ISSN–0974–0759 | ●●● Popular Article ●●● |Visit us : *www.researchjournal.co.in*|


Cultivation of winter (*Flammulina velutipes*) and wood ear (*Auricularia auricula*) mushrooms

Durga Prasad[1] and Ramji Singh[2]
[1]Department of Plant Pathology, College of Agriculture (Agriculture University, Jodhpur), Baytu, Barmer (Rajasthan) India
[2]Department of Plant Pathology, College of Agriculture (S.V.P.U.A.T.), Meerut (U.P.) India
(Email : dp.coabaytu@gmail.com)

Winter mushroom (*Flammulina velutipes*) : Winter mushroom has been reported to occur naturally on various trees namely; poplar (*Populus* spp), willows (*Salix* spp), elms (*Ulmus* spp) plum (*Prunus* spp), maple (*Acer* spp) and birch (*Betula* spp) as a parasite and later as a saprophyte growing on the trunks or stumps of these broad-leaved trees from the end of autumn to early spring. Its fruit bodies grow at temperature between -2 and 14 ^{0}C under low intensity winter light. *Flammulina velutipes* is cultivated all over the world. This mushroom is particularly known for its taste and preventive as well as curative properties for liver diseases and gastroenteric ulcers.

Cultivation technology: Sawdust and rice bran / wheat bran are commonly used as substrates for cultivation. Saw dust of broad tree leaves is required for the cultivation of this mushroom. Sawdust media have oxygen and water which is necessary for mycelial growth. Rice bran/wheat is used as a supplement which provides many of the essential nutrients. Much of the lignin, cellulose and monosaccharide are provided by the sawdust. Saw is wetted thoroughly with water for 16-18 hrs. Generally, equal quantity of saw dust is poured in equal quantity of water in 100 liters capacity tubs. After wetting 5 per cent wheat bran is added in the saw dust and mixed thoroughly. Following steps involved in cultivation of winter mushroom.

Containers : This mushroom can be grown in a variety of containers like Polypropylene bags, plastic bottle, vinyl bag, filter bag and jars.

Filling : Polypropylene bags (2000 g) are used for the cultivation. Two kg substrate (soaked) was filled in each bag. The bags are plugged with nonabsorbent cotton by inserting a ring in the mouth of the bag.

Sterilization : The filled bags are sterilized in the autoclaves for 1½ hour at 15 lbs pressure per square inch.

Inoculation : After the bags have been sterilized and cooled down to 20°C, they are inoculated with wheat grain based spawn. Saw dust spawn can also be used which growers may purchase from specialist spawn makers.

Substrate (substrate + wheat/rice bran)
▽
Wetting up to 65%
▽
Pasteurization at 22 p.s.i. for 1.5 hrs
▽
Spawning with wheat grain based spawn @ 4% dry wt. basis
▽
Incubation (22-25 °C, high CO_2, dark)
▽
Pinning (10-14 °C, RH 85%, light 800 lux)
▽
Maturation (3-5 °C, RH 80%)
▽
Harvesting (Yield @ 300-400g/kg wet wt. basis)
▽
Marketing/ sun-drying
▽
Packing

Fig. 1: Flow chart of flammulina cultivation

Substrate (wheat/rice straw)
▽
Wetting in water for 10-12 hrs
▽
Drain out excess water (3-4 hrs)
▽
Mixing wheat bran (@ 4% at wet basis)
▽
Filling in PP bag (2kg capacity)
▽
Pasteurization (22 p.s.i. for 2hrs)
▽
Spawning (@ 2% dry wt. basis)
28-30days
▽
Spawn run
▽
Removing polythene bags
▽
Pinning stage
After 3-4days
▽
Harvesting (Yield 800g – 1.4kg/kg dry wt. basis)

Fig. 2 : Flow chart for cultivation of wood ear mushroom

Sawdust spawn is prepared by mixing ten parts of sawdust with one part of rice bran and enough water to provide a certain degree of humidity.

Incubation (*Spawn run*) : The Bags are placed/ arranged in incubation rooms where mycelia can grow favourably. The optimum temperature for the mycelial growth is between 22 and 25°C, so the temperature of incubation room is kept between 20°C and 23°C under the normal commercial cultivation conditions. Mycelia spread over the whole bag after 20-25 days.

Fruiting induction : When mycelial spread to 90% of the bag space, the plug is pulled off, the neck of the bag is unfolded and the surface of the media is made smooth for fruiting (Fig.3). Bags are then placed in the dark at a temperature of 10 -14 °C and the humidity is maintained at 80 -85%.

Fig. 3 : ***Flammulina velutipes***

A moisture level in the bags is important to fruiting. Good fruit bodies are encouraged to form by adjusting the humidity in the room to maintain the correct moisture content of the substrate. Primordia are formed in 10-14 days after reducing the temperature.

Controlling : At 10 -12°C, the fruit bodies grow rapidly, but they are slender, long, and of poor quality (Fig.3 and 4). For this reason, the growth of fruit bodies is controlled by lowering the temperature to 3-5°C and providing air movement (3- 5 m/sec) which provide stiff, white, and drier fruit bodies. This control is continued for 5-7 days, from the period when the cap's differentiation is observed with the naked eye to the period when the length of the stem reaches 2 cm.

