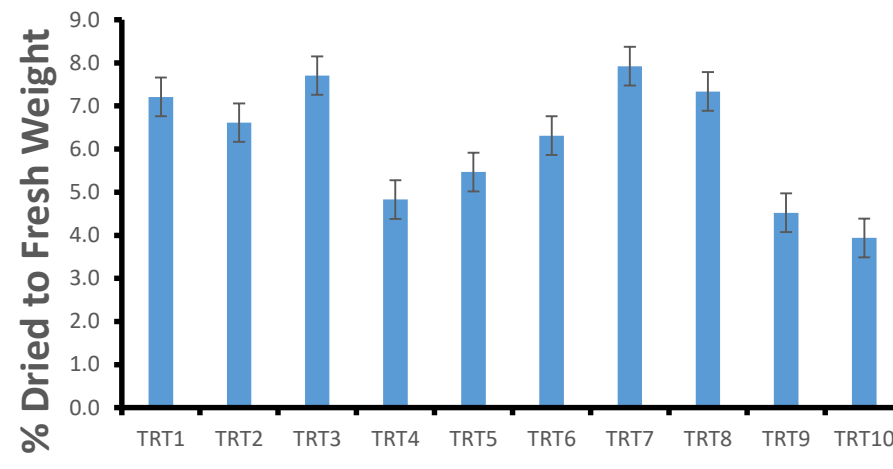


Figure 2: Average head height measured in each treatment

Chlorophyll Content

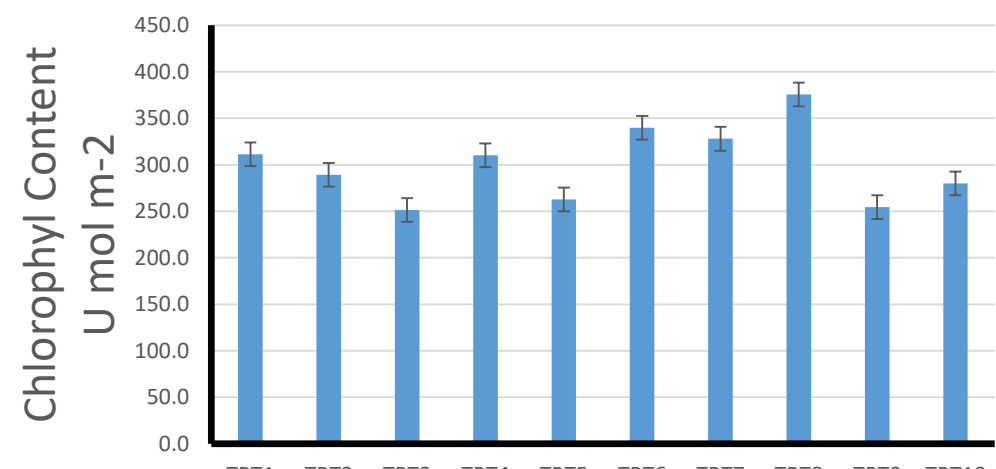


Figure 2: Average head height measured in each treatment

- The results in this greenhouse potted experiment indicated that adding spent mushroom compost has improved the growth of lettuces (head height, weight and chlorophyll content, and has the potential for use as fertilizer
- The results also indicate that adding spent mushroom compost with or without 10-10-10 NPK has improved the growth of lettuces

Knowledge and Skills Gained

- The intern in this project acquired skills involving layout of experiments, collecting and evaluating data and gained knowledge pertaining to sustainable agriculture.
- She participated in preparation of growing medium, planting seeds, transplanting seedling, collecting samples and monitoring of romaine lettuce.
- She compared the growth and yield of the lettuce on various treatments on mushroom compost.
- Assisted in preparing soil and plant biomass samples for chemical analysis.
- The young scholar completed the internship by creating a poster. This work will be presented at VSU agriculture field day and other forums

Research Needs

Further studies of this research in sustainable agriculture will continue to completion to determine:

- The compositional analysis of compost, soil and lettuce
- Nutritional quality of mushroom cultivated on crop residues and/or agricultural wastes
- Nematicidal abilities of mushrooms against gastrointestinal parasites in small ruminants
- Further studies with different application strategies of biological recycling including other microbes namely other fungi and bacteria and agricultural wastes will be very helpful

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