



## VALUE ADDITION OF MUSHROOM

Mushrooms have huge health and nutritional benefits and can solve many problems of under-nutrition and malnutrition. Despite this fact mushroom cultivation and its utilization is not catching up fast because mushrooms are highly perishable. Thus it is important to process mushrooms into value added products which will not only cater to the protein and micronutrient requirement of masses but at the same time will solve the problem of short shelf-life and postharvest losses of mushrooms. Following are some technologies to process mushrooms into value added products with extended shelf life. Many persons do not purchase mushrooms as they don't know how to cook these. Hence we will read about some recipes.



### OBJECTIVES

After reading this lesson you will be able to

- preserve mushrooms using different methods like drying, canning, steep preservation;
- demonstrate preparation of various conventional value added products like mushroom pickle, biscuits, soup powder, nuggets, papad, etc;
- demonstrate various non-conventional value added products like mushroom fortified corn extrudates, ready to use/cook products, cake, noodles, pasta, etc;
- prepare various mushroom recipes.

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### 10.1 PRESERVATION OF MUSHROOMS

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Drying and canning are the two most popular methods of preservation. For short time preservation, we may also keep mushrooms in salt solution (steep preservation).



### 10.1.1 Drying of Mushrooms

As you are aware that drying is one of the most important methods to decrease the water content of the produce. The dried produce can be further utilized for preparing a number of value added products. Button mushroom cannot be easily sundried. However, mushrooms like oyster, shiitake, wood ear mushroom, etc can be easily sundried (Fig. 10.1). Besides sun drying, mushrooms can be dried in cabinet dryers at a drying temperature of 55-60°C which gives dehydrated final product of lower moisture content with longer shelf life and better quality.



**Fig. 10.1: Dried oyster mushroom**

Mushrooms have about 90% water and hence after drying these become very light. Care has to be taken while sun-drying. Mushrooms should be dried in dust free area and in containers where these don't get dispersed with wind. Additional advantage of sun drying is the increase in Vitamin D content in the mushroom. Mushrooms having open gills should be firstly dried with gill side upwards preferably in shade and then dried in sun.

You may use solar based heater. But it is important to monitor the temperature of drying. Temperature above 60°C is not desirable as it leads to charring of sugars, loss of flavour and also decrease in rehydrability (that is gain of weight on rehydration of the dry product).

You may powder the dried mushrooms and use it to make various products. Up to 10% powder can be added to flour that may be used to make biscuits, bread, cake or any other bakery product.

### 10.1.2 Canning of Mushrooms

Canning is a technique by which the mushrooms can be stored for longer periods up to a year and most of the international trade in mushrooms is done in this form.



## Notes

Mushrooms can be canned whole, sliced and stems and pieces as per demand. The canning process involves cleaning, blanching (5-6 minutes at 95-100°C), filling into can with brine solution (2% salt with 0.1% citric acid or 100 ppm ascorbic acid), sterilization by heat (118°C), cooling, labelling and packaging (Fig. 10.2).



Fig. 10.2: Canning of mushroom

### 10.1.3 Steeping Preservation of Mushrooms

This method is simple and economical and the mushrooms can be preserved for short period by steeping them in solution of salt or acids. Solution consisting of 2% sodium chloride, 2% citric acid, 2% sodium bicarbonate and 0.15% KMS is used for steeping preservation of blanched mushrooms for 8-10 days at 21-28°C (Fig. 10.3).

