Use of Brewer's Spent Grain for Production of High-Value Mushrooms

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Background and Introduction

- Brewer's Spent Grain is a solid waste generated in the brewing industry
- > 38 Million Tons BSG is produced worldwide annually
- Typically used as animal feed, composted, or sent to landfills, but contains valuable nutritional components
- Oyster Mushrooms (*Pleurotus ostreatus*) typically grown on sawdust & wheat bran

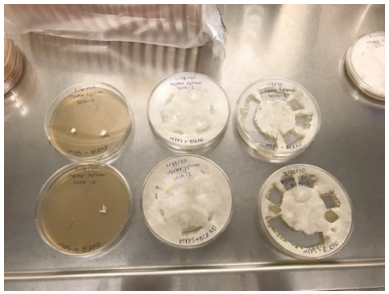
Objective

- Determine the efficiency of using BSG as a primary substrate for growing oyster mushrooms

Materials and Methods

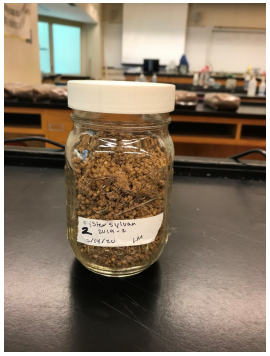
Isolation and Growth of *Pleurotus ostreatus* cultures

Cultures grown on MYPS from stored samples



Production of Grain Spawn by Inoculating Proso Millet

Grain colonized for 2 weeks at RT, shaking often



Inoculation of Sterilized Substrate Bags

Substrate colonized by mycelium for 2 weeks at RT

Bags Placed in Humidified Growth Chamber

Bags punctured and stored for 4 weeks in ~ 95% humidity tent

Sample Collection During Fruiting

Samples harvested ~3X per week over 4 weeks.

Materials and Methods

Experiment Details

- Each treatment contained 10 substrate bags
- Treatments were staggered 1-2 weeks apart over 4 months
- Cultures were inoculated and transferred to millet jars every 2 weeks
- Inoculated millet jars were mixed into substrate after 2 weeks of growth
- Fresh mushroom samples were weighed and dried for 2 days after harvest then weighed again

Substrates Tested

- Control Sawdust Substrate (3 replications)
- Three BSG Samples:
  - Smoked Pale Ale (2 reps)
  - Graham Cracker (2 reps)
  - Stilly Wheat Ale (2 reps)

Materials and Methods

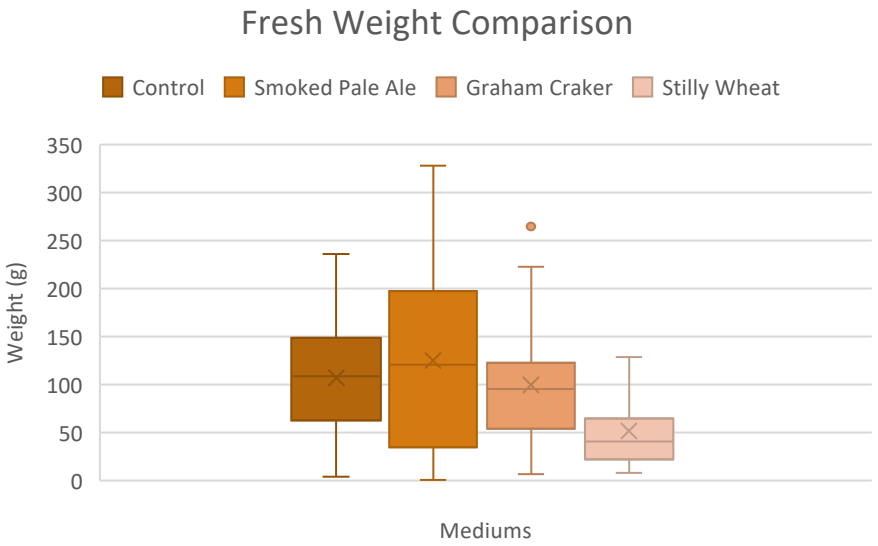
Substrate Recipe

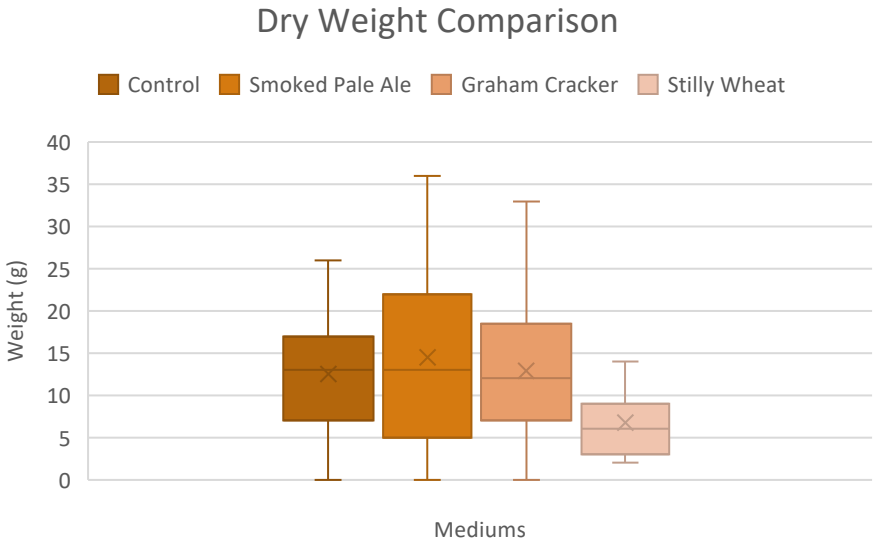
Ingredient	Amount
Hardwood Sawdust Pellets (or dry BSG)	204 g (330 mL)
Wheat Bran	63 g (105 mL)
$CaSO_4$ (gypsum)	4 g (5 mL)
$CaC0_3$ (lime)	4 g (5 mL)
Millet Bird Seed	12 g (20 mL)
Water	420 mL

