

Button Mushroom: Cultivation, Utilization and Processing

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Introduction

Button mushroom is a rich source of good quality proteins having most of the essential amino acids, vitamins and minerals and is popular for its delicacy and exotic flavour. Its production has tremendous scope as an income generating activity. It requires little space or land, hence it is of great importance for landless and marginal farmers. Mushrooms can be treated as a healthy and nutritive food, supplying good amount of protein, minerals and vitamins. They are recommended as alternative source of proteins for bringing the protein malnutrition gap in the developing countries of the world.

Cultivation / Production

The method of cultivation of mushroom was recorded as early as 300 BC and their international cultivation was started as early as 600 AD in China. Large scale white button mushroom production is centred in Europe (mainly western part), North America (USA, Canada) and S.E. Asia (China, Korea, Indonesia, Taiwan and India). White button mushrooms are grown all over the world and account for 35-45% of the total mushroom production. At present the total mushroom production in India is approximately 0.13 million tons. The mushroom industry in India has registered an average growth rate of 4.3 per cent annum. Out of the total mushroom produced, white button mushroom share is 73 per cent followed by oyster mushroom (16%), paddy straw mushroom (7%) and milky mushroom (3%) compared to other vegetables; per capita consumption of mushroom in India is meager and data indicates it is less than 100 grams per year. In India, commercial production of white button mushroom was initiated in the hilly regions of the country (17- 18 °C) like Chail (Himachal Pradesh) Kashmir and Ooty (Tamil Nadu). Recently, Himachal Pradesh, Punjab, Haryana, Uttar Pradesh, Maharashtra, Tamil Nadu, Karnataka and Andhra Pradesh are a major mushroom producing state (seasonal cropping during winter). The total white button

mushroom produced in India from both seasonal and high tech cultivation units is estimated at 94676 metric tons. Out of this, approximately 8500 metric tons of button mushrooms was produced from the seasonal growing units located in Haryana and Punjab which accounted for 9% of total button mushroom production (Sharma *et al.*, 2017).

Utilization

Mushrooms are the health food of the world. Analysis of fresh button mushrooms show that, they contain 90 to 93 per cent moisture, 28 to 42.5 per cent crude protein, 8.3 to 16.2 per cent crude fibre, 9.4 to 14.5 per cent ash, 59.4 per cent carbohydrates and 3.1 per cent fat. Among the minerals 71 mg calcium, 912 mg phosphorous, 106 mg sodium, 8.8 mg iron and 2850 mg potassium (per 100 g dry weight basis) are present. Among the vitamins 8.9 mg thiamine (B1), 3.7 mg riboflavin (B2), 26.5 mg ascorbic acid (C) and 42.5 mg niacin (B3) are also available on 100 g dry weight basis.

Mushrooms are good as nutritious food for all ages and under all conditions of health. They are rich in good quality proteins with lysine and tryptophan that are normally deficient in cereals. The carbohydrates in the mushrooms are at a level of 4.5 to 5.0 per cent but are in the form of glycogen, chitin and hemicelluloses instead of starch. The fat contain is as low as 0.3 % but is rich in linoleum acid, an essential fatty acid. Cholesterol is absent and in its place ergo-sterol is present which gets converted to vitamin D by the human body. Mushrooms are fairly good source of vitamin C and vitamin B complex, particularly thiamine, riboflavin, niacin, biotin and pantothenic acid. Folic acid and vitamin B12 which are absent in most vegetables are present in the mushrooms which also supply a range of valuable minerals especially potassium and iron (Mehta *et al.*, 2012).

Mushrooms have traditionally been used for medicinal and tonic properties and cosmetic products. Compounds extracted from button mushroom have been reported to have anti-fungal and anti-bacterial properties. The high proteins, sterols, macro-elements and low calorie content make mushroom ideal for prevention of cardiovascular diseases. Thus they are an ideal food ever for patients, old people, pregnant ladies and children. Therapeutic properties of mushroom include enhancement of macro phase function and host resistance to many bacterial, viral, fungal and parasitic infections, activation of non-specific immune stimulation and reduction of blood cholesterol and glucose levels.

Processing

In view of Mushroom's high perishable nature, the fresh mushrooms have to be processed to extend their shelf life for off season use. This can be achieved by adopting appropriate post-harvest technology to process surplus mushrooms into novel value added products. The value-added products are the need of the hour for the mushroom growers not only to reduce the losses but also to enhance the income by value-addition and boost the consumption of this important horticultural crop. The possible value-added products can be developed either by converting freshly harvested mushrooms into ketch-up, murabba, candy, chips and pickles or by dehydrating freshly harvesting mushrooms into dehydrated form and then making soup powder, biscuit, nuggets ant RTE.

1. Mushroom Ketch-up:

Freshly harvested button mushrooms are washed in 0.05 per cent KMS Solution, sliced and cooked in 50 per cent of water for 20 minutes. Mushroom paste is prepared using a mixer grinder with 0.2 per cent Arrarote, 1.5 per cent acetic acid and other ingredients and cooked to bring its TSS to 35 °Brix. Then the ketch-up is filled in the sterilized jars.

