

ISSN Print: 2664-844X
ISSN Online: 2664-8458
NAAS Rating (2026): 4.97
IJAFS 2026; 8(11): 505-507
www.agriculturaljournals.com
Received: 24-08-2026
Accepted: 04-10-2026
Published: 14-11-2026

Chetana Jangde
Guest Teacher- Plant Pathology, College of Agriculture and Research Station, Korba, Chhattisgarh, India

Shalini Markam
Department of Plant Pathology, IGKV, Raipur, Chhattisgarh, India

Corresponding Author:
Chetana Jangde
Guest Teacher- Plant Pathology, College of Agriculture and Research Station, Korba, Chhattisgarh, India

Cultivation of Shiitake mushroom (*Lentinula edodes*): A review of production methods, crop management and post-harvest handling

Chetana Jangde[1], Shalini Markam[2]

DOI: https://www.doi.org/10.33545/2664844X.2026.v8.i11g.91105

Abstract
Shiitake (*Lentinula edodes*) is an edible wood-decaying basidiomycete valued for its distinctive flavour, nutritional composition and commercial importance. It is traditionally cultivated on hardwood logs and is now widely produced on supplemented sawdust blocks under controlled environmental conditions. This paper reviews the biological requirements and practical steps involved in shiitake cultivation, including strain and substrate selection, substrate preparation, spawn inoculation, incubation, fruiting, harvesting, yield considerations and contamination management. Log cultivation is comparatively simple and may produce crops over a long period, whereas sawdust-block cultivation allows more predictable scheduling and higher production intensity but requires greater technical control. Successful production depends on clean spawn, suitable lignocellulosic substrate, adequate moisture, temperature management, fresh-air exchange and careful sanitation. The review also highlights common production problems and the relevance of shiitake cultivation for small-scale enterprises and diversified mushroom farming.

Keywords: Shiitake, *Lentinula edodes*, Mushroom cultivation, Hardwood logs, Sawdust substrate, Spawn, Fruiting

1. Introduction

Shiitake, scientifically known as *Lentinula edodes* (Berk.) Pegler, is an edible mushroom native to East Asia. It is one of the most widely cultivated specialty mushrooms and is recognized by its brown, often scaly cap, pale gills and firm central or slightly eccentric stipe. The fungus is saprotrophic: it obtains nutrients by decomposing lignin and cellulose in dead hardwood. This wood-decaying ability makes logs and hardwood sawdust suitable cultivation materials (Chang *et al.*, 2004; Stamets, 2000) [1, 2].

Commercial production has developed along two principal systems. In the traditional method, hardwood logs are inoculated with spawn and stacked in shaded, humid conditions. In the intensive method, sterilized or pasteurized sawdust-based substrates are packed into bags or blocks, inoculated and incubated before fruiting is induced. The choice depends on investment, available materials, climate, labour and the market's requirement for regular supply (Royse *et al.*, 2017) [3].

The objective of this review is to present a practical, evidence-informed account of shiitake cultivation and the major factors affecting crop performance.

2. Biological and environmental requirements

2.1 Taxonomy and morphology

Kingdom: Fungi; Phylum: Basidiomycota; Class: *Agaricomycetes; Order: Agaricales; Family: Omphalotaceae; Genus: Lentinula; Species: Lentinula* edodes. Older literature may place the species in Tricholomataceae. The fruit body consists of a pileus (cap), lamellae (gills), stipe (stalk) and spore-producing basidia. The cap is generally brown and may show scales or cracking, particularly under lower-humidity conditions.

2.2 Temperature, humidity and light

The optimum temperature varies with strain and production stage. During spawn run, many commercial strains colonize well at approximately 20–25 °C, while fruiting commonly occurs at cooler temperatures, often around 12–20 °C. These are practical ranges rather than universal limits; strain-specific supplier recommendations should take priority. Fruiting requires high relative humidity, commonly about 85–95%, but the surface should not remain continuously waterlogged. Fresh-air exchange is essential because elevated car

26648458, 2026, 8(11), Downloaded from https://www.doi.org/10.33545/2664844X.2026.v8.i11g.91105 by International Journal of Agriculture and Food Science on [14/11/2026]. See the Terms and Conditions (https://www.agriculturaljournals.com) for rules of use; OA articles are governed by the applicable Creative Commons License

bon dioxide produces elongated stems and poorly developed caps. Diffused light is needed for normal fruit-body development; direct sunlight and strong drying air should be avoided (Stamets, 2000; FAO, n.d.) [2].

2.3 Substrate and water

Shiitake grows on hardwoods such as oak, beech, chestnut and other suitable broad-leaved species. In regions where these woods are unavailable, locally available non-resinous hardwoods may be evaluated in small trials. Resinous softwoods are generally unsuitable. For sawdust blocks, hardwood sawdust is commonly supplemented with a cereal bran such as wheat or rice bran. A typical formulation may contain 80–85% hardwood sawdust and 15–20% bran on a dry-weight basis, with water added to reach roughly 60–65% moisture. Exact recipes should be adjusted to the strain, sawdust particle size and processing method.