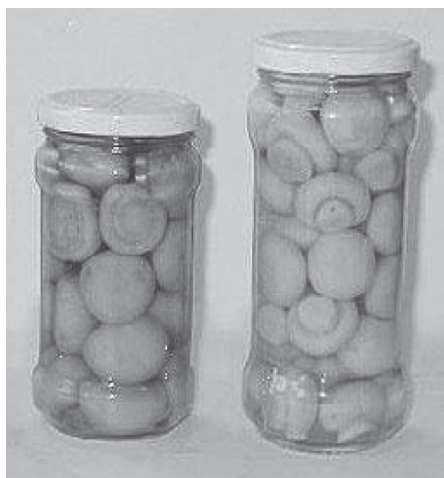


Fig. 10.3: Steep preservation



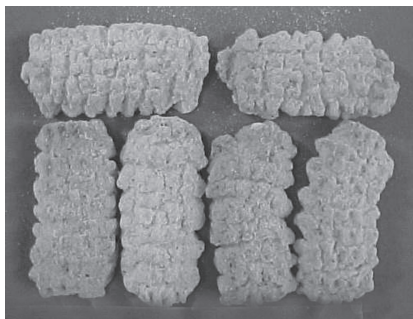
**INTEXT QUESTIONS 10.1**

Fill in the blanks

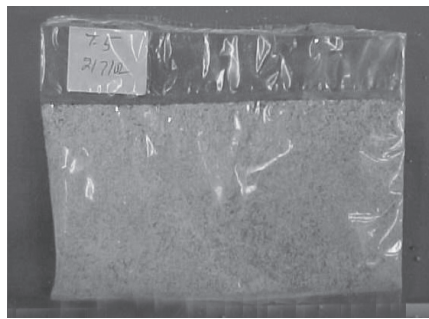
- (i) Mushrooms should not be dried at temperature above ..... °C.
- (ii) By canning mushrooms can be stored upto ..... year(s).
- (iii) Steep preservation is method for ..... term storage of mushroom.
- (iv) ..... mushroom cannot be easily sundried.
- (v) Sun drying increases Vitamin ..... content in the mushroom.

**10.2 VALUE ADDED PRODUCTS OF MUSHROOMS**

You can also prepare various value added products such as mushrooms pickle, jam, sauce, candy, preserve, chips etc. from fresh mushrooms whereas from the dried mushroom powder value added products like instant soup mix, bakery products, papad, nuggets etc. can be prepared (Fig. 10.4).



Mushroom Biscuit



Mushroom soup powder



Mushroom nuggets



Mushroom papad

**Fig. 10.4: Different products made using mushroom powder**



### 10.2.1 Conventional Products

#### Mushroom Pickle

Under our conditions, especially in rural area, it may not be possible to do canning of mushrooms. A locally accepted alternative is to make pickle. In fact, some mushrooms like milky mushroom are more accepted as pickle than as fresh product. Pickling of mushrooms is an easy home scale process for preservation of mushrooms to a value added product of high market acceptability. For preparing mushroom pickle, one kg mushrooms are washed in 0.03 to 0.05% KMS solution and then blanched for 5 min at 85°C. The blanched mushrooms are washed in cold water 2-3 times and the excess water is drained off. Mushrooms are cut in halves or quarters according to the size. Then the mushrooms are subjected to salt curing process, in which 20 g sodium chloride per kg of mushroom is added and kept overnight. The excess water that oozes-out of mushroom is removed on the next day. Mushrooms are allowed to dry for 2-3 hours and spices, salt and preservatives are mixed to the desired taste and quality of mushroom pickle. We add heated mustard oil from the top to the mixture and blend with both hands, leave overnight for imbibing of spices and flavour development, fill in plastic/glass jars and again top-fill with mustard oil, close the caps and seal the jars and store pickle at shaded ambient place.

For 1 kg mushroom you need various spices *viz.*, turmeric powder (20g), black mustard seed powder (35g), red chilli powder (10g), cumin seed powder (1.5 g), carom seed (10 g), nigella seed (kalonji) (10 g), fennel seed powder (1.5 g), salt (90 g) and mustard oil (200 ml). You may also use Acetic acid (upto 100 ml) and sodium benzoate within the permitted limits as preservatives. This pickle can be stored up to one year in the airtight bottles.

Given below is another recipe for making sweet-sour pickle of mushroom:

#### Sweet-sour/mixed mushroom pickle

##### Ingredients

Mushrooms	250 g
Onion	50 g
Ginger	25 g
Garlic	2-3 cloves
Mustard oil	100 g
Salt	1 spoon

### Value Addition of Mushroom

Red chillies	1/2 spoon
Garam masala	1/2 spoon
Jaggery	100 g
Vinegar /acetic acid	3 cup/ 1 spoon
Mustard seeds	10 g

### Method

1. Wash the mushroom and cut into small pieces.
2. Cut ginger, onion garlic into fine pieces.
3. Grind the mustard seeds coarsely.
4. Make a mixture of Jaggery and vinegar.
5. Heat the mustard oil and fry the mushrooms, keep fried mushrooms to one side.
6. Fry onion ginger, garlic till light brown.
7. To this add fried mushrooms and solution of jaggery and vinegar.
8. Then add mustard powder, chillies, salt and garam masala. Mix well and keep in sun for 2-3 days.

