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The Impact of Substrate Variation on the Growth, Yield and Nutrient Composition of *Pleurotus ostreatus* Kumm.

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ABSTRACT

A mushroom is the fleshy , spore bearing fruiting body of a fungus. It plays an important role in industrial and agricultural field. Mushroom of *Pleurotus* genus are popularly consumed all overthe world due to their taste andflavour. The climate of kerala is very suitable for the cultivation of *Pleurotus ostreatus*kumm. Mushroom cultivation is one of the efficient way by which residues can be recycled. This high nutritional value suggest that these are important functional foods. This paper aims to elucidate the cultivational process as well as nutritional aspects of *Pleurotus ostreatus* in different substrates. For this study *Pleurotus ostreatus* is cutivated on a wide range of plant waste such as paddystraw,sawdust,coconut petiole,fibrous husk of coconut. Fast mushroom growth was observed in coconut petiole and least growth was observed in sawdust.The first harvest takes few days in fibrous husk of coconut and maximum days for harvest in sawdust substrate. Maximum yield obtained from the paddy straw substrate. The nutrient analysis shows that cooked oyster mushroom contain less amount of protein, fat and ash compared with fresh ones.

keywords *Mushroom; Pleurotus ostreatus; Harvest; Substrates.*

Edible mushrooms are the fleshy edible fruit bodies of several species of macrofungi. *Pleurotus ostreatus* Kumm. (Basidiomycota) of the pleurotaceae family, is one of the edible mushroom and it is commonly known as oyster mushroom. The common name “oyster mushroom” comes from a white shell like appearance of the fruiting body, not from the taste. It varies texture from very soft to very chewy, depending on the strain and what time of the year you pick it.They tend to be chewier during the colder months of the year. This oyster mushroom is found in chinese, korean and japanese menus. It is cooked in soups,soy sauce and other dishes. It is picked young for the kitchen because when it becomes tougher as it grows and its taste and smell deteriorate.With the recent focus on locally sourced food and foraging,the importance of the mushrooms doesnot be slowing down. If anything, mushrooms are now more popular than ever.It can also be easily cultivated on a variety of substrates,so it is making its way on to many supermarket shelves.

In nature *Pleurotus* species are found mainly as saprophytes growing on wood trunks,endowed with the capacity to secret wide spectrum of hydrolyzing enzymes (Hong and Namgung, 1975 a,b; Hong,1976; Toyama and Ogawa,1976 ; Daugulis and Bone, 1977; Molitoris,1979; Rajarathnam *et al*,1979; Madan and Bisaria, 1983). Cultivation of *Pleurotus* species on their natural habitat was first described at the beginning of 20th century(Flack,1917) and on a sawdust cereal mixture by Kaufert (1935). The foundation for the industrial production of *Pleurotus*on different substrates was laid by several workers(Kalberes and Vogel,1974; Zadrazil,1974 and Kurtzman,1979).

Cultivation of oyster mushroom has increased tremendously throughout the world because of their abilities to grow wide range of temperature. *Pleurotus ostreatus* demands few environmental controls, and their fruiting bodies are not often attacked by diseases and pests,and they can be cultivated in a simple and economic way (Kues andLiu,2000).

In India, and particularly Kerala,the *Pleurotus ostreatus* is farmed extensively and the people there make a wide range of dishes from it. Agricultural waste products are used for mushroom cultivation.It is said to be easiest to grow.Among all the cultivated mushrooms *Pleurotus* has maximum number of commercially cultivated species suitable for round the year cultivation.The nutrition in *Pleurotus ostreatus* is very high.These have a very low calorific value so making them an ideal part of the healthy diet.The present work was undertaken with a view to carrying out morphological and nutritional aspects and cultivation method of *Pleurotus ostreatus* Kumm.

