Mushrooms for Hobby & Profit

Steve Gabriel
Extension agroforestry Specialist

sfg53@cornell.edu
MUSHROOM CULTIVATION

This website hosts information on the agroforestry practice of mushroom cultivation. Research at Cornell over the last decade has focused on the cultivation of four species: shiitake, lions mane, oyster, and stropharia.
<table>
<thead>
<tr>
<th>Best Management Practices for Log-Based Shiitake Cultivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>This complete guide walks readers through all the details for starting a successful log-based shiitake operation on their farm. Research combined with farmer advice makes this an invaluable resource for growers.</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>VIDEOS: Shiitake Mushroom Cultivation</th>
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<tr>
<td>This series of short videos produced by the eXtension Forest Farming group features Dr. Kenneth Mudge of Cornell describing in detail many of the important considerations for growing shiitake mushrooms on logs.</td>
</tr>
</tbody>
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<tr>
<th>Totem Inoculation Factsheet</th>
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<tbody>
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<td>The “totem” method is recommended for log cultivation of lions mane and oyster mushrooms. It involves cutting stumps or logs into sections and inoculating with spawn between each layer. This factsheet provides step-by-step instructions.</td>
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www.youtube.com/user/exforestfarming
## Types of Spore Delivery

<table>
<thead>
<tr>
<th>Gilled</th>
<th>Toothed</th>
<th>Polypore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oyster</td>
<td>Lions Mane</td>
<td>Chicken of the Woods</td>
</tr>
<tr>
<td>Shiitake</td>
<td></td>
<td>Maitake</td>
</tr>
<tr>
<td>Stropharia</td>
<td></td>
<td>Turkey Tail</td>
</tr>
</tbody>
</table>
Spore Print

- Aluminum Foil
- Mushroom
- Cover

Time: 2 – 24 hours
If In Doubt, play It Safe

Shiitake

White Spore print

Galerina spp.

Brown Spore print

Michael Kuo
Domesticating A Fungus (Lion’s Mane)
Saprophytes eat DEAD stuff.
Big Picture: Incentive to manage
<table>
<thead>
<tr>
<th>Best Tree Species</th>
<th>Shiitake</th>
<th>Oyster</th>
<th>Lions Mane</th>
<th>Stropharia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oak</td>
<td>Poplar</td>
<td>Beech</td>
<td>Mixed</td>
</tr>
<tr>
<td></td>
<td>Sugar</td>
<td>Tulip</td>
<td>Sugar</td>
<td>hardwood</td>
</tr>
<tr>
<td></td>
<td>Maple</td>
<td>Poplar</td>
<td>Maple</td>
<td>chips</td>
</tr>
<tr>
<td></td>
<td>Beech</td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Hop</td>
<td></td>
<td></td>
<td>hardwood</td>
</tr>
<tr>
<td></td>
<td>Hornbeam</td>
<td></td>
<td></td>
<td>sawdust</td>
</tr>
<tr>
<td></td>
<td>Ironwood</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Birch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preferred Method</td>
<td>Bolts</td>
<td>Totems</td>
<td>Totems</td>
<td>Beds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(straw)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Cultivation of Forest Mushrooms
“Bolt” Inoculation: Shiitake
Shiitake

*Lentinula edodes*
Why Log-grown Shiitake?

$12 – 16/lb
Health & Nutrition (Shiitake)

• Shown to significantly lower cholesterol levels

• Contains lentinan, which blocks cancer growth

• Supports Immune system balancing

• Full of Vitamins and Enzymes
  – B2, B5, B6, maganese, phosphorus, potassium, selenium, copper, zinc, Vitamin D, 30+ enzymes
- Fresh Logs (less than 3 months old)
- 4 – 8” in diameter
- 36 – 40 ‘ long
- Oak, Sugar Maple, Beech, Hornbeam
Step 1: Drill Holes

BIT SIZE:
7/16” or 12mm (Sawdust)
5/16” (Dowels)

Angle Grinder

Corded Drill
Step 2: Insert Spawn (Sawdust)
Step 2: Insert Spawn (Dowels)
Step 3: Wax
Step 4: Wait 6 months (Spawn Run)
Characteristics of a Good Laying Yard

- Shade
- Slope
- Water
- Access
Stacking Logs

Crib or Rick Stack

...during spawn run and rest periods
Step 5: Soak
Stacking Logs

A-frame stack
...during fruiting!
Step 6: Harvest
Sell Fresh Mushrooms

$10 – 12
WHOLESALE

$12 – 16/lb
RETAIL
Step 7: Rest (6 - 8 weeks)
Three forces a year possible...
How many logs?