### Mushroom Preserve (Murabba)

For preparing mushroom preserve, fresh button mushrooms are graded, washed, pricked and blanched in 0.05% KMS solution for 10 min. Blanched mushroom are then dipped in 50 °Brix sugar solution and refrigerated overnight. Next day mushroom are strained out of sugar solution and to the solution we add 0.1% citric acid and sufficient sugar and heat to attain strength of 60 °Brix. Mushrooms are then again dipped into it and kept overnight. This process is repeated to raise the concentration of syrup to 70 °Brix and mushrooms are dipped into it for 1 week to prepare preserve. The preserve is then drained out of sugar syrup and filled in a container with freshly prepared sugar syrup of 68 °Brix. The containers are then sealed airtight and stored.

### Mushroom Candy

The process for making candy is practically the same as that employed for mushroom preserve, with the difference that the produce is impregnated with a higher concentration of sugar (75° Brix) and is also partially dried under shade to attain the chewable consistency. The mushroom candy can be stored up to 8 months with excellent acceptability.



Notes



### Mushroom Chips

For preparing mushroom chips, freshly harvested button mushrooms are washed, sliced (2 mm) and blanched in 2% brine solution. The mushrooms are dipped overnight in a solution of 0.1% of citric acid + 1.5% of NaCl + 0.3% of red chilli powder. After draining off the solution, the mushrooms are subjected to drying in cabinet dryer at 60°C for 8 hr. Then it is fried in the refined oil and good quality chips are prepared. After mixing the spices, the chips are packed in polypropylene packets and sealed.

### Mushroom Biscuit

Both button or oyster mushroom can be used to prepare delicious and nutritious mushroom biscuits using ingredients *viz.*, refined wheat flour (*maida*) & mushroom powder (in 80:20 or 90:10 ratio), sugar (30%), ghee (bakery fats) (45%), baking powder (0.6%), ammonium bicarbonate (0.3%), salt (0.6%), milk powder (1.5%) and vanilla essence (0.02%). For making biscuits all the dry ingredients are finely ground and sieved. Then fat and sugar are mixed well for 5-7 minutes using Dough kneeder. These ingredients are then added to dough kneeder with other dry ingredients for dry mixing. Thereafter, water is added to make dough cohesive and homogenous and mixing is continued till fully done. Then dough is kept for 10 minutes covered with wet cloth. Thin sheets of dough (1.25 cm thick) are made and cut into different shapes of biscuits using different steel dies. These raw cut biscuits are then baked in hot oven (at 180°C) for 20 minutes and after cooling biscuits are ready for packaging.

### Mushroom Soup Powder

For preparing mushroom soup powder, dried oyster or button mushrooms are finely ground in a pulveriser to pass through 0.5 mm sieve. This mushroom powder (20g) is then mixed with milk powder (25g), corn flour (40g), salt (8g), sugar (3g), black pepper (2g) and oregano (2g). This soup mix has to be mixed with 6 times quantity of water for the preparation of good quality mushroom soup with characteristic aroma and taste.

### Mushroom Nuggets

For preparation of mushroom nuggets, mushroom powder (dried and coarsely ground mushrooms) is mixed with the Black gram (*Urad*) dal powder (1:8) and a paste is prepared by adding required quantity of water. Salt (2%) and red chilli powder (1%) are added to the prepared paste and round balls of 2-4 cm diameter are made. The prepared balls are spread over a steel tray and are sun dried. These mushroom nuggets can be straightaway deep fried and used as snacks or can be used in vegetable curry preparation.



### **Mushroom Papad**

Papad is a thin, crisp disc-shaped Indian snack food usually made from seasoned batter of peeled black gram flour (urd flour), lentils, chickpeas, rice, tapioca or potato, fried or cooked with dry heat. Papads can be supplemented for protein with mushroom either in the form of paste or dried powder in the batter prepared from other sources as mentioned above. This can make papad a wholesome food with high protein content. The steps can be summarized as below:

- Wash harvested mushrooms in water (containing 300 ppm KMS).
- Blanch mushrooms in hot water at 85°C for 5 min and then dip immediately in cold water.
- Cut mushrooms into halves or quarters and make a paste in commercial/ kitchen mixer grinder.
- Boil potatoes in a pressure cooker or vessel, peel and crush/grate boiled potatoes to a paste consistency
- Blend potato paste and mushroom paste in 50:50 ratio and add spices (Salt, chilli powder/ black pepper, cumin etc as per taste).
- Add KMS powder to the blend @ 300 ppm.
- Spread the papad batter on a polyethylene sheet in drying trays in appropriate round size (10 cm diameter) with uniform thickness (1-2 mm).
- Keep the trays in sun for sun drying or in tray drier at 50°C for 5-6 hr to reduce the moisture content to 5%.
- Peel off the dried papads from polyethylene film and pack in sets on 10-20 papads in one poly-bag.
- Store in a cool and dry place.

