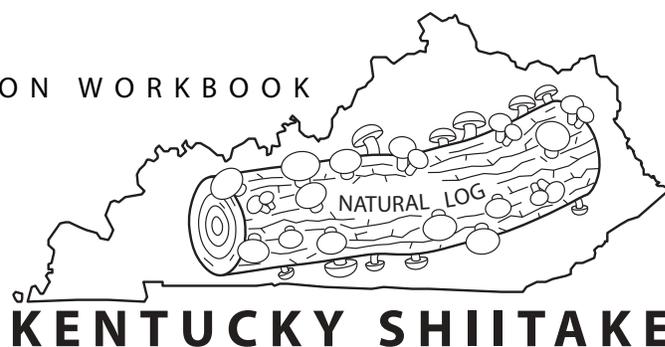


KENTUCKY SHIITAKE PRODUCTION WORKBOOK

Spawn Selection

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Shiitake mushrooms are like any other plant crop—they must be started from “seed.” For mushrooms, this process begins when the mushroom’s spores (normally located in the cap on the underside between the gills) are mixed with nutrients and a cellulose source, usually hardwood sawdust. This mixing starts the growth process and results in a material called *spawn*. Generally speaking, most shiitake mushrooms are produced with one of two kinds of spawn—dowel or sawdust. At least one other type, pressed sawdust thimbles, is available from some suppliers.

Types

Sawdust spawn is a bag of sawdust with a small amount of grain added (Figure 1). The mushroom spores are added to this mixture and incubated so that they begin to grow and produce the shiitake *mycelium*, which is the actual organism—the mushrooms are merely its fruit. After incubation, the whole bag of sawdust is active spawn, and small pieces of it will begin mushroom growth in the logs you inoculate. Sawdust spawn can be inoculated into the drill holes by hand or with an inoculation tool. If you inoculate directly by hand, wear surgical rubber gloves to eliminate contamination of the spawn from your hands as well as to protect your hands from lots of exposure to the spawn. There are at least two types of a specially designed inoculation tool that can be used with sawdust spawn (Figures 2a and 2b). These tools have a single spring-load mechanism, which you use to release the sawdust into the drill holes with your thumb or palm. If you intend to inoculate many logs, you will probably find the palm model easier to use.

Figure 1.



Figure 2a.

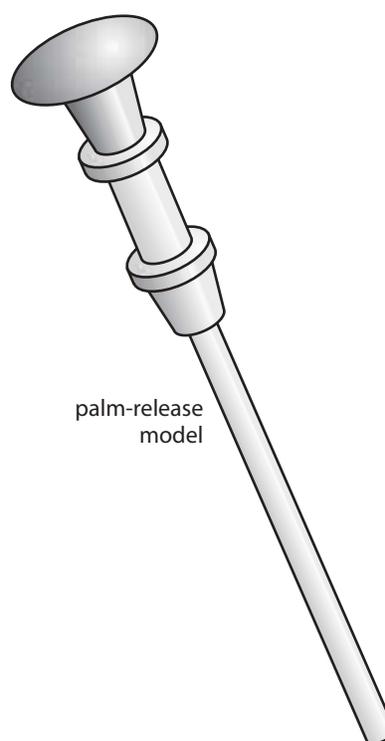
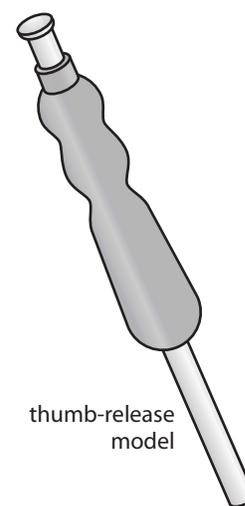


Figure 2b.



Dowel spawn is exactly what it sounds like—small pieces of wooden dowel that have been inoculated with shiitake spores and have begun to grow the shiitake *mycelium* (Figure 3). The dowels are made of hardwood and are easy to use. Just hammer them into the drill holes with a standard hammer.

People who do a lot of shiitake production on logs often prefer the sawdust spawn to dowel spawn, for several reasons:

- A standard unit of sawdust spawn usually will inoculate more logs than will a standard unit of dowel spawn.
- Sawdust spawn is cheaper to use per log inoculated.
- The surface area of sawdust spawn, because it is made up of small particles, is greater than that of a dowel; therefore, the spawn's contact with the raw surface of the drilled hole is also greater.
- Using sawdust spawn seems to result in a faster and more complete spawn run, probably in part because of a greater active surface area than dowel spawn.

Figure 3.

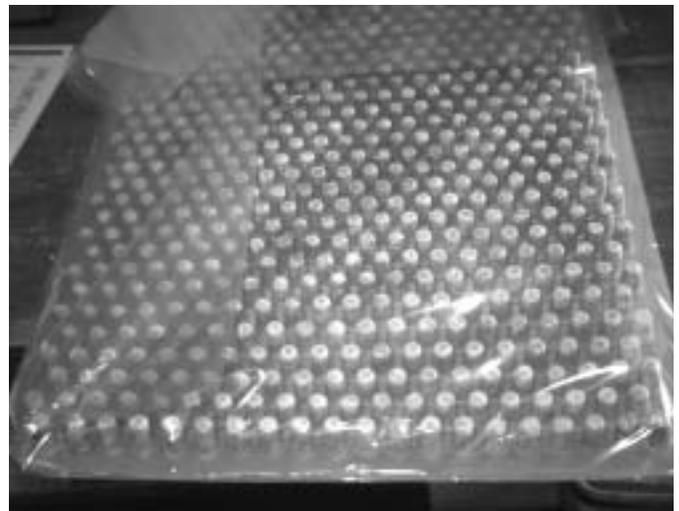


The most recent type of shiitake spawn available is the pressed sawdust thimble (Figure 4). This type of spawn comes in a 14-inch-by-18-inch plastic sheet holding approximately 540 thimbles. Each thimble has a lower part of pressed sawdust, topped by a cap of Styrofoam. Since the thimble is pressed sawdust, it has the surface area advantage similar to sawdust spawn. Pressed sawdust thimbles are also easy to handle and are designed to be time-saving; the attached plug seals the inoculation site, eliminating the need for wax and therefore eliminating the time needed for the waxing step of the inoculation process. However, sheets of pressed sawdust thimble have these disadvantages:

- They are more expensive than the units of other types of spawn.
- They are more awkward to store.
- They dry out quickly when not stored properly.
- They need to be used as soon as they arrive.

