



DEPARTMENT OF BOTANY

BEST PRACTICE

**MUSHROOM
CULTIVATION**



ADUSUMILLI GOPALAKRISHNAIAH & SUGAR CANE GROWERS SIDDHARTHA DEGREE
COLLEGE OF ARTS & SCIENCE, VUYYURU-521165, KRISHNA Dt., A.P. (AUTONOMOUS).

NAAC recredited at 'A' level
Autonomous –ISO 9001-2015 Certified
DEPARTMENT OF BOTANY

Mushroom culture

Milky mushroom (*Calocybeindica*):

Milky mushroom (*Calocybeindica*) is second tropical mushroom after paddy straw mushroom, suitable for cultivation in tropical and subtropical regions of the country. This variety is new introduction to world mushroom family from India. During last decade it has become a major variety for cultivation in South India. Its high biological efficiency, better keeping quality; simple cultivation process and white attractive colour are factors for its popularity.

Cultivation

1. Substrate and substrate preparation

Milky mushroom (*Calocybeindica*) can be grown on wide range of substrates as in case of oyster mushroom. It can be grown on substrates containing lignin, cellulose and hemicelluloses. Substrate should be fresh and dry. Substrates exposed to rain or harvested premature (green colour) are prone to various weed moulds which may result in failure of the crop. It can be grown on straw of paddy, wheat, ragi, maize/bajra/cotton stalks and leaves, sugarcane bagasse, cotton and jute wastes, dehulled maize cobs, tea/coffee waste etc., However cereal straw (paddy/wheat) easily available in abundance, is being widely used.

Straw is chopped in small pieces (2-4 cm size) and soaked in fresh water for 8-16 hours. This period can be reduced when pasteurization is to be done by steam. Main purpose of soaking is to saturate the substrate with water. It is easier to soak if straw is filled in gunny bag and dipped in water. The substrate can be treated in various ways as follows:



STUDENTS CUTTING PADDY STRAW

a. Hot water treatment:

Water is boiled in wide mouth container and chopped wet straw filled in gunny bag is submersed in hot water for 40 minutes at 80-90°C to achieve pasteurization. This is very popular method particularly with small growers.



Hot water treatment

b. Steam pasteurization:

Wet straw is filled inside insulated room either in perforated shelves or in wooden trays. Steam is released under pressure from a boiler and temperature in side substrate is raised to 65°C and maintained for 5-6 hours. Air inside the room should be circulated to have uniform temperature in the substrate.

C. Chemical sterilization technique:

Hundred liters of water is taken in a rust proof drum (preferably of galvanized sheet) or G.I. tub of 200 liters capacity. Ten to twelve kg of paddy straw is slowly steeped in water. In another plastic bucket, Bavistin 7.5 g and 125 ml formaldehyde (37-40%) is dissolved and slowly poured on the already soaked paddy straw. Straw is pressed and covered with a polythene sheet. After 15 to 18 hour the straw is taken out and excess water is drained. One can use a larger container or cemented tank of 1000-2000 liters for soaking more straw. The chemicals to be added can be calculated accordingly. The remaining solution can be used at least once again for chemical sterilization of straw without any further addition of chemicals. Some of the farmers fill the prewetted substrate in nylon net bags and press these bags in to the cemented tank containing chemical solution. This makes the process of taking out of substrate easier.



GRASS STERILIZATION AND DRYING

d. Sterilization / Autoclaving:

Substrate is filled in polypropylene bags (35x45cm, holding 2-3 kg wet substrate) and sterilized at 15 lb psi for 1 hour. Once pasteurization/sterilization is over straw is shifted to spawning room for cooling, bag filling and spawning.

2. Spawning and spawn run

Higher spawn dose 4-5% of wet substrate is used. Layer spawning is preferred. After spawning bags are shifted to spawn running room and kept in dark where temperature 25-35°C and relative humidity above 80% are maintained. It takes about 20 days when substrate is fully colonised and bags are ready for casing.



MUSHROOM BAGS PREPARATION

Spawn run bags:

Higher spawn dose 4-5% of wet substrate is used. Layer spawning is preferred. After spawning bags are shifted to spawn running room and kept in dark where temperature 25-35°C and relative humidity above 80% are maintained. It takes about 20 days when substrate is fully colonised and bags are ready for casing.

