CULTIVATED EDIBLE SPECIALTY MUSHROOMS - SCOPE IN INDIA AND EU COUNTRIES

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ABSTRACT

In India and EU countries, the specialty edible mushrooms are not grown and available commonly. Any mushroom other than popularly grown white button mushroom Agaricus bisporus comes under the specialty category, and these mushrooms are generally not available in departmental stores/vegetable vendors. The mushrooms under this group are the different species of Oysters, Shiitake, Black Ear mushroom, Shimeji, Nameko, Enoki, Milky, Paddy Straw mushrooms and others. 11 varieties of specialty mushrooms were grown at the Centre on commercial scale for marketing in a niche market in India. This paper describes the cultivation technology of these mushrooms as grown at our Centre in controlled environment conditions. The mushrooms were grown on steam pasteurized/steam sterilized substrates without the use of chemicals/pesticides. The mushrooms were harvested fresh, chilled at 2-4°C for 4-6 hrs before dispatch to the niche market. The mushrooms were sold at attractive prices as gourmet mushrooms. The raw materials used for cultivating these mushrooms were wheat straw, paddy straw, saw dust, wheat bran, rice bran and gypsum for pH adjustment. The environment was simulated in the cropping rooms with use of Air Handling Units with computer controls for temperature, RH and CO₂ concentration. One cropping cycle was completed under these conditions in 3-4 weeks, unless otherwise stated. Regular water sprayings were applied to keep the beds moist. Light was provided to the cropping beds wherever required.

Key words: Pleurotus, Volvariella, Lentinula, Auricularia, Calocybe, Hypsizygus, cultivation, controlled environment.

INTRODUCTION

The word specialty mushroom has different meaning for different countries. In India and EU countries, the specialty edible mushrooms are mushroom that are not grown commonly and available commonly in the market. Any mushroom other than popularly grown White Button mushroom Agaricus bisporus falls under the specialty category, and these mushrooms are generally not available in departmental stores/with vegetable vendors in India. In India and EU countries White Button mushroom Agaricus bisporous is cultivated commercially for local consumption and export to other countries. The specialty mushrooms for India and the EU countries are the different Pleurotus spp, Lentinula edodes, Auricularia spp, Hypsizygus tessulatus, Pholiota nameko, Flammulina velutipes, King Oyster mushroom P.eryngii and others. Similarly, specialty mushrooms in EU countries/USA and other developed countries in Europe/America are the mushrooms grown other than the White Button mushroom A.bisporous. But in China and many Far Eastern countries in Asia, most of our specialty mushrooms are commonly grown there as a home grown crop, and are easily available everywhere in these
countries over the counter, both in fresh and dehydrated form. In China, mushroom is the 6th important crop in the country as far as revenue generation for the nation is concerned. Button mushroom is exotic mushroom/specialty mushroom for these countries, and is chiefly grown for export/distant markets.

The Chinese mushroom growers cultivate these specialty mushrooms on a commercial scale, with substrate preparation/bottling/spawning done mechanically, semi-mechanically on a gigantic scale and mushrooms harvested are exported as such fresh or after dehydration. Today China is the largest producer of mushrooms in the world with 70% of world production happening in China. Chinese grow White Button mushroom for export, mostly seasonally. In China, mushroom is the base for most of the medicines available there for cure of wide spectrum of diseases. These mushrooms are listed under a separate group of mushrooms called medicinal mushrooms. Today China is trading medicinal mushrooms worth billions of dollars worldwide with increasing demand. Notable medicinal mushrooms/mushroom products are Reishi mushroom *Ganoderma lucidium* (immune system enhancer), Chinese caterpillar mushroom *Cordyceps sinensis* (hormone stimulator) and many others. These medicinal mushrooms together with nutritionally rich Shiitake mushroom are in great demand in USA, EU countries, India, Australia and other countries. While mushroom is the health food, medicinal mushrooms offer a big hope for cure of those human diseases where there is no known cure available in other systems of medicine in the world. Mushrooms are the health food and recommended by FAO-UN as a potent protein source along with soybean for all, especially in developing countries’

CULTIVATION OF SPECIALITY MUSHROOM
The commonly grown specialty mushrooms in India are listed in Table 1 and Cultivation technology as standardized suiting local conditions at Mushroom Research Development and Training Centre (MRDTC), Delhi under controlled environment is described below.