MATERIALS AND METHODS

Cultivational method

Pleurotus ostreatus can be cultivated in a room.The room is arranged with little ventilation and light.But for large scale production, thatched sheds are preferred for cultivation.For the cultivation process

Table 1. Effect of different substrate on mycelium spread & days of spawn running completed

Substrate	Completion of mycelium formation	Daysofspawnrunning completed
Paddy straw	9th day	21
Saw dust	20th day	27
Fibrous husk of coconut	7th day	22
Coconut petiole	6th day	16

Fig:1 A -Spawn Used For Mushroom Cultivation :B-saw Dust:C-fibrous Husk Of Coconut D- Paddy Straw : E-coconut Petiole

Table 2. Number of days & yield of first and second harvest in different Substrates

Substrate	Day sand yield in first harvest	Days and yield second harvest
Paddy straw	28 days & 585 g/bed	34 days & 465g/bed
Saw dust	43 days & 150 g/bed	55 days & 110 g/bed
Fibroushuskofcoconut	24 days & 475 g/bed	27 days & 286 g/bed
Coconut petiole	30 days & 278 g/bed	32 days & 203g/bed

NUTRITIONAL ANALYSIS

TABLE-3 :COMPOSITION OF FRESH *Pleurotus ostreatus*

SUBSTRATE	TOTAL ASH (%)	TOTAL PROTEIN (%)	TOTAL FAT (%)	CARBOHYDRATES (%)
PADDY STRAW	0.84	2.98	0.4	6.6
SAW DUST	0.82	2.9	0.35	7.1
FIBROUS HUSK OF COCONUT	0.84	2.93	0.39	6.9
COCONUT PETIOLE	0.8	2.89	0.38	5.95

TABLE-4 :COMPOSITION OF COOKED *Pleurotus ostreatus*

SUBSTRATE	TOTAL ASH (%)	TOTAL PROTEIN (%)	TOTAL FAT (%)	CARBOHYDRATES (%)
PADDY STRAW	0.81	2.97	0.36	6.6
SAW DUST	0.8	2.9	0.3	7.1
FIBROUS HUSK OF COCONUT	0.82	2.91	0.34	6.9
COCONUT PETIOLE	0.8	2.87	0.33	5.94

seeds collected from krishivigyankendra, sadanandhapuram in kottarakara.Seeds are also known as spawn.

Substrate

The material on which the mycelium of the mushroom grows is called substrates.The properties of substrates determine which mushrooms and microbes can grow in it.

The substrates used for the present study are:

1. Paddystraw
2. Sawdust
3. Fibrous husk ofcoconut
4. coconut petiole

Pre treatment of substrates

About 750gram of each substrate is cut into small pieces of 3 to 5cm long and soaked in water overnight. The substrates is then cooked in a drum containing boiling water for 30 to 45 minutes at 75^0C to 100^0C .Add 2 % lime while cooking the substrate to increase the yield of mushroom. After cooking excess water is