- One Meal = 7 logs, soak one/week (1/4 – ½ lb)
  - Family = 28 logs, soak 4/week (about 1 lb)
  - Small Biz = 350 logs, soak 50/week (10 lbs)
  - Enterprise = 1,000 logs, soak 140/week (40 lbs)
VALUE ADDED PRODUCTS = ZERO CROP LOSS
Production in NY

• **46** growers commercially producing or plan to begin selling shiitake mushrooms in 2016. These growers cultivate **17,435 logs**, which can yield an estimated **69,740 pounds** of production over three years ($836,880 gross income potential)

• In 2015, **23** actually sold mushrooms for a combined gross income of **$180,110** or **$7,830** per grower.

• **60%** of growers plan to expand production in 2016.
Over four seasons, a **1,000 log operation:**

**COSTS:** $4,740 to establish and manage (including labor at $12/hr rate).

**YIELDS:** 1,040 pounds produced by year three, which sold at the average price of $12/lb creates $12,480 of income.

This rate can be perpetually sustained from year four onward and would qualify a producer for **agricultural exemption in NY.**
2015 rate for woodland: $384

FOR IMMEDIATE RELEASE

September 30, 2015

ITHACA, NY – The Cornell Small Farms Program announces a new development in the emerging log-grown mushroom industry; New York State has officially designated “actively managed log-grown woodland mushrooms” within the meaning of the term “crops, livestock and livestock products,” for purposes of provisions of law relating to agricultural districts.

The bill, introduced by Bill Magee in the Assembly and sponsored by Senator Patricia Ritchie in the Senate, was signed by Governor Cuomo in September and means that farmers will be able to designate lands used for cultivation as agricultural, leading to tax breaks and other benefits. The provision further clarifies that mushrooms are seen as a significant agricultural crop and designates the intentional farming of mushrooms from wild harvesting.
Totem Inoculation: Oyster & Lions Mane
Oyster

*Pleurotus ostreatus*
Lion’s Mane
(monkey's head, bear's head, etc.)

Hericium erinaceous, H. americanum
Totem Method

- Fresh Logs (less than 3 months old)
- 10 – 14” in diameter
- 2‘ long (cut into 1’ sections)
- Beech, Aspen, Cottonwood, ????
Golden Oyster

Grossed $300 over 5 years on one Tulip Poplar (Liriodendron tulipifera) stump
Bed Inoculation:
Stropharia
Wine Cap Stropharia
Stropharia-rugoso-annulata
Layering Stropharia

WOODCHIPS/STRAW

SPAWN

SAWDUST

BARE GROUND
1. Bare Ground
4’ x 4’ or 16 ft²
2. Sawdust/Shavings (about 1”)
3. Spawn
(1 bag)
3. Spawn
(1 bag)
4. Straw or Woodchips
- Not really old
- 2 – 4”
Oyster on Treated Media

1. Dry: shredded straw, grass clippings, newspaper, dried brush, sawdust, chips etc
Oyster on Treated Media

1. Dry: shredded straw, grass clippings, newspaper, dried brush, sawdust, chips etc

2. “Wet”: coffee grounds, spend brewing grain, etc
Oyster on Treated Media

1. Dry: shredded straw, grass clippings, newspaper, dried brush, sawdust, chips etc

2. “Wet”: coffee grounds, spend brewing grain, etc

3. Other: cat litter, wood pellets, almost anything!
• *If temps too cool:* will hibernate or die if tropical (pink oyster)

• *Too hot* and they can cook themselves to death, so err on the cooler side

  – account for 10-15 degrees increase in thermogenesis (heat generated by itself internally)

<table>
<thead>
<tr>
<th></th>
<th>White</th>
<th>Pink</th>
<th>Golden</th>
<th>Warm Blue</th>
<th>Cold Blue</th>
<th>Phoenix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>55-70F</td>
<td>75-90F</td>
<td>65-80F</td>
<td>65-80F</td>
<td>40-75F</td>
<td>75-90F</td>
</tr>
</tbody>
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Home Scale

- 15 psi (121 degrees) for 1 hour
- Small amounts of material
- Mostly for grain, sawdust, and thus propagation material at this scale
Farm Scale

http://mushroomersclub.blogspot.com
-- Heat water to 180 degrees

-- Put straw in, seal

-- Soak for two hours
The waiting game: Spawn Run
-- Reusable

-- Not translucent unless in a darker space

-- Able to keep oxygen levels low, then increase

-- Trial and error!
Harvesting Mushrooms
Questions?

Steve Gabriel
sfg53@cornell.edu

www.cornellmushrooms.org

Wellspring Forest Farm
www.WellspringForestFarm.com