<table>
<thead>
<tr>
<th>Common name</th>
<th>Scientific name</th>
<th>Optimum Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grey Oyster</td>
<td><em>Pleurotus sajor-caju</em></td>
<td>20-28°C</td>
</tr>
<tr>
<td>Black Oyster</td>
<td><em>Pleurotus ostreatus</em></td>
<td>18-22°C</td>
</tr>
<tr>
<td>White Oyster</td>
<td><em>Pleurotus florida</em></td>
<td>20-28°C</td>
</tr>
<tr>
<td>Pink Oyster</td>
<td><em>Pleurotus djamor</em></td>
<td>20-36°C</td>
</tr>
<tr>
<td>King Oyster</td>
<td><em>Pleurotus eryngii</em></td>
<td>18-22°C</td>
</tr>
<tr>
<td>Black Ear Mushrooms</td>
<td><em>Auricularia polytricha</em></td>
<td>22-26°C</td>
</tr>
<tr>
<td>Shimeji Mushroom</td>
<td><em>Hypsizygus tessulatus</em></td>
<td>18-22°C</td>
</tr>
<tr>
<td>Shiitake Mushroom</td>
<td><em>Lentinula edodes</em></td>
<td>18-22°C</td>
</tr>
<tr>
<td>Milky Mushroom</td>
<td><em>Calocybe indica</em></td>
<td>28-32°C</td>
</tr>
<tr>
<td>Paddy Straw Mushroom</td>
<td><em>Volvariella volvacea</em></td>
<td>30-35°C</td>
</tr>
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</table>

GREY OYSTER MUSHROOM
*Pleurotus sajor-caju* [1-5] the Grey Oyster mushroom, has its pileus color at pin head formation grey to dark grey in color. The color of the pileus changes to light grey on maturity, with fan shaped fruit body and thick texture. The fruit bodies are weighty when fully grown, and the pileus diameter may extend up to 4 inches. This Oyster mushroom is very commonly grown in India under seasonal growing conditions at temperature ranging between 20-28°C, but growth stops at air temperature above 28°C. This mushroom performs excellently when grown under controlled environment conditions.
Substrate Materials: *P. sajor-caju* grows best on wheat straw substrate which is easily available in India at affordable prices. Other alternative materials that are used for substrate preparation are maize stems, maize cob shells, pseudo banana stems and other agricultural recyclable wastes. These base materials are supplemented with N-rich supplements like wheat/rice bran at 10% dry weight of base material. These materials should be fresh and free from moulds and with maximum of 10-15% moisture content. The water used for wetting and watering should be at a pH of 7.

Substrate Preparation: The base material is wetted on composting yard with a water hose and left overnight for water absorption by straw cells. The heap is made rectangular shaped, about 2.5 to 3 feet in height and turned/mixed the next day after 24 hours before filling into the pasteurization chamber. The base material is alternatively soaked in a water tank in gunny bags overnight. The material is brought out of the tank and heaped on the floor of the composting yard to drain off excess water. The material after wetting is filled into the pasteurization chamber for steam pasteurization at 65°C for 8 hours. The material is loaded directly onto the grated floor up to a height of 6 feet, blower fan switched on and steam injected to raise the temperature of the material to 65°C. The material is held at this temperature for 8 hours. Alternatively, the material is filled into the perforated plastic crates and loaded into the chamber for pasteurization of the material. The material after pasteurization is cooled to 24-25°C overnight, and then spawned in aseptic spawning area located on the other side of bulk chamber. Rice bran/Wheat bran is filled into the perforated crates and pasteurized along with the substrate at same temperature, which is mixed with the substrate at the time of spawning.

Spawning and Spawn run: The spawning is done inside the glazed spawning area located on the cleaner end of the bulk chamber. The spawning is done at 2% spawn rate (2 kg per 100 kg wet substrate). The pasteurize rice/wheat bran is also mixed during spawning operation with the base material. The spawning is done by ‘through spawning method’, and seeded substrate filled into the perforated polythene bags, pressed hard to remove air. The bags are tied on the top and shifted to the spawn incubation room maintained at 24-25°C and 90% RH. The spawn run takes about 12-14 days at 24 ±1°C. The bags are allowed to become white on outside, and that is the stage the bags are shifted to cropping room.

