

# Cultivation of Shiitake Mushroom (*Lentinula edodes*)



**Directorate of Mushroom Research**  
**(Indian Council of Agricultural Research)**  
**Chambaghat, Solan - 173 213 (HP)**

## INTRODUCTION

Shiitake (*Lentinula edodes*) is the most important culinary medicinal mushroom which ranks at number two in terms of total mushroom production in the world only next to button mushroom. Shiitake is a prized mushroom with a delicious taste and texture. It is used medicinally for diseases involving depressed immune function-including cancer, AIDS, environmental allergies, *Candida* infections and frequent flu and colds. Shiitake is also beneficial for soothing bronchial inflammation and regulating urine incontinence as well as for reducing chronic high cholesterol. Lentinan (a cell-wall constituent extracted from the fruiting bodies of shiitake) is an immunomodulating agent which may be useful both as a general rejuvenative for older persons, as well as prophylactically to protect healthy, physically active young people from overwork and exhaustion.

## PRODUCTION SYSTEM

The commercial cultivation can be carried out on sawdust of broad leaf trees mainly tuni, mango, safeda, oak, maple and poplar using saw dust (80 kg), wheat bran (19 kg) and calcium carbonate (1 kg). Water should be adjusted to 60-65% and pH to be adjusted to 5.5-6.0 using gypsum. Saw dust is soaked for 16-18 hours and wheat bran for three hours. All the ingredients are thoroughly mixed.

**Filling and sterilization of bags:** Fill the bags (1.5 to 2 kg) immediately after mixing all the ingredients. Otherwise fermentation and contamination may start. Polypropylene (heat resistant) bags are used for filling. The bags are first loosely filled and later pressed to get cylindrical shape. After filling the bag

PVC or iron ring is inserted at the mouth of the bag and plugged with non-absorbent cotton (Fig. 1). Sterilization is carried out in an autoclave at 22 psi for 1½-2 hours.

**Spawning and Spawn running:** Spawning is carried out by removing the cotton plugs. Grain spawn is introduced @ 3% (dry wt basis) under aseptic conditions (Fig.2 & 3). After inoculation bags are placed in cropping rooms where these are incubated in a 4 h/ 20 h light/ dark cycles at 22-26°C. Spawn run (Fig.4) may take 60-80 days or more depending upon the strain and environmental conditions. During the period it goes through mycelial growth, mycelial coat, mycelial bump, pigmentation/browning and coat hardening phase.

**Mycelial coat formation :** A thick mycelial sheet coat will develop (Fig. 5) on the surface of the substrate. This will be formed after 6-8 weeks of inoculation/spawning.

**Mycelial bump formation:** Bumps are clumps of mycelium, commonly formed on the surface of most strains after 9-10 weeks (Fig.6). These bumps can turn into mushroom primordia at a later stage but most of them abort. Fluctuating temperatures and high CO<sub>2</sub> promotes bump formation.

**Pigmentation :** Some aeration should be provided when the bumps have formed. After longer spawn run the surface of the colonized substrate may begin to turn brown, some exudates may also be there during spawn running.

**Coat hardening phase:** Remove the polypropylene bag when synthetic log has partially (half or one third) turned brown.

The coat will gradually become hard and outside of the substrate should also be hard while the inside should be softer and moist. The core of the substrate has moisture of about 80%.

**Fruiting :** For induction of fruiting suitable temperature, high RH, good ventilation and cold water/ shock treatment are required. After 5-8 days of cold-water (4-6°C) treatment for 10-20 minutes, initiation of primordia begin (Fig.7). The fruit bodies further develop and became ready to harvest in next 5-7 days.

A schedule of various parameters is given below in Table 1.

**Table 1. Various fruiting parameter**

Stages/ Activity	Days	Temperature (°C)	Light intensity (Lux)	Humidity (%)
Incubation	60-80	22-26	500-1000	65-70
Induction	2-4	10-20	500-1000	85-95
Fruiting	7-14	12-25	800-1000	60-80
Rest	7-21	22-26	None	65-70
Induction	2-4	10-20	500-1000	85-95

- i. The temperature range for fruiting is strain dependent.
- ii. A dry period after harvesting will prevent contamination.
- iii. The synthetic logs may be given a water bath to restore high moisture content of the substrate.

## Harvesting

Take the stalks of the mushrooms and break them from the substrate. Don't tear them from the surface. Harvest the mushrooms at an early stage (Fig. 8). Normal yields are 35-45% of the wet weight of the substrate.

## Flow Chart of shiitake production

### Substrate

Sawdust +  
Wheat bran

Wetting - 65%

Pasteurization  
22 p.s.i. for 2 hr

### Spawn

Wheat grain based

Spawning

@ 3% dry wt. basis

Incubation

(22-26°C, high CO<sub>2</sub>, dark)

Pinning

(12-25°C, RH 85%, light >  
800-1000 lux)

Maturation

(12-25°C, RH 80%)

Harvesting

Sun drying or in oven  
(50-60 °C)



**Fig. 1. Filled bags**



**Fig. 2. Inoculation of sterilized bags**



**Fig. 3. Inoculated bag**



**Fig. 4. Spawn run bags**



**Fig. 5. Mycelial coat formation stage**



**Fig. 6. Mycelial bump formation stage**



**Fig. 7. Initiation of fruit bodies**



**Fig. 8. Mushrooms ready to harvest**

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**Director**

Directorate of Mushroom Research  
Chambaghat, Solan- 173213 (HP) India  
Phone: 01792-230767, 230541, 230451;  
Fax: 01792-231207

E-mail: [directordmr@gmail.com](mailto:directordmr@gmail.com)  
Website: [www.nrcmushroom.org](http://www.nrcmushroom.org)

**Authors : V.P. Sharma and Satish Kumar**