MUSHROOM GROWING

Part II.

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The mushroom has great potential as a rich and cheap source of protein, nicasin, thiamine (B_1), riboflavin (B_2), ascorbic acid, (c) nicotine acid, (c) nicotine acid, Pantothene acid, Vitamin K, for the human diet. The availability of edible and delicious species, (indegenous to sub-tropical and tropical region) and possibilities for production using simple techniques makes it a good vocation for self-employment seekers. Like most vegetables, mushrooms mainly consist of water In mushrooms the percentage of carbohydrates and fats is low and the carloric value is not high; about 30 calories per 100 grams. Of the minerals phosphorus can be specially mentioned. Although in small quantities, the mushrooms contain the complete set of amino acids, a human being needs. Its methionine content is relatively small whereas trytophan and lysine are present in relatively high amounts. These essential amino acids are usually deficient in most vegetable proteins. Mushroom protein, (like other fungal protein) is therefore intermediate in quality between vegetable and animal protein. Mushroom is richer in folic acid than meat and vegetables except liver. Therefore while it can prevent and cure anemia, with its low content of a starch and fat. It is suitable for people wishing to reduce their weight or afflicted with diabetes or hypertension.

"On 11th May 1967, Graham Chedd discovered that retine, a substance in the human cell, can stop the growth of tumours. Nobel Prize Winner Albert Szent Gyorgyi found that the human body contains a balanced amount of retine and promine and that excess of promine could produce cancer. Retine may be a substance that slows down tissue growth. Analysis have shown that all fungi, especially opened or mature mushrooms, have as high a retine content of 3 units. Thus if mushrooms and consumed regularly, there might be no chance of having cancer. This observation was confirmed by Professor Stephen Vocel of Duke University, (in May 1970) who stated that mushrooms actually had a substance in their spores that can prevent and stop cancer.

The mushroom association of England conducted an experiment in which cancer patients were given three pounds of mushroom every week

for six months. The patients' condition improved and they were subsequently cured of the disease. Those patients who received medication, other than the mushroom treatment all died," (From a report of FAO Publication)

The average compositions of the straw mushroom, compared with other types of agricultural produce is indicated in Table 1 (in percentages of the fresh weight).

Table 1.

Nutritive value of Mushrooms compared with some food items - % by fresh weight.

Item	Water	Protein	Fats	Carbo-hydrates	Miner-als.	Energic value per 100 grams
Mushroom	88.9	3.4	1.8	3.9	1.0	105
Milk	87	3.5	3.7	4.8	0.7	260
Beef	68	18.0	13.0	0.5	0.5	792
Spinach	93	2.2	0.3	1.0	1.9	63
Asparagas	95	1.8	0.1	2.7	0.6	84
Potato	75	2.0	0.1	21.0	1.1	356

Technology of Mushroom Production.

The development of a technology evolves through several stages. In the first stage there is the discovery that if certain things are done, some predictable results will occur. This kind of information is probably slowly acquired and handed down from person to person. For example, it was learnt early if spawning was done to a particular substrate under certain conditions, one could expect that mushroom would be produced. Initially there was little concern with why and how this happened. So this first stage is solely the "Art" of mushroom growing.

In the second stage of the development of a technology, people ask a few questions, such as: "Why does this work" Are there any methods or materials which can be used to increase the the yield or improve the process?

In this stage a scientific approach is employed and it involves both basic science (attempts to explore how the process works), and applied science (attempts to improve the process). Basic studies on mushroom growing would involve the biology of the organisms (life style,nutritional requirements, genetics, environmental conditions for growth and fruiting etc.) Applied science would involve such studies as: composting, spawn running, environmental conditions to support fruiting, means of controlling pests, development of improved strains etc., using the knowledge gained from the basic scientific studies of the organism. Thus oncea the change is made from an art to science, we find basic and applied science working together, and there is an acceleration in the advancement of technology.

In Sri Lanka there is much hope for the advancement of growing mushrooms for home consumption and export. This could generate self employment. The island has 758,940 hectares under rice cultivation. Producing plenty of rice straw to be used as a substitute for mushrooms.

Growing mushrooms is an efficient way of utilization of cellulosic wastes. Volveriella Volvacea, the straw mushroom, is a fast-growing, cultivated mushroom. It grows well on rice straw, lotus stems, dried banana leaves, animal compost, and corn stalks etc. The recently introduced oyster mushroom grows well on soft wood like the Rubber, Gliricidia and Sesbania (Katurumurunga).

In general, spawn (seed material) for any type of mushroom culture has to be obtained from pure culture. There are two methods of obtaining pure culture.