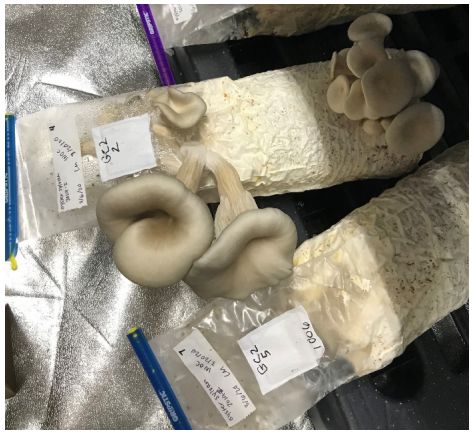
Millet Jar Recipe

Ingredient	Amount
Proso millet	½ cup (88 g)
Hardwood sawdust pellets	3-4 pellets
$CaSO_4$ (gypsum)	Added in small amounts
$CaC0_3$ (lime)	Added in small amounts
$CaSiO_3$ (wollastonite)	Added in small amounts
Water	420 mL

Results: Mushroom Growth

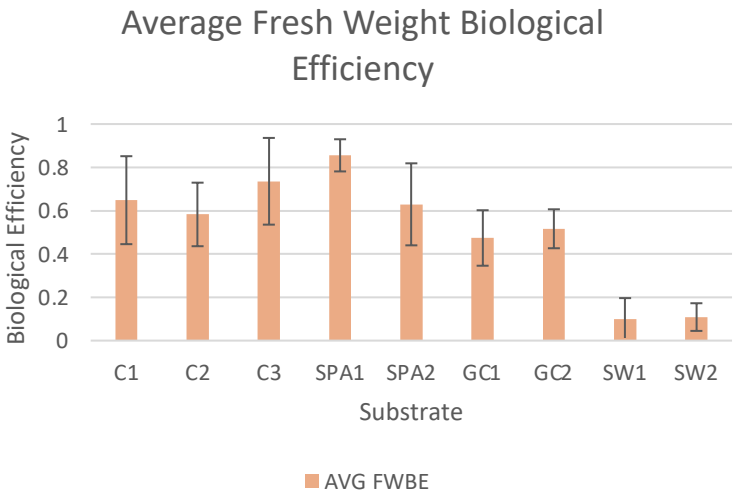


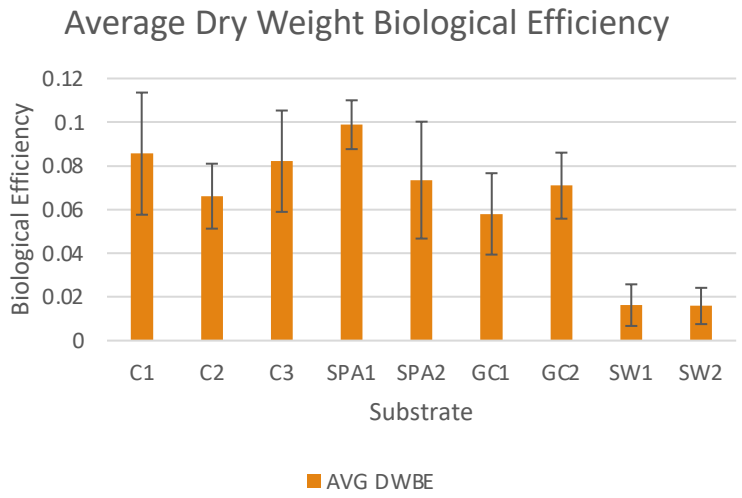




Results: Biological Efficiency

Biological Efficiency = mushroom biomass produced / initial substrate mass





Discussion & Conclusions

- All 3 BSG samples fruited and produced mushrooms
- Smoked Pale Ale BSG samples performed slightly better than the Control samples
- Graham Cracker BSG samples performed slightly worse than the Control samples
- Stilly Wheat BSG samples performed much worse than any other samples

- A number of factors could be better controlled during the experiment, including
  - Placement of cut
  - Standardization of harvest time
  - Amount of inoculated millet mixed into the substrate bag

Opportunities for Future Work

- Conduct tests with additional BSG samples
- Evaluate combinations of BSG with wheat bran, sawdust
- Evaluate potential inhibitory compounds in the spent grain
- Conduct research on uses for waste produced after cultivation

Implications

Brewer's spent grain is currently an underutilized resource. Creating value-added opportunities for use of the grain could help turn a waste liability into a future asset.

Acknowledgements

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