



OYSTER MUSHROOM CULTIVATION- A STUDY IN PALAKKAD DISTRICT, KERALA

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Introduction

Agriculture plays a predominant role in shaping and molding the lives of people to a great extent. It plays an important role in the society. It beckons man, back to nature and tries to keep him there, which is ecologically more beneficial whereas, modern industry forces man to lead a kind of life, which is artificial and devoid of the soothing caresses of Mother Nature. Agriculture sector occupies a key position in the Indian economy. It provides employment to about 65% of the working population of India. Around one-quarter of India's national income originates from the agriculture sector. Agriculture being a state subject, the bulk of public investment in agriculture takes place at the level of states and the central Government supports the states as a catalyst.

The largest portion of the natural resources of India consists of land and by far the largest number of its inhabitants is engaged in agriculture. Therefore in any scheme of economic development of the country, agriculture holds a position of basic importance. Although Indian agriculture is way back, compared to the level in developed countries, some notable developments have occurred over the years since independence. Large areas which suffered from repeated failures of rainfall have received irrigation; new crops have come to occupy a significant position in the country's production and trade; the agricultural and the industrial economies in the country now exert a powerful influence on one another; problems of rural indebtedness and the exploitative practices of the village money lender are much less and finally there is already in the countryside an awakening and a desire for raising standards of living.

The first five year plan (1951-56) accorded the highest priority to the agricultural sector to tide over the difficult food problem created by the partition of the country. Agriculture has occupied an important place in every successive plan. Mushrooms can serve as agents for promoting equitable economic growth in society. They are a unique group of fungi through which we can pilot a non-green revolution in less developed countries, and in the world at large. They demonstrate great potential for generating a great socio-economic impact in human welfare, at local, national and regional levels.

The global food and nutritional security of growing population is a great challenge, which looks for new crop as a source of food and nutrition. In this context, mushrooms find a favour which can be grown even by landless people, that too on waste material and could be a source for proteineous food. Use of mushrooms as food and nutraceutical have been known since time immemorial, as it is evident from the description in old epics Vedas and Bible. Earlier civilization had also valued mushrooms for delicacy and therapeutic value. In the present time, it is well recognized that mushroom is not only rich in protein, but also contains vitamins and minerals, whereas, it lacks cholesterol and has low calories. Furthermore, it also has high medicinal attributes like immunomodulating, antiviral, antitumor, antioxidants and hepatoprotective properties.

With the growing awareness for nutritive and quality food by growing health conscious population, the demand for food including mushrooms is quickly rising and will continue to rise with increase in global population which will be 8.3 million by 2025, an expandable income. The mushroom cultivation has grown up in almost all the parts of the world and during last decades, the world mushroom production achieved the growth rate of about 10%. Globally, china is the leading producer of mushrooms with more than 70% of the total global production which is attributed to community based farming as well as diversification of mushrooms. In India, owing to varied agro-climate and abundance of farm waste, different types of temperate, tropical and sub-tropical mushrooms are



cultivated throughout the country. It is estimated that India is generating 600 million MT of agricultural waste besides, fruit and vegetable residue, coir dust, husk, dried leaves, coffee husk, which has potential to be recycled as substrate for mushroom cultivation leading to nutritious food as well as organic manure for crops.

Mushroom cultivation has great scope in India and in some of other developing countries because of the cheap and easily available raw materials needed for this activity, coupled with faster means of communication and marketing (as a fresh commodity), and better purchasing power of the people.

It is hoped that the avocation of mushroom farming will become a very important cottage industrial activity in the integrated rural development programme, which will lead to the economic betterment of not only small farmers but also of landless labourers and other weak sections of communities. The advantages of mushroom cultivation can be summarized as:

1. Wastes such as cereal straws are largely burnt by the farmers, which causes air pollution. However, these raw materials can actually be used for the cultivation of mushrooms. This kind of bioconversion exercise can greatly reduce environmental pollution.
2. Mushroom cultivation can be a labour intensive activity. Therefore, it will serve as means of generating employment, particularly for rural women and youths in order to raise their social status. It will also provide additional work for the farmers during winter months when the farming schedule is light.
3. It will provide people with an additional vegetable of high quality, and enrich the diet with high quality proteins, minerals and vitamins which can be of direct benefit to the human health and fitness. The extractable bioactive compounds from medicinal mushrooms would enhance human's immune systems and improve their quality of life.
4. Mushroom cultivation is a cash crop. The harvested fruiting bodies can be sold in local markets for additional family income or exported for an important source of foreign exchange that will definitely improve the economic standards of the people.
5. *Pleurotus sajor-caju* (Oyster mushrooms) are relatively fast growing organisms and can be harvested in 3 to 4 weeks after spawning. It is a short term agricultural business and can be of immediate benefit to the community.

