Developing Technology to Grow Mushrooms from Recycled Urban Waste and Food Scraps-Paper Waste (Vermicompost)

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I. Objectives

- Evaluate vermicompost as the casing layer in the production of white button mushrooms (*Agaricus bisporus*).
- Evaluate substrate formulas based on vermicompost, composted wood-overs, and other alternative materials in the production of oyster mushrooms (*Pleurotus spp.*).

II. Introduction and Background

Mushrooms production represents $45 to $50 million gross annual revenue for Santa Clara County. University of California Cooperative Extension Santa Clara County (UCCE-SCL) has been exploring alternative substrate materials for mushroom cultivation. In preliminary research UCCE-SCL determined that composted yard trimmings and composted wood-overs have high potential as substrate-base for the production of *Pleurotus pulmonarius* and *P. ostreatus* (oyster mushrooms), a lignicolous edible mushroom.

UCCE-SCL, while testing vermicompost technology, determined that vermicompost produced from food and paper waste has characteristics similar to those of peat moss. Peat moss is the main material used as casing layer in commercial production of white button mushroom, thought it is a costly, "non-native", and "non-renewable" input. Vermicompost has the advantage of being a material that growers can produce "on-farm", using own feedstock, and implementing either a mid-scale vermicomposting unit technology or a modular, self contained unit.

This project is a collaborative effort between UCCE-SCL, Royal Oaks Mushrooms, Countryside Mushrooms, BFI Organics Division, Z-Best/Zanker Road Landfill, CIWMB, City of San Jose Environmental Services Department, and County of Santa Clara Integrated Waste Management, and funded by CDFA-UC Specialty Crops.

III. Methods

This project consists of two independent experiments:
1) Evaluation of vermicompost as casing layer for white button mushroom (*Agaricus bisporus*) production.

On-site vermicompost production is carried out in a three windrow system in Royal Oaks Farm, Morgan Hill. The feedstock consists of mushroom stump waste produced in the farm, and shredded newspaper. *Eisenia foetida* introduced as the surface-dwelling earthworm in the windrows. Vermicompost is harvested every 2-3 months. Testing of vermicompost as casing material is conducted within the standard commercial production system of Royal Oaks farm. To test the vermicompost as casing, a bed (4'x8'x12") is top-dressed with a 2-inch layer (0.2 cubic yard or 80 kg) of pasteurized vermicompost amended with CAC, nine days after spawning. Standard production beds are cased with peat moss (control). Experimental beds are placed in a growing chamber together with standard beds, and receive the same management (watering, scratching, picking, etc.).

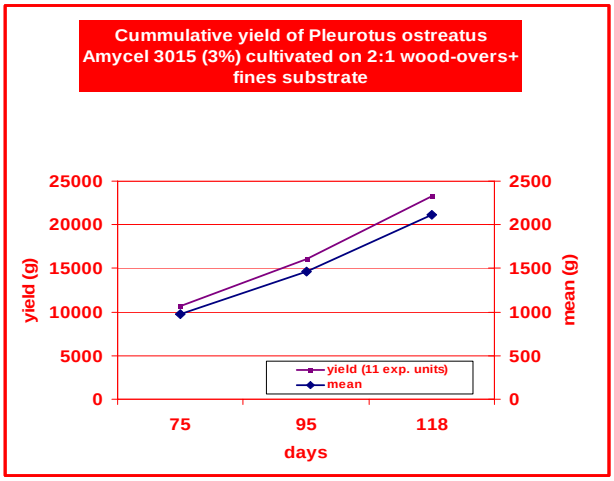
2. Evaluation of oyster mushroom (*Pleurotus* spp.) production on alternative substrates.
The production of oyster mushrooms (*P. ostreatus* and *P. pulmonarius*) is tested in substrate formulas based on vermicompost, composted wood-overs, and fine yard-trimmings compost in mixes at 2:1, 3:1 or 100%. The control being commercial substrate (straw-cotton husks mixture). All materials receive steam pasteurization, and spawning at 3, 5, or 8% (w/w fresh weight).

The growing chambers are two trailer rooms (7'x7'x8'), conditioned with shelving and automated misting system. Moisture and temperature are recorded weekly during the production cycle, as well as number of flushes, yield, size and weight of fruiting bodies.

IV. Partial Results

Composted waste substrate formulas produced oyster mushrooms of excellent quality. Wood-overs and fine yard trimming composts at a 2:1 ratio, and 3% spawning, resulted in 39% biological efficiency. Biological efficiency is calculated as yield divided by dry weight of substrate.
Composted green waste substrates were less susceptible to contamination during production cycle than substrates based on mixtures of straw, cotton husks, and grains (control).
Vermicompost has great potential as casing material, and further testing needs to be completed.

Yield of *Pleurotus ostreatus* in composted waste substrates				
Treatment	**Experimental Units**	**Mean g**	**SD**	**Biological efficiency %**
2:1 wood-overs+fines	**11**	**2116**	**512**	**39**
2:1 wood-overs+ vermicompost	**5**	**1255**	**216**	**23**
100% wood-overs	**13**	**985**	**248**	**18**



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