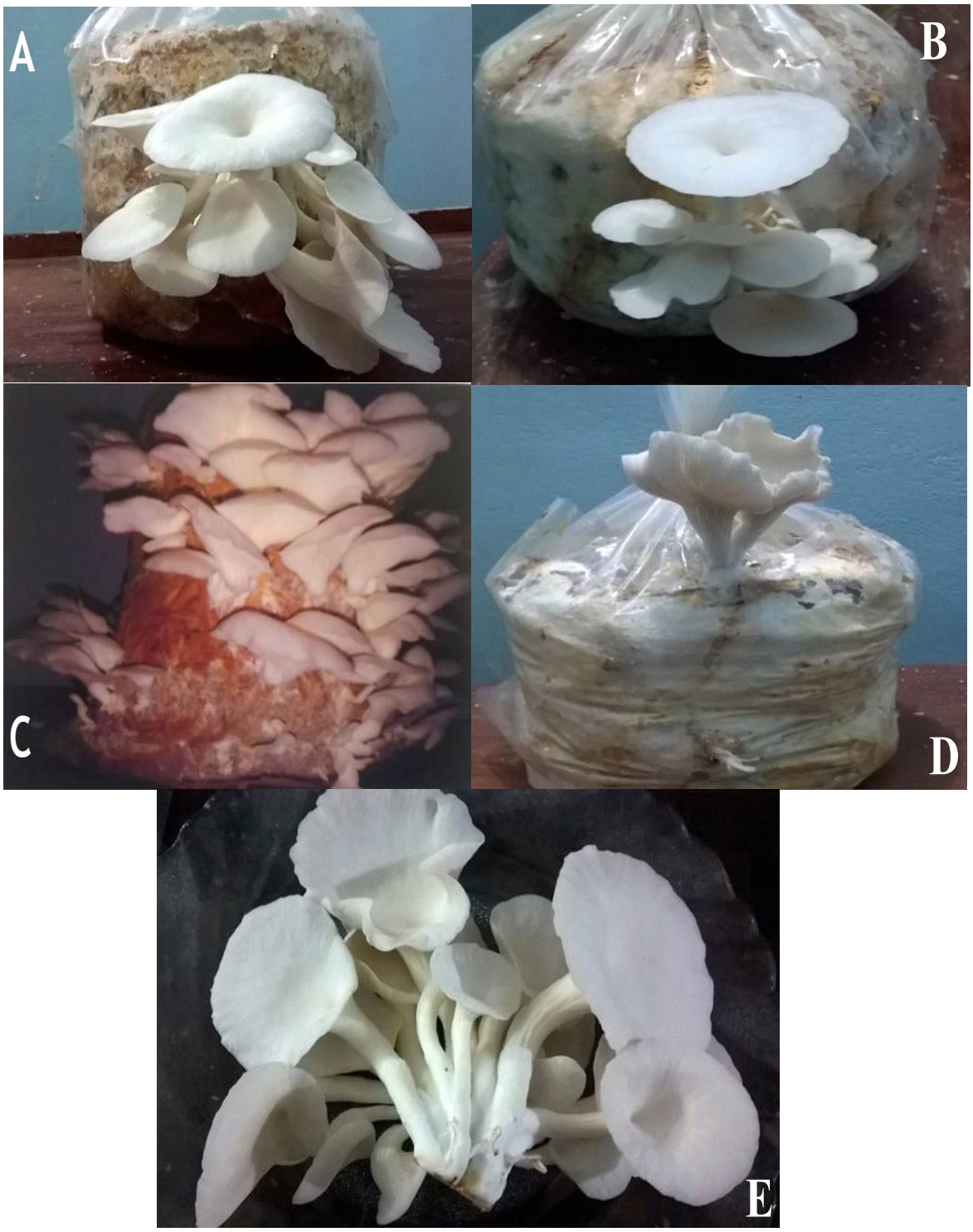

Fig 2. Production of Fruitingbodies A-sawdust:B-fibroushusk of coconut: C-paddystraw D-coconut petiole: E-harvested mushroom

drained by spreading the substrates over a gunny cloth.The correct water content of the substrate is checked by squeezing the substrate in between hands and so that no drop of water should ooze from the substrate.This sterilized substrate wasused for cultivation.

Spawning

About 500gram of spawn is divided into four equal parts. Take a polythene bag of 60x30cm and bottom portion of the bag is tied with a thread and make two holes at the base of the bag. The substrate added into the polythene bag to a height of 5cm. 175gram spawn

is spread over the substrate. Again substrate is placed over the first layer for about 10cm height. Then second part of the spawn is spread over it. Third layer of substrate is placed over the second layer followed by spawn over it. Again fourth layer of substrate is place over the third layer and fourth part of spawn is spread over it. Then substrate added over the fourth layer to a height 5cm.The mouth of the bag is then tied with a thread.Small holes are made on the surface of the bag to facilitate good aeration and to reduce rise intemperature.

