

Oyster Mushroom Cultivation

Part II. Oyster Mushrooms

Chapter 7

Cultivation Modes

LOG CULTIVATION

In the Temperate Regions

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Depending on the length of logs, there are two basic methods for log cultivation of oyster mushrooms. In the long log method, growers cut trees into one-meter long sections and drill a series of inoculation holes in the logs into which spawn is inoculated. This technique is somewhat similar to traditional shiitake log cultivation. In the short log method, growers cut the tree trunks into pieces 20cm in length and inoculate those sections. Though the short log method is more labor intensive, it shows a relatively higher production than long log cultivation.

For that reason, we will narrow down the topic and discuss only the short log method in this article.

Log Preparation

Species

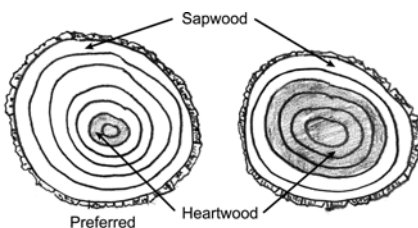


Figure 1. Sapwood/heartwood ratio in wood



Figure 2. Tree felling in winter



Figure 3. Fallen tree is cut to size

One can see wild oyster mushrooms after a rainfall on the dead broad-leaf trees (hardwoods) such as poplars. This indicates that those tree species are suitable for oyster mushroom cultivation. On the other hand, most needle-leaf trees (softwoods) contain phenolic resin compounds and show low productivity when used for oyster mushroom cultivation. Sawdust from conifers can be used after the phenolic compounds are gone. Hardwoods such as poplar, willow, beech, elm and alder are the most commonly used tree species. Unlike shiitakes, oyster mushrooms do not grow well on oak tree logs.

Since mushrooms feed primarily on sapwood, any tree trunks selected for inoculation should have a large sapwood area. The lighter or outermost wood of a log is the sapwood and the darker or inner wood is the heartwood. A log with a small amount of sapwood will probably produce mushrooms for fewer years than another log with a greater amount of sapwood.

Tree felling

Logs should be felled during the dormant season when the bark adheres tightly and the tree trunks are full of sap and nutrients. A bit later the season, these nutrients are likely to have been consumed during the germination of the buds.

When recently cut logs are used, living wood cells interfere with mycelial growth. When too old logs are used, older and drier logs with less water content also retard mycelial growth. In order to prevent water loss and contamination, felled trees should remain uncut in the shade for several days before inoculation. In order to avoid contamination from the ground, cut trees should not contact the ground during storage. Experienced growers cut their logs into 20cm long pieces a few days before inoculation to allow the logs to achieve the proper log moisture at inoculation. As fungi secrete digestive enzymes and absorb dissolved nutrition, mycelial growth requires the proper amount of water content (38-42%) in logs for the smooth transfer of enzymes and nutrition. In practice, when the logs have a coin-thick crack in the cut section, one can assume that the logs have the proper water content. Logs of 15-20cm diameter are an ideal size for handling, therefore efficient.

Spawn Preparation

Sawdust spawn is the usual inoculation medium for oyster mushroom log cultivation. Growers employ low-temperature strains that form bunches easily and produce high yields. High-temperature strains make fast flushes and produce high yield, but are not fit for the production of high quality fruitbodies.

It takes at least 1-2 months for spawn suppliers to make spawn from a mother culture after they receive an order. Therefore, growers should order their spawn from a reliable dealer sufficiently ahead of schedule before the spawning. Growers should give the spawn dealer their desired shipping date so their spawn will be as fresh as possible.

Inoculation

Inoculation season begins when the temperature outside is close to the best growing temperature for mycelia. The mycelia of oyster mushroom are viable at a wide temperature range, and can survive from 5 to 35°C, but they grow best at 25-27°C. Beyond the proper temperature range, the mycelia lose vitality and may die. Therefore, the right time for inoculation is when the lowest temperature is 5°C and the highest is 20°C in spring.