**Note:** To consume the product, it has to be fried at 170°C for 60 to 90 sec in cooking oil.

#### **10.2.2 Novel Value Added Products of Mushrooms**

**Mushroom fortified corn extrudates:** Fortification in extrudates to a level of 20% paste and 10% mushroom powder for both single and twin screw extruders can give extrudates of acceptable quality.

**Mushroom fortified cakes:** Mushroom fortified cake can be made by fortification to a level of 10-20% of dry mushroom powder in the wheat flour. The process of making cake remains the same.





Notes

**Mushroom Based Vegetarian Sausages:** Vegetarian sausages can be prepared from fresh mushroom by adding 5% saturated fat and binding agents such as carrageenan, soya protein concentrate, casein or xanthan gum.

**Mushroom fortified instant noodles:** Mushroom fortified Ready to cook instant noodles of acceptable quality and high nutritive value can be prepared by fortifying noodle dough with with 4% of mushroom powder (*Pleurotus ostreatus*).



Mushroom corn extrudates



Mushroom fortified cake



Mushroom Based Vegetarian Sausages



Mushroom fortified instant noodles

**Fig.10.5: Various novel products of mushroom**

### 10.2.3 Mushroom Recipes

Many a times people do not purchase mushrooms as they don't know what to do with it, that is, how to cook it. Cooking mushrooms is similar to cooking of any other vegetable with slight difference that other vegetables on over cooking become soft whereas reverse happens in case of mushrooms. Mushrooms can be used as salad after light sautéing, used for making soups, snacks or vegetables. Most of the recipes available are or western type. We here describe some of the simple recipes that can be suitable for our conditions.



### **Mushroom as Salad**

Clean button mushrooms thoroughly and cut these into flat thin pieces. These can be directly used as salad or sautéed a little. For the latter, put little oil on tawa, lightly fry mushrooms, sprinkle black pepper and lemon juice before serving it as salad.

### **Mushroom Tomato Soup**

#### **Ingredients**

The following is required for preparing mushroom tomato soup

1. Fresh mushrooms(button or oyster) - 200 g (chopped)
2. Tomatoes - 4 (chopped)
3. Onion - 1 medium (chopped)
4. Garlic - 3 cloves
5. Corn flour - 3 table spoon
6. Cream - 2 table spoon
7. Butter - 50 g
8. Salt and pepper - to taste

#### **Method**

Boil tomatoes, onion and garlic in water for 10 minutes. Grind the above material and sieve it. Melt butter in a pan and sauté chopped mushrooms for 10 minutes until they become golden brown. Add sieved material to it, then add corn flour and boil the mixture for few minutes till it thickens. Serve hot with cream.

### **Mushroom Pakoda**

#### **Ingredients**

The following is required for preparing mushroom pakoda

1. Fresh mushrooms - 500 g (Button or oyster or milky)
2. Gram flour (besan) - 150 g
3. Onion - 1 big (chopped)
4. Ginger - 2 tbl (chopped)



Notes

## Value Addition of Mushroom

5. Garam masala - 10 g
6. Anar dana powder - 1 tbl.
7. Cooking oil - 100 g
8. Salt, green chillies (chopped) - to taste

### Method

It is good to blanch the mushrooms before using these for making pakoda. Boil the mushrooms in hot water containing some salt for 5 minutes, remove excess water by sieving, allow these to dry and then cut and mix with other ingredients mentioned above. Mix well. Make a mixture of gram flour and add salt and chillies to it as well. Make small balls of the mixture, dip in besan and fry till golden. Serve hot with chutney or sauce.

We can make various other types of pakodas. These include use of small mushrooms as such, use of mushroom caps joined from gill side after filling cheese or palak inside and joined using tooth pricks (mushroom duplex). We can splice 100g oyster mushroom into small pieces manually or with knife, and then add pinch of salt, pepper, etc and one or two spoon of besan. Mix it with hand. There is no need to add water. We can fry these directly till golden brown to get crisp pakoda.

