

No Waste Mushroom Cultivation

Viability Comparison of Spent Grain and Coffee Grounds for Small-scale and Urban Farmers



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Introduction

Mushroom cultivation with coffee grounds and spent grain will create a circular economy for small-scale growers and emerging farmers. Cooperation between local farmers, brewers and coffee vendors will develop business to business relationships to create a robust economy with shared benefits. The utilization of safe and effective practices for sterilization on a small scale, empowers emerging farmers with access to mycelium based soil amendments. Start-up costs for soil amendments to begin production is one of many barriers to incorporating new growers into the local food system. Reported in 2011, at least two billion cups of coffee are consumed every day on the planet. Excluding waste from the agricultural production segment and all the packaging, the amount is equivalent to six million tons of waste grounds.

3 Flock Farm completed a viability assessment by utilizing spent grain and/ or coffee grounds for mushroom cultivation and compost.

Opportunities to Recover Substrate

- On average 32 gallons per week per coffee roaster is disposed instead of used to grow food and amend soil. Totalling 224 gallons per week and nearly 900 gallons or 750 pounds. *5 local coffee roasters responded that all were producing at least a commercial size trash can of coffee grounds as byproducts from operations weekly.*
- Local brewers grain are fed to livestock from the production of local beer. *4 Local brewers responded with an established relationship with a local livestock farmer to pick up the by-product weekly.*

Goals/Objectives

3 Flock Farm seeks to determine the highest yield method of mushrooms from spent grain or coffee grounds. In addition, which varieties flourish from each by-product. Evaluation of sterilization processing will demonstrate the safest and effective practices for small-scale production. 3 Flock Farm provides education and resources to bolster community organizations including Mother Hubbard cupboard food pantry, Bloomington orchard, and Bloomington Parks and Recreation garden plot programming. 3 Flock Farm fosters cooperation amongst brewers and roasters to avoid viable plant matter ending up in the city dump.

- Produce mushroom compost can be a low-cost solution for soil improvement that meets the needs of the individual farmer.
- Compost donated to community organizations for soil remediation in community garden programming at Banneker Community Center.

Scope of Work

This project entails research, surveys, cooperative recruitment, and observation.

Processing took place in-house in a closed environment for inoculation and incubation with the exception of sterilization. Spent grain and coffee grounds were picked up as close to the end of production as possible to avoid bacteria growth. Reusable plastic bins are sealed for transport of the by-product to our facility.

After the sterilization process, inoculation takes place in jars in order to avoid contamination. Mushroom growth takes place on racks in a sealed room with humidity ideal for fruiting mushrooms. The remaining substrate will be removed from the closed environment to amend soil.

The fruiting body size will determine success and an assessment tool for higher yield. The stalk, gills and cap signify a sellable product. The scale for size is limited to large defined as greater than 2 inches and small defined as less than 2 inches. The weight of the compost is measured for quantities to sell or donate. In other words, soil amendments are sold in units of pounds or gallons for compost tea.

Timetable

DESCRIPTION OF WORK	START DATE	END YIELD
<p>PHASE 1 PASTEURIZATION Sterilize Coffee grounds within 7 day period. Complete inoculation.</p>	February 1st	March 8th Harvest mushrooms
<p>PHASE 2 SPAWNING AND CASING Inoculated coffee grounds in clean jars and leave in humidity.</p>	February 8th	
<p>PHASE 3 SPENT MUSHROOM SUBSTRATE After 2 weeks undisturbed, incorporate mycellium or let fruit.</p>	February 22	Mushroom compost utilized in the garden.

This process was repeated for 16 weeks to observe changes in the mycelium grown from spent grains and coffee grounds.



Time Budget

The first step to creating an effective sterilization process is to determining the amount of inoculant and substrate available. Choose an incubation location to set the inoculated jars without disturbance for at least 14 days.

SCALE	ESTIMATED YEILD
32 OZ MASON JAR	2-3 pounds
64 OZ MASON JAR	6-9 pounds
5 GALLONS	60-75 pounds
30 GALLONS	250+ pounds*required equipment and space for fruting

Glass Jars replace the use of plastics in the production of mushrooms from coffee grounds in order to reduce single use plastic in the environment. Inoculating a larger quantity of jars reduces contamination cross and losses due to human error. Labeling jars with date and mushroom variety assists with recognizing a failed inoculant. Mushroom based biodegradable plastic bags, unicorn bags, are an adequate alternative to jars to accommodate larger quantities (gallons). The cleaning and sterilizing of the jars, packing with substrate, inoculation and labeling took no less than 5 hours for 8 32 oz jars.

Measurements

How will we know that our goals have been met?

Spent coffee grounds are easily sourced with higher yields than brewer's grain.

Coffee grounds used as a substrate for mushroom cultivation yielded 25% more than spent grain. Oyster mushrooms harvested with coffee ground had larger cap size and longer stalk when cultivated with coffee grounds. Lion's Mane mushrooms harvested with brewer's grain were large in size and equaled 30 pounds. Returns diminished with the introduction of coffee to this mushroom variety.

Coffee ground compost as a by product provides nitrogen and acidity to soil. Coffee grounds are easily sourced at coffee roasters and can be stored in a freezer prior to the sterilization and inoculation process. In other words, brewed coffee grounds are accessible for emerging farmers and growers. Spent grain from local brewers have limited pick up times and require additional steps for sterilization as compared to coffee grounds.

Spent brewer's grain in and around Bloomington is used for livestock feed in order to eliminate storage of the byproduct of production. Additionally, Brewers responded that the cost of transporting and dumping spent grain is zero when a consistent relationship with a farmer is established.

Key Personnel

Who is on our team?

Lauren McCalister (she/they) is a farmer-owner of Three Flock Farm in Ellettsville, IN, a community activist, and founder of the Plant Truck Project, a BIPOC-led initiative making plants, seeds, medicine and healthy food accessible for those historically denied land and food sovereignty due to discrimination based on race, class, sexual orientation, gender identity and citizenship status. Lauren is an incorporator of The People's Cooperative Market, the best anti-racist farmer's market in Monroe County. Lauren is a life long learner, weaver, meditation and asana instructor and birth worker.

AB Scherschel (they/them) is an eclectic horticulturalist residing in Bloomington, IN.

With multiple bachelor degrees (IU '17) (Biology, Anthropology & Contemporary Health Practices) and a certificate in web development, AB is always happy to share their wealth of knowledge and extensive library. AB is strongly motivated by the desire to bring sustainable nutrition and natural remedies to their community. In addition to being Project Coordinator with the Plant Truck Project, AB is an accomplished ceramicist. When they are not tending to the soil, teaching local youth about gardening, or volunteering at market, AB is inspired by multimedia art projects that contemplate assumptions.

Next Steps:

5

Community Engagement

Find other growers to share the mushroom compost and the method

Cooperation with Roasters

1

Create partnership local coffee shops interested in partnering with farmers and growers.

2

Conference or Training

Attend an online or in person training for mushroom harvesting and care.

3

Increased Yield

Take photos and document sterilization days and inoculant supplier.

4

Recover more byproduct

Reach secondary or passive coffee sites including offices and event spaces.

Thank you's and acknowledgements

Partnership and Cooperation are at the heart of research that is valid and reliable.

- *People's Cooperative Market*
- *Goldleaf Hydroponics*
- *Hopscotch Coffee*
- *Upland Brewery*
- *Mother Hubbard's Cupboard*
- *Banneker Community Center*
- *Bloomington Orchard*
- *Hilltop Gardens at Indiana University*
- *Alan Barker*

With sincere gratitude for my partner in cultivating mushrooms and life Brett Volpp.