Method

Growers can either inoculate with original spawn only, or original spawn with supplements that increase the quantity of total spawn. With the supplement, growers can use less original spawn, but when it is hot, contamination may increase with poor management because the supplement usually contains much nutrients. To begin with, growers should sort the logs by width. Next, they should make the inoculum by mixing 20-50% spawn with the supplement, which is composed of sawdust and rice bran at a ratio of 4:1 on a volume basis with a moisture content of 60-65%. Too much

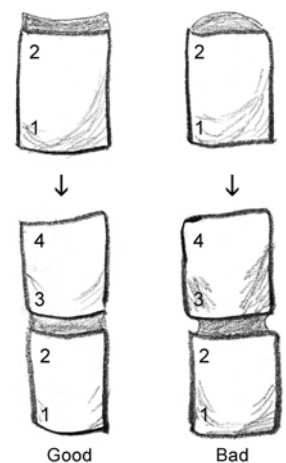


Figure 4. Inoculation of the logs

supplement can increase contamination. Next, they should apply the inoculum 5-10mm thick to the log ends with more on the margin of each log (Fig. 4). And last, they should stack five or six logs on top of another like a sandwich. Stacking logs in the order of cutting minimizes the contamination risk by reducing the exposure of spawn to contaminants (Fig. 5). In order to prevent damage by respiration heat, growers should arrange the stacked logs in three or four rows and make walking aisles between the rows.

Incubation

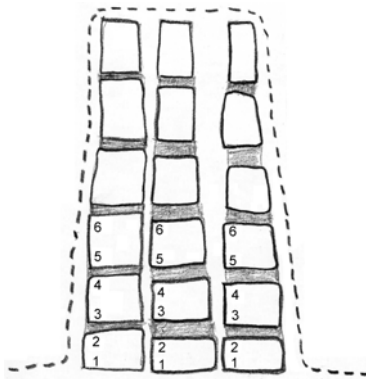


Figure 5. Incubation of the inoculated logs

Inoculated logs should be covered with plastic and the mushroom mycelia allowed to colonize the logs in a shady moist area. When it is dry, growers should water the surrounding ground. It takes 3-4 days for mycelia to recover and begin regrowth. Early in the incubation, growers should keep the room temperature as steady as possible, somewhere between 15 and 20°C being best. A wide variation in temperature will result in a high risk of fungal infestation. When growers notice green mold, they should apply fungicides such as Benlate to the spot. With summer comes, growers may need to use appropriate temperature controls to keep the area around 20°C.

Burying

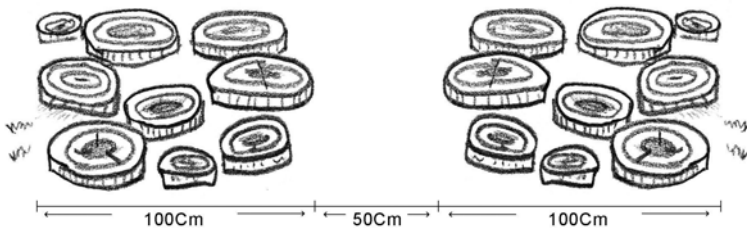


Figure 6. Burying after incubation. The embedded logs will be covered with shade cloth

During the summer, the well-colonized logs will adhere to each other. At this point they are ready to fruit. Growers should move them to the desired place for mushroom fruiting. Growers may grow mushrooms either by standing the logs or by burying the logs. Burying is recommended because sand can prevent drying. Growers should separate each log unit and bury them all vertically in the mound with the inoculated sides up and with about 10-20% of the length above ground level. Each log should be spaced 10-15cm apart on a 1m wide ridge. Growers should direct free water to a 50cm furrow for good drainage (Fig. 6). After burying, growers pitch a tent over the buried logs to prevent direct exposure to the sun and moisture loss. The tent must not disturb watering or harvesting.

Pinning Induction

During mid-autumn when the temperature goes down below 20°C, it is time to induce pinning. The usual pinning stimulation methods for mushroom are from light, cold-shock, soaking or physical impact. About ten days before pinning, growers should apply enough water to promote fruitbody pinning. Fruitbodies appear mainly on the cambium.

Fruiting and Harvesting

During fruiting, Growers need to water enough to keep the logs and soil moist. They can expect to see mushrooms form on the top surface first around the boundary between bark and wood. They should then remove the covering sheet from the logs and increase irrigation. Growers should stop irrigation 1-2 days before harvest. Fruiting takes nearly 5-6 days. When is the right harvest time? Growers should pick mushrooms when the caps reach 5cm in diameter. They must reap the pleasure of harvest along with clusters of fresh mushrooms from the logs (Fig. 7).



Figure 7. Mature fruitbodies on logs

When they finish the first cycle harvest, they should clean the mushroom remains and maintain the logs in a moist condition. Fifteen days later or so, they may see a second flush. If the outside temperatures go down in winter, they should cover the logs with a plastic sheet. When it gets warm again, they can harvest again.