3. Cultivation systems

3.1 Natural-log cultivation

Freshly cut, healthy hardwood logs are usually selected during the dormant season. Logs approximately 8–15 cm in diameter and 0.9–1.2 m long are convenient to handle, although dimensions vary by grower. The bark should remain intact because it protects the wood and helps retain moisture. Logs are allowed to rest briefly after felling so that natural antifungal compounds decline, but they should not be left long enough to dry or become colonized by competing fungi.

Holes are drilled in a staggered pattern and filled with grain, sawdust or plug spawn. Inoculation points are sealed with food-grade wax to reduce moisture loss and contamination. Inoculated logs are stacked in a shaded, humid location with good air movement. The spawn gradually colonizes the wood; this incubation period may take several months to more than a year, depending on log size, strain and climate. Logs are then managed through a resting and fruiting cycle, with soaking or controlled temperature/moisture changes used when appropriate to stimulate fruiting (Chang & Miles, 2004; FAO, n.d.) [1].

3.2 Sawdust-block cultivation

Sawdust-block cultivation is suited to commercial units because blocks can be produced in batches and fruited in a controlled room. A common substrate uses hardwood sawdust with bran supplementation. The ingredients are mixed uniformly, hydrated and packed into heat-resistant polypropylene bags or suitable containers fitted with a filter patch. The substrate must be neither excessively wet nor dry: a squeezed handful should feel moist, with only a few drops of water expressed.

4. Production procedure

4.1 Substrate preparation and sterilization

The prepared substrate is filled firmly but not excessively compacted, leaving sufficient structure for gas exchange. Bags are sterilized using a validated steam process. Supplemented sawdust is nutrient-rich and is generally sterilized rather than merely pasteurized; the required time depends on bag size, load density and equipment. A pressure sterilization cycle around 121 °C is commonly used, with sufficient holding time for the coldest point in the substrate to reach the target. Commercial operators should validate their own cycle and follow equipment safety instructions. After sterilization, bags are cooled completely in a clean area before inoculation.

4.2 Spawning

Use vigorous, contaminant-free shiitake spawn from a reliable culture supplier. Inoculation should be carried out in a clean room or under a laminar-flow hood where available. Hands, tools and work surfaces must be disinfected, and bags should be opened only briefly. Spawn rate commonly falls around 3–5% of wet substrate weight, although commercial recipes vary. Mix or distribute spawn evenly, reseal the bag and label it with strain, inoculation date and batch number.

4.3 Incubation and browning

Incubate bags in a clean, dark or low-light room at the strain-recommended temperature, commonly around 20–25 °C. Maintain adequate spacing to prevent overheating within stacks. During spawn run, the mycelium spreads through the substrate and the block gradually becomes white. Shiitake blocks typically undergo a browning or maturation phase in which the surface develops a firm brown rind. This stage is important for normal fruiting and may take several additional weeks after full colonization. Do not rush blocks into fruiting before they are mature.

4.4 Fruiting induction and crop management

Mature blocks are exposed to fruiting conditions according to strain requirements. A change in temperature, increased fresh-air exchange, light and appropriate moisture can stimulate primordia formation. Remove or open the bag as directed by the production system. Maintain high humidity while providing enough ventilation to prevent excessive carbon dioxide. Mist the room or use humidification equipment rather than continuously soaking developing mushrooms. Water droplets trapped on caps and stagnant air can encourage bacterial blotch and other quality problems.

Pinheads develop into harvestable mushrooms over several days. Maintain stable environmental conditions and remove damaged or diseased fruit bodies promptly. After a flush, blocks need a recovery period before another flush. Rehydration may be used when blocks have lost significant moisture, but the timing and duration should follow the strain and block-management protocol.

5. Harvesting, yield and post-harvest handling

5.1 Harvesting

Harvest when caps have expanded but the margins are still slightly inrolled or just beginning to flatten, depending on the market's preferred size and appearance. Mushrooms are cut or twisted carefully at the base without damaging the block. Harvesting too late may result in flatter caps, reduced shelf life and greater spore release. Handle mushrooms gently to avoid bruising.

5.2 Yield and crop duration

Yield is influenced by strain, substrate formulation, supplementation, block size, biological efficiency, contamination rate and environmental control. Biological efficiency (BE) is calculated as fresh mushroom weight divided by dry substrate weight, multiplied by 100. For example, 1.0 kg of fresh mushrooms from 2.0 kg dry substrate represents 50% BE. Published and commercial yields vary substantially, so production planning should use locally recorded results rather than a single guaranteed figure. Log-grown shiitake may fruit over multiple seasons, while sawdust blocks commonly produce several flushes over a production cycle.