1. Using mushroom spores or seeds.
   This method is not very popular due to uncertainity of yields and possibility of variation in the fruit type.

2. Using mycelium from ushroom tissue.
   This method requires less equipment, and simpler techniques.

The mushrooms obtained by this method would be true to type, like in the case of plants propagated by budding, grafting etc.

How to obtain pure culture tissue.

First prepare an Agar media

Formula : PDA + bean	
P - Potato	200 gms
D - Dextrose	200 gms
A - Agar	20 gms
Mung bean or soybean	50 gms
Water	1000 gms

Method:

1. Wash and dice potato (with the peel) into small pieces 1 cm^3.
2. Boil diced potato, mung or soybean and water together for 15 minutes.
3. Strain the preparation through cheese cloth and reheat the liquid.
4. Add the agar and nboil for 8 - 10 minutes and add the dextrose.
5. Add hot water to restore the original volume of 1000 gms.
6. Put 10 ml. of the media in each test tube or 30 ml. into flat whisky bottles. These containers are plugged with cotton wool and the plug wrapped with paper.
7. Sterilise in a pressure cooker for 30-45 minutes. (temp. 121°C - 125°C).
8. After sterilization and while still warm place the tubes at an angle to make the slants, when the agar congeals, the slants are ready for use (to receive the tissue).

Removal of mushroom tissue and the method of innoculation.

Select for desirable qualities, size, prolificeness of the mushroom. It should not be over matured and contaminated by micro-organisms.

Tare the mushrooms into two from the centre of the cap to the base of the stem. Remove a small tissue from the area connecting the stalk and the cap and directly plant it in the Agar slant under aseptic conditions. Experiments have shown that tissue from that part of the mushroom is the most healthy and yields the best true-to-type mycelium.

The lamp for flaming can use alcohol as it is smokeless, and convenient for sterilizing instruments.

The isolation needle should be prepared beforehand by dipping it in alcohol, and flaming it red hot. The correct flaming is to hold the needle at the rear end and tilt it in a downward position to allow a greater part to be in the flame. Allow it to cool for 15-20 seconds without letting it touch anything. It is more convenient to have two needles so that one could be used while the other one cools.

When the plug of the sterilized bottle has been removed for innoculation the neck of the bottle should be kept over the flame. Immediately after innoculation replace the plug and put the bottle in dark room where the temperature is from 25°C - 30°C. Mushroom will not need light for mycelial growth. Light will only slow the mycelial growth and age quickly.

In 7-10 days the bottle will be covered with mycelium and be ready to innoculate the packs which has got sterilized culture material inside.

Formula of the culture material.

Sawdust or any cellulose containing material dried	... 100 kg.
Fine rice bran as protein and mineral supplements ½..	... 10 kg.
Dead lime	... 1 kg
Magnesium sulphate ...	... 200gms
Water	.80-100 kg

Mix all the items together, and pack into heat-resistant polythene bags taking care to compress the material in the bag by passing them to the bottom. Insert a plastic or bamboo bottle neck onto the mouth, pull the polythene out of it and pull it down. Tie with rubber band, plug the mouth using cotton wool and cover the whole neckwith a paper.

Sterilization can be done in a steamer or in a boiler at a temperature above the boiling point for two hours.

Innoculation of these bags is similar to making the tissue culture. Use the mycelium already prepared.

Incubation - Keep the bags in a dark room, on shelves or in boxes where air can circulate inside these boxes (empty potato boxes) do not water. The doors and windows should be closedto allow for an ideal condition.- the temperature 24 - 28°C.

The mycelium of oyster mushroom takes about 30 - 40 days to grow over the compost in the bag.

Mushroom production.

In this last stage in the growing process, cropping house and clean water is very essential. If these are not given, all the hard work done will be wasted.

Cropping House.

It should not be too large as ventilation may be adversely affected and the possibility of drafts. The popular size is 4x6x2.5 m. The floor can be paved with gravel or bricks. The house can be partially dark; water is very important for mushrooms. It should ot be too acidic or too alkaline, should not contain mineral salts and chlorine etc.

Opening of bags for cropping.

1. Opening and rolling down the mouth.
2. Cutting off the mouth with blade.
3. Slitting the sides of the bag.

After cropping, wet the outside of the bag twice a day; 1/2 a tea cup in the morning and 1/2 a tea cup in the afternoon. Do not allow water go into the bags as it can affect the mycelial growth. In 5-7 days mushrooms will appear and can be harvested in 2 - 3 days. These bags (mushroom kits) will yield 4-6 times. Total production could be 30% - 50% of compost.

Harvesting:- A mature mushroom is plump and firm, with fully extended volva. It should be picked at this stage before opening. Store in a cool place.