Cropping : When the fruit bodies are from 13-14 cm, the rolled paper is removed and fruit bodies are pulled up from

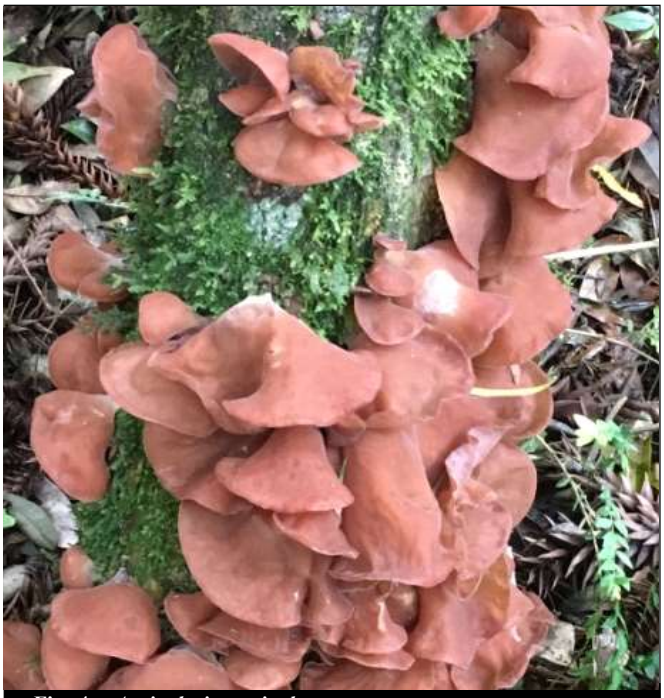

Fig. 4 : ***Auricularia auricula***

the bottle and packed. It takes about 50-60 days from the initial fruiting to the crop. The first crop usually amounts to 100- 140 g/ 800 ml bags and the second crop from 60-80 g in the same bag.

Management : The initiation of fruit bodies starts in dark but light is necessary for the further development. At the time of fruit body formation, temperature of cropping room should be lowered to 8-12°C with relative humidity from 80-85 per cent.

Harvesting : When the fruit bodies are 14-18 cm long, the fruit bodies are harvested. They are packed in PP bags or can be sun dried. After harvesting, second flush appears in about 15 days. Only two flushes are harvested. About 360-400 g fresh mushrooms can be harvested per bag containing 2 kg wet substrate.

Wood ear mushroom (*Auricularia auricula*) : The two main species cultivated commercially are: *Auricularia polytricha* and *A. auricula*. *A. auricula* is thin and light in colour whereas *Auricularia polytricha* is darker, thicker and long haired. This mushroom has a special quality of retaining its characteristic crispness on cooking. The cultivation of this mushroom is undertaken as follow.

Cultivation technology:

– Take good quality wheat straw

– Soak the straw overnight for 16-18 hrs and later remove the straw and drain out excess of water

– Mix 4-5% wheat or rice bran on wet weight basis

– Fill 2 kg substrate in polypropylene bag and

autoclave at 15 lbs pressure for 2 hours

– On cooling, spawn the substrate @ 2% aseptically and incubate at 25-30°C for spawn run for 20-25 days

– Cross cut or give slits and hang the bags for fruiting at 25°C and 85-90% RH

– Spray water daily and provide diffused light and aeration 2 hours daily

– Mushroom appears after 5-7 days of the opening of bags, which become ready to harvest in next 4-5 days

– Mushroom Mushrooms are easily harvested by hand

– In 3-4 flushes, which appears at an interval of 8-10 days, 0.7-0.9 kg mushrooms can be harvest from one bag

– The fruit bodies can be marketed either fresh or sun dried

Management : Proper hygienic conditions are necessary because addition of wheat/ rice bran may attract moulds in the absence of autoclaving. Presence of high level carbon dioxide results in development of abnormal fruit bodies and long stalks and small pileus. The absence of light also produces abnormal underdeveloped mass of fruit bodies. Under very humid conditions cob web has been found to attack this mushroom.

Harvesting : Harvesting is done by slight twisting. Mushrooms harvested from wood logs have longer hair, more tough texture, less attractive colour and longer production period than from straw bags. In 3-4 flushes, one can harvest 1.0-1.4 kg fresh mushrooms/kg of dry straw. The fruit bodies can easily be sun dried with dry matter of 8-12 per cent. This mushroom retains its characteristic crispness on cooking.

References :

Beetz, A. and Kustudia, M. (2004). Mushroom cultivation and marketing. *National Sustainable Agriculture Information Service.* 1-800-346-9140.

Breene, W. M. (1990). Nutritional and medicinal value of specialty mushrooms, *J. Food Protect*., **53** : 883-894.

Chang, S.T (1991). Cultivated mushrooms. *In Handbook of Applied Mycology*., **3**: Foods and Fees, 221231. Edited by D. K. Arora, K.G. Mukerji and E. H. Marth. New York Marcel Dekker Ink.

https://iasri.icar.gov.in/

https://nrcmushroom.org/html/technicalbulletin.html

https://www.agrimoon.com/

Singh, M., Vijay, B., Kamal, S. and Wakchaure, G.C. (2011). Mushrooms: cultivation, marketing and consumption. Directorate of Mushroom Research. ICAR-Chambaghat, Solan –173213 (HP), 266pp.

Received : *05.02.2022* ***Revised :*** *02.03.2022* ***Accepted :*** *11.03.2022*