5.3 Grading, storage and processing

After harvest, remove substrate particles and grade by cap size, appearance and freshness. Store fresh shiitake under refrigeration, ideally near 0–4 °C with suitable humidity and air circulation; avoid sealed wet packaging that promotes condensation. For longer storage, mushrooms can be dried using controlled warm-air drying until sufficiently low moisture is reached, then packed in moisture-barrier containers. Dried shiitake has a concentrated flavour and can be rehydrated before cooking.

6. Major problems and their management

Contamination is a major risk during supplemented sawdust production. Green moulds (often *Trichoderma* spp.), competitor moulds and bacteria can colonize poorly sterilized or contaminated blocks. Prevention relies on clean raw materials, correct moisture, validated sterilization, clean inoculation and prompt removal of contaminated bags. Do not open heavily contaminated bags in the production room, as spores can spread.

2664844X, 2026, 8(11), Downloaded from https://www.doi.org/10.33545/2664844X.2026.v8.i11g.91105 by International Journal of Agriculture and Food Science on [14/11/2026]. See the Terms and Conditions (https://www.agriculturaljournals.com) for rules of use; OA articles are governed by the applicable Creative Commons License

Poor fruiting may result from immature blocks, unsuitable strain-temperature combinations, low humidity, excessive carbon dioxide, inadequate light or depleted substrate moisture. Long stems and small caps commonly indicate insufficient fresh-air exchange. Dry or cracked caps may indicate low humidity or strong air movement, while slimy or spotted caps may be associated with excessive wetness and poor sanitation. Keep batch records for temperature, humidity, ventilation, contamination and harvest weights to identify recurring problems.

7. Economic and environmental considerations

Shiitake production can diversify farm income and create value from suitable hardwood residues and sawdust. However, profitability depends on spawn and substrate costs, energy for sterilization, labour, climate control, packaging, transport and access to a reliable market. Log cultivation has lower equipment requirements but ties up logs for a long colonization period. Sawdust-block cultivation offers more regular production but requires investment in sterilization and a clean growing facility. Spent substrate may be composted or used as a soil amendment after appropriate handling, subject to local regulations and crop needs.

For warm regions, including much of India, strain selection and seasonal planning are particularly important. Cooler rooms or naturally cool production periods may be needed for fruiting, and pilot batches should be used to verify performance before scaling up.

8. Conclusion

Shiitake is a high-value edible mushroom that can be cultivated using either hardwood logs or supplemented sawdust blocks. Log cultivation follows a traditional, low-technology approach, whereas sawdust-block production enables more controlled and frequent harvests. In both systems, success depends on selecting an adapted strain, maintaining clean spawn and substrate, managing moisture and temperature, ensuring sufficient ventilation and allowing adequate maturation before fruiting. Careful harvesting, rapid cooling and hygienic handling preserve market quality. Because responses vary with strain and local climate, growers should begin with small trials, record production data and adopt recommendations from reputable spawn suppliers and regional mushroom-development agencies.

Note on technical values

Temperature, humidity, spawn rate, substrate formulation and sterilization schedules in this review are indicative operating ranges reported in cultivation literature. They are not universal prescriptions. Use strain-specific technical sheets, validate sterilization for the actual bag size and equipment, and comply with local food-safety and occupational-safety requirements.

References

1. Chang ST, Miles PG. Mushrooms: Cultivation, nutritional value, medicinal effect, and environmental impact (2nd ed.). CRC Press; 2004.
2. Stamets P. Growing gourmet and medicinal mushrooms (3rd ed.). Ten Speed Press; 2000.
3. Royse DJ, Baars J, Tan Q. Current overview of mushroom production in the world. In D. C. Zied & A. Pardo-Giménez (Eds.), Edible and medicinal mushrooms: Technology and applications. Wiley-Blackwell; 2017:5-13.
4. Indian Council of Agricultural Research–Directorate of Mushroom Research (ICAR-DMR). Technologies developed by ICAR-Directorate of Mushroom Research. Solan, India; 2020.
5. Penn State Extension. Production technology: *Lentinula edodes*. The Pennsylvania State University.
6. Przybylowicz P, Donoghue J. Shiitake growers handbook: The art and science of mushroom cultivation. Kendall/Hunt Publishing Company; 1990.
7. Virginia Cooperative Extension. The basics of hardwood-log shiitake mushroom production and marketing (ANR-102). Virginia Tech; 2025.

How to cite this article: Jangde C, Markam S. Cultivation of Shiitake mushroom (*Lentinula edodes*): A review of production methods, crop management and post-harvest handling. *International Journal of Agriculture and Food Science*. 2026;8(11):505-507. doi: https://www.doi.org/10.33545/2664844X.2026.v8.i11g.91105

2664844X, 2026, 8(11), Downloaded from https://www.doi.org/10.33545/2664844X.2026.v8.i11g.91105 by International Journal of Agriculture and Food Science on [14/11/2026]. See the Terms and Conditions (https://www.agriculturaljournals.com) for rules of use; OA articles are governed by the applicable Creative Commons License