Opening of the bags for Cropping: The polythene bags is cut and discarded, and spawn run substrate bundles are placed on the racks in the cropping room. The cropping room is maintained at a temperature of 17-19°C, RH of 85-90% and CO₂ content of 800 ppm. The climate is automatically simulated to above mentioned levels, and the pin head/primordial formation takes place in another 4-5 days. The primordia/pin heads grow into harvestable mushrooms in another 3-5 days (Fig.1).

![Grey Oyster Mushroom](image1.png)

**Figure 1:** Grey Oyster Mushroom.
Cropping and crop Management: The color of the pileus is dark-grey to grey in color, which turns lighter on maturity. During the cropping period from pin head to maturation, light source of about 400 lux is made available to the developing mushrooms as per requirement of the mushroom. The mushrooms are allowed to grow to full biological maturity, say 3-4 inches of pileus diameter. The cropping room is maintained at above mentioned growing parameters throughout cropping phase. The filters installed on the Air Handling Unit required periodic weekly washing to remove the film of Pleurotus spores on the filters, which would hamper the air flow speed inside the cropping room. The cropping is done for maximum of 2-3 weeks, and the spent substrate discarded at the end of cropping. On an average of 20-22 kg of excellent quality fresh mushrooms were harvested from 100 kg wet substrate. Grey Oyster mushroom, *P.sajor-caju* is large in size at harvesting time with hard/thick pileus, spreading out like a fan. Pileus diameter of 3-4 inches is considered right for harvesting, and is accepted by the consumer with a smile. During cropping regular water sprayings were given to the crop beds. No chemicals/pesticides were used during the entire process of cropping.

Post Harvest Handling and Marketing in India: The mushrooms are harvested at the right biological stage of the fruit body; that is when it is fully grown with pileus tight and curved outwards on the edge. The gills are decurrent and stipe is thin and short. The bulk of the fruit body is constituted by the pileus itself. This mushroom is very attractive to look at and fleshy in appearance. The mushrooms are plucked singly or in bunch from the substrate, collected in a basket, graded and packed in polythene bags/paper bags for the market. The polythene bags are provided with a small hole for air exchange to prevent the development of aflatoxins on the fruit body. The mushrooms are chilled inside a cold storage at 2-4°C for 4-6 hours before dispatch to the market for enhancement of shelf life. These mushrooms are sold in niche market in big cosmopolitan cities in India.

BLACK OYSTER MUSHROOM

*Pleurotus ostreatus*, [2-3, 5-6] is the Black Oyster mushroom, as the pileus is black in color at the time of primordia/pin head formation. The entire process of its cultivation is similar to *P.sajor-caju*, except that this mushroom grows in vertically long bunches, with bunch growing in acropetal order (lower mushrooms younger/smaller, upper mushrooms larger). This mushroom is also called Hiratake mushroom in Japan, and this mushroom loves the lower temperature range of 18-22°C. This mushroom is a prolific yielder, and yields 20-25% mushrooms of wet weight of substrate over a cropping period of 3-4 weeks. The mushroom shows distinct black color when young, which turns lighter on maturity. This mushroom is harvested in bunches, and packed/marketed like *P.sajor-caju*. This mushroom is in greater demand because of its velvety look/texture and excellent aroma. The diameter of the pileus of this mushroom is 2-3 inches, but mushroom length comprising of pileus and stipe is about 3-4 inches. The entire length of this mushroom is fleshy in texture, with decurrent gills on lower side. The fruit body looks like a horse shoe. This mushroom has preferred marketability value, and is readily accepted in the market by the consumers and the executive chefs of star hotels for its excellent taste (Fig.2).
Figure 2: Black Oyster Mushroom.

WHITE OYSTER MUSHROOM

Pleurotus florida [1, 5, 7] the White Oyster mushroom, is white in color from primordia/pin head formation to maturity, and this mushroom also grows in bunches. The pileus of this mushroom is with thin margins, smooth and pileus thickness is lesser as compared to P.ostreatus and P.sajor-caju. The mushroom looks like a white disc, growing on a thick stipe with decurrent gills extending to the base of the stipe, unlike P.ostreatus/P.sajor-caju. This mushroom grew excellently at 18-22°C temperature range but can grow up to 28°C. White oyster looks graciously white, with delicate flesh which is turgid in texture. The marketability of this mushroom is quite high with increased demand in the niche market in India. These mushrooms are real gourmet mushroom, with high culinary value, and with intense mushroom aroma when used fresh (Fig.3).

Figure 3: White Oyster Mushroom.

