

Growing Shiitake on Underutilized Hardwoods

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Shiitake, a gourmet mushroom, is grown mainly on Oregon white oak sawdust in the Pacific Northwest. Farming shiitake is a new industry, employing approximately 100 people in western Oregon, primarily in small, timber-dependent towns. Outside the United States, most shiitake is grown on hardwood logs using traditional methods. In the United States, however, most shiitake grows on sawdust enclosed in plastic bags. Continued development of the industry requires a steady and increasing supply of hardwood. Consequently, we tried replacing oak sawdust with whole-log chips of Oregon white oak, tanoak, and bigleaf maple as alternative substrates for shiitake. Our study was intended to expand the supply of raw material by increasing the choice of hardwood species and using whole-log chips instead of headsaw sawdust.

Our study had three parts. First, we located a supply of suitable hardwood chips. Second, we used the chips in pilot-scale trials to determine how well they grew mushrooms. Finally, we did an economic analysis to determine whether commercial growers could afford to use whole-log chips.

In seeking sources of chips we considered two factors: (1) chip quality (species, particle size, and cleanliness) and (2) chip availability (local sources, quantities, and price). Although we needed relatively small amounts for our experiments, we looked for sources that could supply truckloads of chips. To minimize shipping cost, we looked only in western Oregon. Finally, we looked for prices at or below pulp-chip prices.

We located several commercial producers of whole-log chips in the Willamette Valley and southern Oregon who wanted to expand or diversify their markets for hardwood chips and could supply our species. All were able to resize large chips to our specifications and supply it in chip-truck amounts.

Typical commercial hardwood chips are too coarse for mushroom farm mixers, baggers, and bags. Therefore, we needed to grind whole-log chips to our specifications. After testing several unsatisfactory models of small to mid-sized chipper-grinders, we found a supplier of a satisfactory, light industrial, 20 HP chipper-shredder made by Crary Bear Cat, West Fargo, ND.

During our pilot-scale trials we tested three commercial shiitake strains: CS-41, CS-53, and CS-287. Each strain responds differently to substrate and growing conditions.

We tested these strains on six experimental chip media and two sawdust media (white oak and maple). The six media

consisted of two from each of three hardwood species: Oregon white oak, bigleaf maple, and tanoak. For each species, one medium was coarse chip and one fine chip. In each case, the medium contained only one hardwood species, and the chips contained fines.

We incubated the bags for 94 days to allow the fungus to grow through the medium. After incubation, we removed medium and fungus from their protective bag. By then, the fungus had converted the medium into a solid block. To induce each block to produce mushrooms, the block was placed in a fruiting chamber with conditions favorable for mushroom production.

Mushroom production occurs as successive fruitings (flushes) from each block. Following the first flush, the blocks were soaked in tap water, then treated as described above to induce successive flushes.

As the mushrooms developed, they were harvested and the fresh weight and grade produced by each block were recorded. In ideal commercial production, most mushroom production occurs in the first two or three flushes. We harvested mushrooms through four flushes.

All three hardwoods and both sizes of chips produced mushrooms. Yields were generally higher on fine chips than on either coarse chips or headsaw sawdust. Yields were also higher on tanoak than on Oregon white oak or bigleaf maple.

Our pilot-scale trials established that shiitake can be grown on whole-log chips of the hardwood species tested. All three hardwood species are currently available as whole-log chips from commercial sources in Oregon. Actual use of these species by shiitake farmers, however, depends also on economic factors. This involves three basic questions:

- Can the individual shiitake farmer afford to use whole-log chips of these species? The short answer is “Probably.”
- Is the market for chips to supply shiitake farms lucrative enough to interest commercial chip suppliers? The issues are price, which is market dependent, and volume (presently 4,000 to 6,000 tons per year). Several suppliers have shown interest in expanding their production of hardwood chips for use in shiitake farming.
- Will the use of whole-log hardwood chips for shiitake farming create or sustain employment in western Oregon? Probably. Broadening the base of available raw materials should help the shiitake farmer, and increasing the market for chips from underutilized hardwood species should benefit the chip supplier.