Maintenance of Mushroom beds

Polythene bag containing spawned substrate is called mushroom bed. The mushroom beds are kept on racks in a mushroom shed. Sprinkling of water on the floor helps to keep a suitable moisture condition inside the mushroom shed. After 12 to 15 days of spraying, the fungal mycelium grows and forms a compact bed inside the polythene bag. The mushroom beds are watered twice a day to maintain the temperature inside the room. Many small fungal knots appear on the surface of the mushroom bed. These are pin head stage ,later develops into mature mushroom within two to fourdays.

Harvesting

The matured mushrooms were harvested by hand picking. The base of the stipe is cleaned with a sharp knife and packed well aerated containers. The first harvest usually done in 20 to 22 days after spawning. The subsequent harvest is done at weekly intervals. From a single bed 4 to 5 harvest can be done.

Nutritional studies

For the study of nutritional value of *Pleurotus ostreatus*, the quantity of carbohydrate,protein,fat,ash present in the fresh and cooked mushroom grows on different substrate are find out in the laboratory test and other nutrient information collected from available resources systematically arranged. Total fat analysis of cooked and fresh mushroom done by AOAC, method number:948.22,total protein analysis of cooked and fresh mushroom done by using AOAC,method number:950.48,955.04C,total ash content analysis of cooked and fresh mushroom done by AOAC,method number:950.49 and the carbohydrate analysis of carried out by anthrone method.

RESULT AND DISCUSSION

Pleurotus ostreatus (Jacq) P. Kumm. belonging to the family pleurotaceae and grows in shelf like clusters on dead logs and living trees.It have three distinct parts-a fleshy shell shaped cap,a short or long lateral stalk called stipe and ridges and furrows underneath the pileus called gills. The mycelium of *Pleurotus* is pure white in colour. The present study revealed that *Pleurotus ostreatus* is a delicious edible mushroom. This is the second most important cultivated mushroom for food purposes through outworld wide (Chang,1991).

At present, edible mushrooms can be used as a weapon against starvation because of its high protein content. Oyster mushroom cultivation also provides employment generation. There is ample scope to earn more from mushroom cultivation using some innovation like attractive packaging for longer shelf life, processing units and new products such as biscuits, pickles, soup powder etc..

In the study *Pleurotus ostreatus* cultivated in four kinds of substrates gives varies in yielding,out of which more yield(585g/ bed and 465g/bed in first and second harvest) obtained from paddy straw. In the cultivational process the coconut petiole recorded maximum mycelia spread in minimum period of time (16 days) and the mushroom harvested firstly from the fibrous husk of coconut. *Pleurotus ostreatus* grown on sawdust take longer days (43 days) for harvest. The nutritional test shows that average amount of carbohydrate,protein,fat and ash content of fresh and cooked *Pleurotus ostreatus* are 6.64%, 2.92%, 0.38%, 0.83% and 6.64%, 2.91%,0.33%,0.8% respectively. Protein, fat and ash showing less variation after cooking and carbohydrate remains same.It contain low amount of carbohydrate compared with other food substance. The carbohydrate content is different in each oyster mushroom cultivated from various substrates. The nutrient variation of fresh mushroom occurs due to the environmental condition and substrate used for the cultivationmethod.

CONCLUSION

Edible mushrooms are popularly consider as a boneless vegetarian meat or white vegetables. *Pleurotus ostreatus* cultivation is a profitable agribusiness. Artificial cultivation of mushroom help to improve social as well as economic status of small farmers. *Pleurotus ostreatus* requires a shorter growth time in comparison to other edible mushrooms. Almost all produces use paddy straw for mushroom cultivation

but now a days availability of paddy straw is difficult, the use of variety of substrate is essential. This study reveals that fibrous husk of coconut and coconut petiole can be used alternative substrate for mushroom cultivation and also heating can affect the nutritional value of *Pleurotus ostreatus*.

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