

# Non-Timber Forest Product (NTFP) Highlight: Shiitake Mushrooms



Wild shiitake mushrooms (image credit: adobe)

Other common names: Sawtooth Oak Mushroom, Black Forest Mushroom, Black Mushroom, Golden Oak Mushroom, or Oak-wood Mushroom — Latin Name: *Lentinula edodes* — Family: Marasmiaceae (basidiomycete fungi that have white spores)



College of Agriculture  
Cooperative Extension

**Dr. Sougata Bardhan\***  
Assistant Professor of  
Natural Resource  
Management  
306A Foster Hall  
(573) 681-5249  
BardhanS@LincolnU.edu  
missouriforest.com  
\*corresponding author

**Raelin Kronenberg**  
Research Specialist  
Agroforestry  
324 Foster Hall  
(573) 681-5111  
KronenbergR@lincolnu.edu

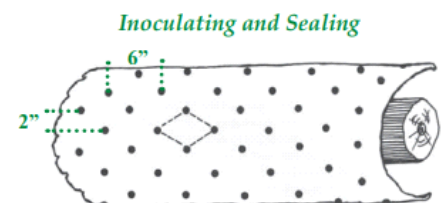
LUCE #23-10(11)-FS003

## Range:

Shiitake mushrooms are native to countries throughout East Asia, but they are primarily found in Japan and China. Cultivars have been successfully introduced throughout the United States.

## Description:

Shiitake mushrooms produce a medium-sized, brown fruiting body. Due to shiitake's long history of cultivation, many different strains have been produced. These vary in their size, texture, and ornamentation. They also differ in their length of spawn-run (the time it takes for the mycelium to expand throughout the growing substrate), and also their response to cold-water forced fruiting and different fruiting temperatures. These differences allow a producer to select several strains to produce mushrooms throughout each seasonal temperature change. Additionally, there are strains suitable for either indoor production or outdoor systems.



Drill holes 1" deep in a diamond pattern, separated by 6" along rows 2" apart. If inoculation holes are spaced too far apart, spawn run will be incomplete and contaminating fungi will gain a foothold. (Image courtesy Mary Ellen Kozak and Joe Krawczyk, "Growing Shiitake Mushrooms in a Continental Climate.")

## Inoculation:

The ideal time to cut logs is during the mid-to-late winter for early spring inoculation. Logs should be protected from wind and sun to maintain an internal moisture content above 35 percent. Oak and maple logs are the best for shiitake production, but other dense hardwoods can be used. Log size is best kept in the three-to-five-inch diameter range, which helps keep the size manageable for stacking. It also provides the best rate of mushroom production per unit of log weight. To inoculate logs, drill holes approximately one inch deep and six inches apart.

Stagger rows so that the holes are drilled in a diamond pattern two inches apart (see diagram). Drilled holes should immediately be filled with spawn and covered with food-grade hot wax to seal out potential contaminants and protect spawn. You can purchase shiitake spawn as either plugs or in sawdust form. Sawdust spawn inoculation generally provides larger flushes and is best done using a special tool to insert loose spawn into the log. Plugs are often more expensive but can easily be tapped into holes with a mallet.

Inoculated logs should then be stacked loosely in a configuration that maintains protection from the sun and wind. Never lay logs directly on the ground to avoid contamination. Instead, elevate logs four to six inches off the soil using rails, other un-inoculated logs, or pallets.



*Fruiting shiitake logs - Photo by Stephen Hight, USDA*

## Pests:

Properly inoculated shiitake logs have few pests. Proper spacing of inoculation points, prompt filling and sealing of spawn substrate, and log management keep unwanted spores and insects out of the production logs. Despite these best practices, over time logs become contaminated with other naturally occurring fungi and will need to be removed from production. Animals, including mice and slugs, also enjoy shiitake and may damage some mushrooms. The best practice is to inoculate enough logs to account for some loss to wildlife.

## Harvest:

Mushrooms develop over several days after forced fruiting. Mushrooms should be harvested when their caps are about 70 to 90 percent open/expanded with the cap margin still slightly rolled in. Harvesting at this stage will maximize mushroom freshness and allow for longer storage. Harvest mushrooms by twisting and pulling the stem off the log. Cutting the stem will shorten the self-life as the mushroom dries out more quickly. Harvested mushrooms should be taken to the market as soon as possible as their quality begins to slowly decline after harvesting.

## Conservation Status:

Not threatened.

## Market potential:

Shiitake has shown significant market potential and many producers are already successfully running forest-grown shiitake farming operations. Interest in fresh, locally grown mushrooms is increasing among chefs and household consumers. It is common to achieve a price of \$10 to \$15 per pound for fresh, high-quality shiitake sold to a restaurant. In addition to fresh mushroom sales, value-added products such as dried shiitake, seasoning mixes, and soup mixes provide additional opportunities for producers to generate income. It is important to note that developing a successful market presence requires consumer education and connection.

## References:

- Bruhn, J., Hall, M. 2008. Growing Shiitake Mushrooms in an Agroforestry Practice. Agroforestry in Action. [www.centerforagroforestry.org](http://www.centerforagroforestry.org)
- Jameson, M. 2016. Grow Shiitake Mushrooms in Your Backyard [Internet]. University of Florida Extension; [cited 2022 Oct 20]. Available from [nwdistrict.ifas.ufl.edu](http://nwdistrict.ifas.ufl.edu)