PINK OYSTER MUSHROOM

Pleurotus djamor [7] the Pink oyster mushroom looks gracious on the bed and yields profusely. The cultivation process for this mushroom is similar as described for P.sajor-caju, excepting that this mushroom requires limited water spraying during its cropping. The mushroom pileus is thinner as compared to above species, leathery in texture and looks like a pink queen on the beds. The pileus is up to 3-4 inches in diameter, with little or no stipe and pileus thickness is 3-4 mm at the outer edges. Outer boarder on pileus top is pink, gills on the lower side are pinkish too. This mushroom is not fleshy as compared to above described 3 species. The marketability of this mushroom is excellent and sells at attractive prices in the niche market in India. It fruits profusely at lower air temperature of 18-20°C in the cropping room (Fig.4).
KING OYSTER MUSHROOM

Pleurotus eryngii [8] is really the king amongst oyster mushrooms, not from size point of view alone but for its elegance in taste and aroma. This mushroom is also known by the name of Kabul Dhingri in India, and earlier it was harvested from natural habitats in Afghanistan and sold in India after dehydration at very attractive prices. This mushroom is now cultivated in cropping rooms all over the world, both under seasonal growing conditions and controlled environment. The cultivation technology is described in details as under.

**Substrate materials.** The commonly used substrate material for cultivating this mushroom is sawdust, supplemented with 10-30% wheat/rice bran. Wheat straw substrate supplemented with rice/wheat bran also supported the growth of this mushroom, but best quality mushrooms grew on sawdust substrate supplemented with rice/wheat bran.

**Substrate preparation.** Substrate sawdust is supplemented with 30% rice bran (w/w dry) and wetted on the composting platform, using water with pH 7. Gypsum/calcium carbonate is mixed with the substrate for pH adjustment only. The substrate materials after wetting were filled into the polypropylene bags of 1 kg capacity, material pressed hard into the bag with hands and a hole made with a wooden stick in the centre for inoculums. Plastic neck is fixed on the open end of the polypropylene bag and the bags are then cotton plugged and sterilized at 15 psi for 90 minutes. Wheat straw substrate was pasteurized at 65°C with steam, but it did not support the spawn run. When wheat straw substrate was sterilized at 15 psi for 90 minutes as for sawdust, it supported good spawn run and fruited well, but yields were lower.

**Spawning and spawn run:** The bags were allowed to cool inside the autoclave and inoculated the next day on laminar flow deck using freshly prepared grain spawn of *P. eryngii*. About 40-50g of spawn was poured into the sterilized bag through the neck, and grain spawn pushed into the hole with a sterile glass rod, and cotton plug restored in the neck. The bags were then shifted to the incubation room maintained at a temperature of 22-24°C. The spawn run takes 12-15 days for complete spawn impregnation of the substrate.
Opening of bags for fruiting. The bags were opened after complete spawn run, by cutting off the extra polypropylene near the upper edge of the substrate. The old spawn was scrapped off and discarded, and water sprinkled over the substrate to keep it moist. The bags were then shifted to the cropping room maintained at 17-19°C temperature, 85-90% RH and 800 ppm CO₂ concentration. The pin heads started appearing on the top surface in 9-10 days, which grew into harvestable mushrooms in another 3-4 days. King Oyster loves cold temperature, and the production stops at temperature beyond 24°C (Fig.5).

Cropping and crop management. The bags were given water spraying daily to maintain the substrate in moist condition. The mushrooms grow into large fruit bodies with brownish streaks on the pileus giving it an attractive look. The pileus stays curved inwards on the outer edge, the texture is tough and the fruit body is quite fleshy, with decurrent gills extended over the stipe. The stipe is quite thick and forms the bulk of the fruit body. The bags are maintained in the cropping room at 17-19°C constantly with 85% RH and 800 ppm CO₂ concentration.

Post harvest handling. The fruit bodies are harvested when these are 5-6 inches tall, with average weight of about 100-250 g. These mushrooms grow large in size and require to be placed in larger containers/bags for marketing. King oysters have a superior shelf life and can withstand small distance transportation. These mushrooms are marketed in India to a niche market as a specialty mushroom of high value. The common consumer of mushrooms in India does not know much about this mushroom, and it does not sell fresh over the counter. This mushroom is grown in China/Korea/Japan and other Far-Eastern countries for export, and large quantities of King Oyster mushrooms are marketed fresh/in dried form in India, Europe, USA, Canada and other countries. In China, this mushroom is like a home grown crop and large numbers of mushroom growers are cultivating this mushroom on commercial scale for local consumption and export to neighboring countries.