### Mushroom as Vegetable

Preparing mushroom vegetable is similar to making any other vegetable. One major difference is that on over cooking other vegetables may become soft, but mushrooms tend to become harder. Prepare masala using onion, garlic, tomato, turmeric powder, garam masala, red chillies, dhania powder, salt, etc as we do for any other vegetable. Add green peas or Shimla mirch and after slight cooking add mushrooms. Mushrooms can be made without addition of any vegetables as well. Add water as per need depending upon the consistency of the gravy you prefer.

### 10.2.4 Quality Assurance, Shelf Life and Packaging

For successful marketing it is important that our product should good consistent quality with proper details of its nutrition, date of packaging, etc. It is also important that our packaging should be attractive and suitable for the product being marketed. Here are some of the aspects you should take care of to ensure value for the money.

#### Quality Assurance

Quality of processed product is very important for marketing it. The concept of Total Quality Management (TQM) should be applied if we are going to do commercial production. It means right first time, every time. That is, our every

## Value Addition of Mushroom

product should be of the same quality in every batch right from the first packet to the last packet. We cannot provide different quality and our product should taste same every time. For example you must have tasted many soft drinks or chocolates. They taste same irrespective of when or from where you purchase. This is so because the companies follow the concept of TQM.

### Shelf Life

Processed products have long shelf life. The shelf life of all products however will not be same. You must have seen that whenever we purchase any processed product, there is clear mention of date of manufacture and date by which it can be used. There can be other instructions like store in cool and dry place, or use within how many days of opening.

### Packing, Packaging and Market Opportunities

Proper packing is important to ensure that all packets have same shelf life. If we use poor quality bags or cans, then it can lead to loss of quality in some of the packets. Proper labelling with all the nutritional, information and other mandatory details is must. A good label is also important to attract the attention of the customer. Hence, it is important to use the same label to establish your brand in the market. The label may also have instruction regarding how to use the product. Many a times brief recipes can be mentioned to promote the product.



### INTEXT QUESTIONS 10.2

Answer the following questions

- (i) For preparation of mushroom pickle, mushrooms are blanched and subjected to salt curing. (True or False)
- (ii) In mushroom preserve, the sugar concentration is ..... ° Brix.
- (iii) In most of the value added products we can add upto 10% mushroom powder. (True or False)
- (iv) On over cooking mushrooms become .....
- (v) Full form of TQM is .....



### WHAT YOU HAVE LEARNT

Let us recapitulate the important points we have learnt in this lesson:

- Mushrooms have short shelf life as these have 90% water.



Notes



## Notes

### Value Addition of Mushroom

- Some of the mushrooms can be sun dried whereas all can be pickled or canned.
- We can make various products like soup powder, papad, nuggets, chips, preserve, candy, etc using different mushrooms.
- We can make various bakery products like biscuits, cakes, etc and also novel products like pasta, noodles, etc by supplementing with fresh or dried mushroom powder.
- Some people do not purchase mushrooms because either they do not know how to cook, or believe that these are poisonous. Some also think these are non-veg food. We have learnt earlier that mushrooms are fungi and all vegetarians eat lot of fungi.
- We can make indigenous recipes by replacing any other vegetable with mushroom.



### TERMINAL EXERCISE

1. What happens if the mushrooms are dried at very high temperature?
2. Which mushroom is a natural source of cholesterol lowering compound- lovastatin?
3. How much mushroom powder may be used in biscuits, cakes, etc?
4. What happens if we overcook the mushrooms?
5. Why some people do not purchase mushroom products? How you will convince them to eat mushrooms?



### ANSWERS TO INTEXT QUESTIONS

#### 10.1

- (i) 60°C                      (ii) One                      (iii) Short  
(iv) Button                      (v) D

#### 10.2

- (i) True                      (ii) 68                      (iii) True  
(iv) Hard and leathery      (v) Total Quality Management



**Notes**

**SUGGESTED ACTIVITY**

- Visit any nearby canning unit to understand different steps in canning
- Collect the data on dishes of different mushrooms popular in your area. Also record that how many times they cook mushrooms in a month. Do they eat more mushrooms during winter?
- Interact with people to know that why some people consider mushroom as non-vegetarian food, awareness about their nutritive value and do they know how to cook different types of mushrooms.
- Prepare mushroom recipes. See what happens to the texture of mushrooms if we cook mushroom for 2, 5, 10, 20, 30 minutes.

**Key Learning Outcomes**

- Preserve mushrooms using different methods like drying, canning, steep preservation.
- Demonstrate preparation of various conventional value added products of mushroom.