



A Review on Nutritional Requirements of Some Edible Mushrooms

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Abstract - In this article, the nutritional composition and quality of mushrooms depends on strain, substrate, cultivation technology, harvest management and potential. Environmental conditions are very important for successful growth because it requires a lower temperature, the temperature for the growth of *A. bisporus* mycelium is 22°C -25°C and at the time of fruiting the temperature is 14°C -18°C the required humidity is high, for growing mushrooms is the most important compost. High summer temperatures were unfavorable for the growth of *A. bisporus*. The optimum temperature for mycelial growth of *A. campestris* was 25°C. The best harvest of *C. indica* is between August and October at a prevailing temperature of 25-28°C and a relative humidity of 75-84%. In the case of *Pleurotus*, optimum mycelial production was recorded at pH 6.4, while a pH range below 5 showed no significant growth. The fruit of *Pleurotus* spp. requires a temperature range of 10-30°C (depending on the species), ventilation, light, humidity and humidity of 80-95%.

Keywords: Edible mushrooms, strain, substrate, harvest management, temperature.

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1. Introduction

Mushrooms are a group of live macro fungus with a distinctive fruiting body without chlorophyll and are reproduced by spores. Mankind considered fungi as good source of drugs and health food [1]. Owing to their attractive taste, aroma and nutritional values, edible mushrooms are valuable components of the diet, as quoted in literature by many workers, some are [2].

Mushrooms have good flavor, texture, and also all essential amino acids for humans, including lysine and methionine which are commonly deficient in plants [3]. More than 2,000 species of edible mushrooms exist in nature, but around 25 species are well known as edible and few are commercially cultivated. Cultivation of edible mushrooms with minimizing environmental pollution is an upcoming area [4].

Most mushrooms have high protein content, usually around 20–30% by dry weight. This can be useful for vegetarians or anyone looking to increase the protein content in their diet. Fiber helps to lower cholesterol and is important for the digestive system. Niacin and other important B vitamins are found in many edible mushrooms. As certain B vitamins are found in animal tissue but not plants, this can be another good supplement for vegetarians. Vitamin D is also present which is essential for the absorption

of calcium. Fruiting bodies, in general, on dry weight basis, contain about 55% carbohydrate, 32% protein, and 2% fat, and the rest is ash constituting the minerals [5].

Therefore, the commercial cultivation of these mushrooms is steadily increasing to exploit their metabolic products for human health. Mushrooms are also blessed with a variety of hydrolyzing and oxidizing enzymes [6]. Various species of edible mushrooms grow in India are:

(i) **Oyster mushroom:** Oyster mushroom commonly known as “Dhingri” in India. *Pleurotus* species, commonly known as oyster mushrooms, are edible fungi cultivated worldwide especially in south East Asia, India, Europe and Africa [7]. Oyster mushrooms are the third largest [8].



Fig. 1: The common name of mushroom is Dhingri.

1.1 Habitat

Most of the species of *Pleurotus* are saprophytes, found growing on dead branches of

trees in nature [9]. They are found in both tropical and temperate climate throughout the World.

1.2 Cultivation

Oyster mushrooms are cultivated worldwide because of its easy cultivation technology, availability of raw materials and number of species suitable for environment [10]. Falck in Germany performed the first successful experimental cultivation of *P. ostreatus*. Falck inoculated tree stumps and wooden logs with mycelium of *P. ostreatus* (*Agaricus ostrelis*) and could harvest fresh oyster mushroom [11].

Furthermore; Block *et al.* cultivated *P. ostreatus* first time under laboratory conditions using sawdust as substrate. They used a mixture of oatmeal, sawdust for the cultivation, and found best results on eucalyptus sawdust followed by pine sawdust. They reported some growth abnormalities in fruit bodies due to insufficient light conditions and found optimal mushroom production within 10-32°C temperature range [12]. *Pleurotus* has the characteristic ability to colonize plant wastes with low nitrogen content and to produce fruiting bodies of high nitrogen content.

Cropping activities generate large volumes of organic by-products or wastes rich in lignocellulosic composition. The biomasses cause disposal problems and pollute the environment [13]. The base materials that can be used for spawn production are chopped rice

straw, sawdust, tealeaves, coffee hull, cotton waste and cereal grains. The spawned substrate bags are kept in a dark room at temperature around 25°C, which is optimum for mycelial growth for most of *Pleurotus spp.* It takes 3-5 weeks to colonize the substrate throughout by the mycelium of mushroom, depending on the substrate and species of *Pleurotus* used [14].

Quimio, *et al.*, suggested corn cobs, cotton waste, sugarcane bagasse and corn leaves as good substrates for growing these mushrooms. Optimum mycelia production was recorded at pH 6.4 while pH range less than 5 showed no significant growth. This report is in line with the findings of Quimio *et al.* [15]. Decrease in mycelia growth at lower pH could be due to the toxicity of very acidic pH to the hyphae. Water is sprayed daily and in 3-4 days mushrooms start coming out along all sides of the bag. Fruiting of *Pleurotus spp.* requires a temperature range of 10-30 °C (depending on individual species), ventilation, light, moisture and humidity of 80–95% [15].

2) Table mushroom:

The white button mushroom (*Agaricus bisporus*) is very popular as table mushroom, cultivated mushroom which is edible basidiomycetes fungus, throughout the world and is the most important mushroom of commercial significance in India. The original wild form bears a brownish cap and dark brown gills but more familiar is the current variant with a white form, having white cap, stalk and flesh and brown gills [17]. *Agaricus* is the most

cultivated mushroom and accounts for the 38% of worlds cultivated mushrooms [18].