BLACK EAR MUSHROOM
Auricularia polytricha [9], commonly known as Black Ear/Wood Ear mushroom is another specialty mushroom popularly used in Chinese food dishes all over the world. Its substrate preparation technology is similar as discussed for King Oyster mushroom. It grows on both wheat straw/sawdust substrates, but saw dust substrate showed superior results. The synthetic logs were prepared from saw dust supplemented with 10% wheat/rice bran, wetted on the composting floor and filled into polypropylene bags, cotton plugged and sterilized in steam autoclave at 15 psi for 90 minutes. The bags were spawned on cooling on laminar flow with grain spawn at 3% spawn rate. The spawn run was done at 23-25°C, which was accomplished in

Figure 5: King Oyster Mushroom.
two weeks (Fig.6). The substrate bags were opened after complete spawn run and are being maintained for fruiting at two different temperatures in the cropping rooms at 20°C and 24°C separately.

![Image](image1.png)

**Figure 6:** Spawn running bags of Black Ear Mushroom.

**SHIMEJI MUSHROOM**

*Hypsizygus tesselatus*, the Buna Shimeji mushroom was grown on sawdust substrate. Sawdust substrate was supplemented with 5% wheat/rice bran and wetted and filled into polypropylene bags and cotton plugged. The substrate was sterilized at 15psi for 90 minutes, and spawned on cooling on laminar flow with grain spawn at 3% spawn rate. Spawn run was done at 24-25°C which took one month. The bags were opened after complete spawn run and maintained in the cropping room at 18°C. The fruit bodies appeared 2-3 weeks after opening. This mushroom is slow grower and likes cooler temperatures. The fruit body is smaller in size, with light wood color on the pileus (Fig.7). The stipe is long and pileus about 1-1.5 inches in diameter, with pileus thickness of 2-3 mm. The large scale cultivation of this mushroom is in progress.

![Image](image2.png)

**Figure 7:** Buna Shimeji Mushroom.

**SHIITAKE MUSHROOM**

*Lentinula edodes*, [10] the prized Shiitake mushroom grows on wheat straw as well as on sawdust substrates. But the fruiting is superior on sawdust substrate. Sawdust supplemented with 6% rice/wheat bran and small quantity of gypsum (about 1% dry w/w) was mixed and wetted on the composting platform and filled into polypropylene bags, pressed hard to drive out air and a hole made with the wooden stick in the center. The substrate bags were cotton plugged (cotton plug fitting into the plastic neck on the open side) and the substrate bags were sterilized at 15 psi for 90 minutes. The moisture content of the substrate was maintained at 50-55%. The substrate
was spawned on cooling on laminar flow at 3% spawning rate, using grain spawn. This mushroom mycelium grows in its vegetative state in two phases, one is spawn run and the second is browning process. The vegetative growth/spawn run was done at 24±1°C, which took 30-35 days. The bags after spawn run were opened and are being maintained in cropping room at 17-19°C, 90% RH and 1000ppm CO₂ concentration for browning process (Fig.8). The bags after browning process for about 30 days will be shifted to the cropping room maintained at 22±1°C. The complete cycle takes about four months on synthetic logs. The yield potential on synthetic logs is about 80-100% fresh mushrooms of the dry weight of the substrate.

**Figure 8**: Spawn run bags of Shiitake Mushroom.

**MILKY MUSHROOM**

*Calocybe indica*, [11] the Milky mushroom is snow white in color with a long stipe and a small pileus. The stipe is fleshy and constitutes the bulk of the mushroom. This mushroom is grown on wheat straw after steam pasteurization at 65°C for 8 hours, in polythene bags. The spawning rate used was 5% of the wet weight of substrate. The bags after spawning were maintained in a cropping room at 28°C. The spawn run takes about 12-14 days. The bags were opened after complete spawn run and beds casied with steam pasteurized casing material consisting of mixture of coirpith + FYM (Farm Yard Manure)+ ordinary soil (equal parts w/w). The casing thickness used was 2inches and after casing application water spraying was given regularly to maintain casing in wet state. Case run took 12-14 days at 28°C. After case run, the room temperature was lowered to 25-26°C and the crop appeared in another 7-10 days after complete case run. The primordia developed into fully grown harvestable mushrooms in another 3-4 days (Fig.9). The mushrooms attained the height of 4-6 inches at harvest time. One kg of mushroom will have 10-12 fruiting bodies. This mushroom has a superior shelf life, and can be transported to short distances for marketing without damage to its quality.