3. Casing

The casing means covering the top surface of bags after spawn run is over, with sterilized casing material in thickness of about 2-3 cm. Casing provides physical support, moisture and allows gases to escape from the substrate. Casing material (soil 75% + sand 25%) with pH adjusted to 7.8-7.9 with chalk powder is sterilized in autoclave at 151b psi for one our or chemically treated with formaldehyde solution (4%) about a week in advance of casing. Solution should be enough to saturate the soil. It is covered with polythene sheet to avoid escape of chemical and at a interval of 2 days soil is turned so that

at the time of casing soil is free from formalin fumes. Bag's top is made uniform by ruffling top surface of the substrate and sprayed with solution of carbendazim (0.1%) + formaldehyde (0.5%). Casing material is spread in uniform layer of 2-3 cm thickness and sprayed with solution of carbendazim and formaldehyde to saturation level. Temperature 30-35°C and R.H. 80-90% are maintained.



Casing

Cropping

It takes about 10 days for mycelium to reach on top of casing layer when fresh air is introduced while maintaining temperature and R.H. as above. Light should be provided for long time (10-12 hour daily). The changes thus made in environment, result in the initiation of fruiting bodies with in 3-5 days in the form of needle shape which mature in about a week. Mushrooms 7-8 cm diam. are harvested by twisting, cleaned and packed in perforated polythene/polypropylene bags for marketing. Mushrooms can also be wrapped in klin film for longer storage.



Cropping



4. Crop management

a. During substrate preparation

Substrate is major source of weed moulds and disease-causing organisms. Hence substrate should be chopped and soaked at a distance from bag filling/spawn running and cropping areas. The worker chopping straw should not be involved in bag filling and spawning without taking bath and change of cloth.

b. During bag filling, spawning and Spawn running stage:

- i. Bag filling and spawning room should be sprayed with formaldehyde (1%) twice in a week. Persons doing the process should take bath and change the cloth before the job. There should not be much air movement in the room. For large scale production it is advisable to have Hepa filtered air circulation. Spawn running rooms should be sprayed as given below:
 - ii. Formaldehyde 0.5% (5ml/litre of water) once in a week.
 - iii. Malathion 0.1% (1 ml/litre of water) once in a week.

Room should be protected from the rates and files by providing iron frame and nylon net on windows.



Bag filling and spawn running stage

c. During casing and cropping:

At the time of casing of the bags open the top surface spray carbendazim (1 gm) + formaldehyde (5ml) in 1 litre of water do casing and repeat it on casing soil and inside the room and again after a week. It should not be sprayed on mushroom. Malathion (0.1%) should be sprayed in evening or next day to protect from files. It should not be sprayed on mushrooms.

If any patch of mould (it may be green/blue/brown) is noticed do spot treatment with formaldehyde (4%, 40 ml/litre) soaked cotton by touching it o and around the spot. This will kill the mould. Before removal of bags spray formaldehyde (2%) to dispose off spent substrate away from the farm.



Casing and cropping

d. Water management:

This is very important for a good and healthy crop. During rainy season-controlled watering is required and watering once may be enough. During winter watering twice may be sufficient. However, during summer, it is very important as loss of water is more and it becomes very difficult to maintain required RH and moisture of the substrate. During such period one should spread sand on floor and use mist sprayer 3-4 times and frequently check the moisture of the casing by touching. Watering should also be adjusted to maintain RH (80-85%) inside cropping room.

Spent Mushroom Substrate:

The SMS of milky mushroom has not been studied much as the cultivation of this mushroom has remained confined to only few pockets of Southern peninsular regions of India only. As the substrate and the methodology used for substrate production are similar to that of *Pleurotus* spp. so it can be presumed that the physical properties of this SMS will be similar to that of SMS from oyster mushroom. The biochemical properties, which more depend upon the species used for cultivation, are bound to vary from specie to specie.

Utilities:

Even with respect to its utility for cultivation of other mushrooms, for vermicomposting, bioremediation, biocontrol of diseases and insect pests of crop plants, biofuel production and composting for manure preparation has not been studied much. Considering the physical structure and bulk of SMS from milky mushroom there are possibilities that it can found uses in biofuel production that includes extraction of enzymes for their use in bio-ethanol production, briquette making and their use in heat generation and composting for manure preparation.

Economics of milky mushroom production (50kg/day):

The cost of production depends upon the cost of raw material, yield/unit, production level and the whole sale price. At present the whole sale price in different parts of the country is between Rs. 45-60/kg. The information given below is a model to workout cost of production for a medium size mushroom production unit keeping in view an average yield. One has to keep in mind the above factors while working out the cost of production.

Revenue of Surpluses:



DISTIBUTED MUSHROOM TO OUR OFFICE SUPERINTENDENT



MUSHROOM CROP

2017-18



Students are involved in paddy straw cutting

2018 - 19



Paddy straw - used for mushroom preparation

2019-20



Mushroom spawn

Students are preparing mushroom bags



Spawn running bags



Pinnates formed



Developing crop

2022 - 23



Chemical sterilization



Preparing mushroom bags with students



Bags filling with paddy straw and spawn



Bags are stored in dark room