Fig. 2. : Common name is White button mushroom.

1.3 Habitat

As a group, agarics occur in a wide variety of habitats ranging from arctic to the tropics. While some species are known only from restricted areas, others exist in areas that are widely separated geographically. Even so, most species do seem to show preference for a certain type of natural habitat as well as for a particular substrate. They contain parasitic, saprobic, and mycorrhizal forms [19].

1.4 Requirements

For successful growth the environmental conditions are very much important ,as it requires less temperature, the north india in winter take the advantage of growing the mushrooms and the temperature for mycelium growth is 22°C -25°C and at the time of fruiting the temperature is 14°C -18°C the humidity required is high, the compost is the most important thing for cultivation of mushrooms,

for increasing the area of cultivation mostly shelves or trays system is adopted and required measurements should be taken to avoid the moulds and pests attack [1].

1.5 Cultivation

Scientific confession of the commercial cultivation of *A. bisporous* was made by French botanist Joseph Pitton de Tournefort in 1707 [20]. In 1893, pure culture, spawn was discovered and produced by the Pasteur Institute in Paris, for cultivation on composted horse dung [21].

The substrate for culturing *A. bisporous* is the most complicated culture medium used for edible mushroom production. The compost is prepared by a two-stage mechanism. In the first stage, a mixture of raw materials, animal manure (such as stable bedding or poultry manure) and gypsum are assembled, wetted and formed into a stack (windrow). The cultivation of this species has succeeded on different composted organic media such as chicken, horse or pigeon manures, straw residues from wheat, oat, Tifton [22], corn cob, molasses, wheat bran [23], etc.

Automated harvesting of *A. bisporous* by machine at the laboratory level; and the resulting pilot harvester was completely tested on a commercial mushroom farm. The apparatus associates various handling systems and mechatronic technologies. Mushrooms are located and sized using image analysis and a

monochromatic vision system. An expert selection algorithm then decides the order in which they should be picked and selection of picking action (bend, twist or both) [24, 25].

2. Milky White mushroom

2.1 Habitat

In nature, milky white mushrooms are seen grown on humus rich soil in agricultural fields or along the roadside in tropical and subtropical parts of India, especially in the plains of Tamil Nadu (South Indian State) and in Rajasthan (located in the western edge of India) [26].



Fig. 3. : Common name Dhuth chatta

2.2 Requirements

Considerable attention has been given by various authors to understanding the optimal physiological and culture requirements of *C. indica* for mycelia growth, tissue culture, spawn production and cultivation [27-29]. The majority of the results indicate that the time required for maximum mycelia growth in culture media like

potato dextrose agar or malt extract agar is 8 to 10 days. The pH requirement has been reported to have a wide optimal range, between 5.5 and 8.5. The optimum temperature for mycelia growth and mushroom production has been reported to be around 30-35° C. At temperatures below 25° C or above 38° C did not support the growth of *C. indica*.

2.3 Cultivation

Sorghum or wheat grains were found to be the best substrates for *C. indica* spawn production [30, 31]. During preparation of the spawn culture, these substrates are half cooked in water for about 30 min and the excess water is usually drained before the grains are slightly air-dried and mixed thoroughly with 2 wt% calcium carbonate [32]. This wet substrate is then transferred to auto cleavable polypropylene bags (usually 30 × 12 cm), which should be filled up to 75% volume and sterilized at 1.42 kg/cm² pressure for 2 hours. After cooling to ambient temperature, the bags should be aseptically inoculated with the mushroom mycelia, closed and incubated at 30° C. After 15 to 20 days of incubation, complete colonization of the substrate by the mushroom mycelia should be observed, meaning that they can be used for culture bed inoculation [34].

Purkayastha used chopped rice straw, pre-soaked for 18 to 24 hr in water and put in hot water for 2 - 3 hrs. This substrate was filled in trays and seeded with spawn. In a separate

study, Kumar *et al.* [34] evaluated 11 different supplements viz., wheat bran, soybean flour, pigeon pea powder, green gram powder, cotton cake, mustard cake, neem cake and lentil powder. Small scale mushroom growers prefer to grow this tropical mushroom due to the following reasons [35].

- (1) Ideally suited to warm humid climate (30~38oC; 80% to 85% humidity).
- (2) Its longer shelf life without any refrigeration (can be stored up to 7 days at room temperature).
- (3) Retains fresh look and does not turn brown or dark black like that of button mushrooms.
- (4) Lesser contamination due to competitor molds and insects during crop production under controlled conditions.
- (5) Infrastructure needed to grow this mushroom is very much affordable and cost of production is comparatively low, which means industrial production could be attractive and
- (6) Has a short crop cycle (7 - 8 wk) and good biological efficiency of 140% (140 kg fresh mushroom/100 kg dry substrate).

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3. Conclusion

The exact time and method of applying the additive is the prerequisites for obtaining anticipated results, and the process of composting, growth, hygiene and the temperature control for the selection of hygiene measures, and especially in uniform distribution hour.

The products used on the substrate are affecting future yields. There is immediate need to increase the temperature after addition; e.g. modern facilities (air conditioning growth and mechanical shelves for harvesting) additives may be added to colonial compost for the body layer.

Therefore, since cultivated mushrooms are highly nutritious foods that can be grown on biological waste, agricultural waste or agricultural industrial waste, environmental conditions can be controlled, thus avoiding excessive composting temperatures.

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