To date, there is probably not enough experience with this type of spawn to determine whether it is truly worth the extra cost. For a small shiitake operation—such as one solely for personal use—the convenience of this type may justify the cost.

Figure 4.



When ordering spawn from a shiitake supplier, plan for a minimum of 30 to 40 drill holes per log, depending on log diameter, and calculate how much spawn you will need to inoculate all your logs. The suppliers listed under resources in Cooperative Extension publication *Shiitake Production on Logs: Step by Step in Pictures* (FOR-77) are user-friendly and will help you figure out what quantity you need. It is advisable to use spawn from a reliable source, and the companies listed in that publication are

well-established businesses. Also, those suppliers will provide you with varieties of spawn that have come from the original Japanese strains and have been kept pure and viable by expert mushroom laboratories. It is possible to save spores from your own mushrooms and to try to make your own spawn, but if you do that, you will not know exactly what the genetic makeup or the productivity of the resulting mushrooms will be. Your own attempts may or may not be as successful as those you could obtain using commercially available spawn. It is recommended that you rely on the experts for your spawn, at least in the beginning years of your shiitake mushroom production.

Varieties

Mushroom supply catalogs describe several varieties of spawn. If you are just starting your operation, you may want to experiment with:

- More than one variety.
- The same variety from different suppliers (e.g., wide-range strain: Mushroompeople 510; Field & Forest Products West Wind).
- More than one variety *and* what sounds like the same variety from different suppliers.

All-weather (wide-range) strains will fruit when temperature and humidity conditions are favorable. These strains take from 6 to 12 months for the spawn run to complete. Early spring inoculation (February/March) may result in some mushroom production the same fall; midfall inoculation (October/November) may not produce mushrooms until the following fall or the next spring (18 months). After completion of a 12-month incubation period and the beginning of forced production, you can expect logs to continue to fruit for three or four years. How long they produce depends on the size of the log, type of spawn, climate, management, etc.

Warm-weather strains will continue to produce when the weather is warmer than the ideal temperature for shiitake production (higher than the mid- to high 70s F). These strains take about the same time for complete incubation as the all-weather strains and will also produce for three or four years after production begins with the same conditions as those listed above.

Cold-weather strains take considerably longer to incubate, from 16 to 20 months. These strains require at least one cold period before they are ready to be soaked and put into production. Once the spawn run is com-

plete and the logs begin to fruit, the logs can be expected to produce mushrooms for four or more years. Optimal temperatures for production are 45° to 60°F.

Generally speaking, the all-weather, or wide-range, strains are the reliable workhorses among shiitake spawn varieties. However, if you are considering year-round production, it may be wise to include 10 percent or more of your logs in warm-season and 10 percent in cold-season varieties. Make certain you label your logs when inoculating them so that you know which strain of spawn was used and what year the logs were started. Use aluminum tags or labels made from aluminum cans so they will last as long as the logs.

Labels should include abbreviations for:

- Month and year inoculated (such as 2/02 for February 2002).
- Type and variety of spawn used (such as S-MP510 for sawdust spawn—Mushroompeople 510, D-FFWW for dowel spawn—Field & Forest Products West Wind).
- Species of wood (such as WO for white oak, RM for red maple, SG for sweetgum).

If you keep batches of logs together throughout the production cycle and the lifetime of the logs, you can label the batches by colored flags or tags to represent production information instead of labeling each log individually.

It is also important to keep good records on how much production you are getting from different species of wood and different varieties of spawn. Record both total number of pounds per log per flush as well as number of mushrooms per log per flush.

During the growing season from mid- to late April until mid- to late October, it should be possible to force logs that have been inoculated with wide-range strains at least three times (on a 9-week production cycle for each log). Warm-season strains and cold-season strains may only respond well to two flushes in their respective seasons.

Cold-weather strains should be productive until the very coldest months and perhaps earlier in the spring than the wide-range types. Warm-weather strains should be more successfully productive in midsummer than perhaps the wide-range strains will be.

A mixture of the strains should optimize your shiitake production throughout the productive months of the year. Reliable production will improve your options for reliable marketing of your mushrooms.

Grilled Shiitake

1 pound shiitake mushroom caps

Marinade

To make the marinade, combine:

1 cup water (*you can replace half the water with chicken stock if desired*)

3 cloves of garlic, sliced

2 teaspoons sesame oil

1/2 cup other vegetable oil

1/2 teaspoon salt

1/2 cup red wine vinegar

1/2 cup soy sauce

1/4 cup oyster sauce

1 tablespoon brown sugar

1. Soak caps for 30 minutes in marinade, turning frequently.
2. Grill or broil caps about 3 minutes on each side, or until the cap rims become a crispy brown.
3. Serve immediately, alone or over any grilled meats or vegetables. Grilled shiitake also makes an excellent companion to marinated grilled tofu on skewers.

—from the Field & Forest Products Inc. catalog

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