Followings are the ingredients that are used for preparation of ketch-up are:

S.No	Ingredients	S.No	Ingredients
1.	Salt 10 per cent	7.	Vanilla essence 0.02 g
2.	Sugar 25 per cent	8.	Garlic 0.5 per cent
3.	Acetic acid 1.5 per cent	9.	Red chilli powder 1.0 per cent
4.	Sodium benzoate 0.065 per cent	10.	Ajinomoto 0.2 per cent
5.	Onion 10 per cent	11.	Arrarote 0.2 per cent
6.	Cumin 1.0 per cent	12.	Black pepper 0.1 per cent

2. Mushroom Murabba:

A murabba is made by cooking it whole or in the form of pieces in heavy sugar syrup, till it becomes tender and transparent. In preparation of 1kg mushroom murabba 1.250 kg of sugar is required and cooking is continued till a concentration of at least 68 per cent of soluble solid is reached. Freshly button mushrooms are graded, washed, pricked and blanched in 0.05 per cent Potassium metabisulphite (KMS) for 10 minutes. It is treated with 40 per cent of its weight of sugar daily for 3 days. Then, mushrooms are taken out from the syrup and 0.1 per cent citric acid and remaining 40 per cent of sugar is mixed in

the syrup. After making its concentration to 65°Brix, mushrooms are added in the syrup and the good quality murabba is prepared (Arumuganathan *et al.*, 2005).

3. Mushroom Candy:

A fruit or vegetable impregnated with sugar, subsequently drained and dried is called a candied fruit or vegetable. The total sugar content of the impregnated fruit or vegetable is kept at about 75 per cent to prevent fermentation. Fresh mushrooms after harvesting are subjected to washing and halved into two pieces. Halved pieces are blanched for 5 minutes in 0.05 per cent of KMS solution. After draining for half an hour they are treated with sugar. Sugar treatment is given at the rate of 1.5 kg sugar per kg of blanched mushroom. Initially sugar has to be divided into three equal parts. On the 1st day, blanched mushrooms are covered with one part of sugar and kept it for 24 hours. Next day, the same mushrooms are covered with 2nd part of sugar and again kept for overnight and on the third day mushrooms are removed from the sugar syrup. This sugar syrup is boiled with 3rd part of sugar and 0.1 per cent of citric acid to bring its concentration up to 70°Brix. Blanched mushrooms are mixed with this syrup and again the contents are boiled for 5 minutes to bring its concentration up to 72 °Brix. After cooling, the mushrooms are removed from the syrup and drained for half an hour. The drained mushrooms are placed on the sorting tables to separate only defected and unwanted pieces are subjected to drying in a cabinet drier at about 60 °C for about 10 hours. As soon as they become crispy, all mushrooms are taken out and packed in polypropylene bags. The candy can be stored up to 8 months with excellent acceptability and good taste. Joshi *et al.* (1991) developed sweet chutney from button mushroom and the storage of the product was more than a year.

4. Mushroom chips:

The freshly harvested button mushrooms are washed, sliced and blanched in 2% brine solution. The mushrooms are dipped overnight in a solution of 0.1 per cent of citric acid +1.5 per cent of NaCl+ 0.3 per cent of chilli powder. After draining off the solution, the mushrooms are subjected to drying in cabinet dryer at 60⁰C for 8 hours. Then it is fried using the refined oil and good quality chips are prepared. Garam masala and other spices can be spread over the chips to enhance the taste. After spice mixing, the chips are packed in polypropylene packets and sealed after proper labelling.

5. Mushroom biscuit:

Mushroom biscuit is prepared from mushroom powder by mixing it with following listed ingredients:

S.No	Ingredients	S.No	Ingredients
1.	Maida 100 g	5.	Vanilla essence 0.02 g
2.	Sugar 30 g	6.	Baking powder 0.6 g
3.	Fat 45 g	7.	Ammonium bicarbonate 0.3 g
4.	Glucose 1.5 g	8.	water 12 to 22%
5.	Salt 0.6 g		

6. Mushroom nuggets:

Nuggets are generally used for the preparation of vegetables curry along with suitable vegetable or alone in North India and are prepared from dhal powder such as black gram powder, soybean powder, urad dhal powder *etc.* It adds taste as well as nutrients to the meal. For preparation of mushroom nuggets, mushroom powder is mixed with the urad dhal powder and a paste is prepared by adding water. The ingredients are added to the prepared paste and round balls of 2 to 4 cm diameter are made out of the paste. The prepared balls will be spread over a tray and are sun dried. Thus the mushroom nuggets are prepared. Following are the ingredients that are used for preparation of mushroom nuggets: (i) Urad dhal powder 80%(ii) Mushroom powder 10%,(iii) Salt 2%(iv) Red chilli powder 1%(v) Sodium bicarbonate 0.01% and (vi) water 7%

7. Ready-to-eat mushroom curry (RTE): It is generally prepared from freshly harvested mushrooms. But it can also be prepared from dried button mushroom slices after its rehydration by adding the following ingredients:

S.No.	Ingredients	S.No.	Ingredients
1.	Onion 510 g	5.	Salt 160 g
2.	Green chilli 250 g	6.	Red chilli powder 150 g
3.	Garlic 250 g	7.	Curry powder 100 g
4.	Oil 400 ml		

8. Mushroom soup powder:

Soups are commonly used as food appetizers. Mushroom powder is produced from dried mushroom slices with the help of mixer. Then mushroom soup powder is prepared by mixing this mushroom powder with the following ingredients:

S.No	Ingredients	S.No.	Ingredients
1.	Mushroom powder 16 %	5.	Salt 10%
2.	Corn flour 5%	6.	Refined oil 4%
3.	Cumin powder 2%	7.	Suar 10%
4.	Milk powder 50%	8.	Black pepper 2%

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