**Figure 9**: Milky Mushroom
PADDY STRAW MUSHROOM

Volvariella volvacea, [12] the Chinese mushroom/the Tropical Paddy Straw mushroom is the tastiest mushroom amongst the edible group, with added aroma. But its shortcoming is its poor shelf life. This mushroom has to be consumed within hours of its harvest, or dehydrated.

This mushroom was grown on paddy straw bundles. Each bundle weighed about 500g (dry weight) with 2 feet length. The paddy straw bundles were wetted overnight in a water tank. The bundles were removed from the tank, left for a few hours at the composting platform to drain off extra water. The bundles were then steam pasteurized at 65°C for 6 hours. On cooling the bundles were arranged into a bed over perforated shelf inside a cropping room. Each bed was made about 2 feet long and 2 feet wide, consisting of 5-6 layers. The bed was spawned in each layer on the periphery, sprinkling some gram powder - 200g per bed to provide nutrition. Spawning was done at the rate of 3% wet weight of substrate, using grain spawn. The bed was completely covered with a polythene sheet and maintained at a temperature of 30-35°C with 100% RH. The spawn run was complete in 4-5 days, and on complete spawn run, the polythene cover was removed to allow entry of fresh air for primordial/pin head development. The pin heads developed in another 3-4 days, which grew into harvestable fruit bodies in another 3-4 days (Fig.10). The mushroom is harvested in egg stage, not allowing it to open like an umbrella. The mushrooms are harvested in egg stage when these are up to 2 inches in diameter. The mushrooms are packed in a polythene bag for the market. This mushroom is not recommended to be refrigerated, but can be stored at 15°C for a few hours.

CONCLUSION

Cultivated specialty edible mushrooms like commonly grown Grey Oyster mushroom P. sajorcaju (20°-28°C), Black Oyster mushroom P. ostreatus (18-22°C), White Oyster mushroom P. florida (20-28°C), Pink Oyster mushroom P. djamor (20-26 C), King Oyster mushroom P. eryngii (18-22°C), Black Ear mushroom A. polytricha (22-26°C), Shiitake mushroom L. edodes (18-22°C), tropical Paddy Straw mushroom V. volvacea (30-35°C), Milky mushroom C. indica (28-32°C) and Buna Shimeji mushroom H. tessulatus (18-22°C) were grown under controlled environment conditions at MRDTC, Delhi, India on commercial scale. The substrates for cultivation of these mushrooms were steam pasteurized/sterilized, and no chemicals/pesticides were used during the cultivation of these mushrooms. Almost all the specialty mushrooms are lignicolous mushrooms, meaning lignin loving. These mushrooms grow on sawdust, wood, cereal straws as against White Button mushroom which grows on humus or fermented organic matter/compost.

The procedure for cultivation of White Button mushroom is lengthy, cost intensive and requires more space for building of infrastructure with additional costs on cooling of the
environment, as commonly grown White Button mushroom requires growing temperature of 15-17ºC. In comparison, most of our specialty mushrooms (for India/EU countries) grow directly on recyclable agro byproducts like cereal straw and plant residues/wastes after initial wetting and steam pasteurization. For button mushroom cultivation, environment controlled cropping rooms will be required for growing with special infrastructures for compost preparation. No such infrastructure is required for growing specialty mushrooms. These specialty mushrooms can be grown seasonally in your backyard in ordinary rooms, with no requirement of composting as these grow directly on unfermented cellulosic materials/sawdust.

For marketing White Button mushroom, we will require cool chain transport for delivery to the market place as button mushroom browns quickly and has short shelf life, but specialty mushrooms can be transported in ambient conditions with modified packaging, without any damage to the quality of the mushrooms.

Specialty mushrooms are rich in all the dietary components of ‘mushroom fruit body’, especially proteins, vitamins, minerals like potassium and high fiber content with no fats/sodium. It is the richest source of protein amongst the vegetable/fungal proteins and rich source of folic acid required for blood formation in anaemic patients. Specialty mushrooms like Shiitake and Oyster mushrooms are rich in mushroom aroma and considered delicacy in food world ever.

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