The oyster mushroom gained importance during the last decade and now several species of *Pleurotus* are available for commercial production such as: *p.sajor-caju*, *p.florida*, *p.sapidus*, *p.eryngii*, *p.columbinus*, *p.cornucopiae*, *p.flabellatus*, *p.platypus*, *p.opuntiae*, *p.citrinopileatus*. It is now being cultivated in many countries in the subtropical and temperate zones.

Pleurotus spp. can be grown using various agricultural waste materials. The different species of *pleurotus* grow within a temperature range of 20^o to 30^o C. *P. sajor-caju* can tolerate temperature up to 30^o C although it fruits faster and produces larger mushroom at 25^o C. *P. is fossulatus* is the so-called low temperature *pleurotus*, fruiting mostly at 12-20 C.

Statement of the Problem

Quality food, health and environment are the major concerns facing our country. Mushroom cultivation helps to address the issue of nutritional security and also provides solution for proper recycling of agro-wastes, In addition to good quantity protein, no cholesterol, high fiber, low sodium, good quantity of vitamins and minerals, protein polysaccharide complexes that impart unique medicinal values like anti-cancer and anti-viral properties. With



ever increasing demand for quality food, mushroom cultivation is emerging as an important activity in different parts of our country. This activity requires very little land and can be good source of employment for small and landless farmers, educated youth and women. The two primary inputs for mushroom cultivation is ; agro-wastes and labour, are easily available in our country. Integrating mushroom cultivation in existing farming systems will supplement the income of rural masses, provide gainful employment and will lead to inclusive growth to all sections of the society. Even though mushroom cultivation is a profitable business in Kerala due to its favourable climatic conditions, mushroom farming is a highly remunerative enterprise with quick return in the very short period. So the study is based on “oyster mushroom cultivation in Mundur panchayat” - to find out the various problems faced by the cultivators and to suggest various measures for the growth of mushroom farming in the panchayat.

Importance of the Study

Inadequate regional food supplies, diminishing quality of health and increasing environmental deterioration are the three key underlying problems affecting the future well-being of humankind. Mushrooms are very nutritious products that can be generated from lignocellulosic waste materials; and are rich in crude fibre and protein. In fact, mushrooms also contain low fat, low calories and good vitamins. In addition, many mushrooms possess multi-functional medicinal properties. Mushroom cultivation technology is friendly to the environment. The potential of mushroom farming in generating new employment opportunities is another positive element emanating from mushroom farming ventures, which can be labour intensive.

Due to this above mentioned reasons this study concentrates on how the oyster mushroom cultivation will be beneficial to the women and small scale farmers in the Mundur Panchayat

Objectives of the Study

1. To analyse the socio-economic condition of oyster mushroom cultivators in Mundur Panchayat at palakkad district.
2. To evaluate the problems faced by the Oyster mushroom cultivators.
3. To examine the cost of production, growth rate and price trend in mushroom cultivation.

Methodology

The information relating to the study is collected through both primary and secondary sources. Primary data has been collected using interview schedule through personal interview. A detailed schedule was prepared and a separate survey was conducted personally with randomly selected oyster mushroom cultivators.

Secondary data were collected from the published sources, economic review, books, journals, magazines and websites.

Economic and Social Impacts

Since mushroom cultivation can be a labour-intensive agro-industrial activity, it could have great economic and social impact by generating income and employment for both women and youth, particularly in rural areas in developing countries. The mushroom industry can also have even broader positive spill-overs, generating complementary employment in areas such as accommodation, restaurant services etc. The local mushroom industry can also be the main source of revenue for local government.

Mushrooms, like all other fungi, lack chlorophyll and are non-green organisms. They cannot convert solar energy through the process of photosynthesis to organic matters as green plants do but they can produce extensive enzymes that can degrade lignocellulosic materials for their own nutrients for growth and fruiting. Different mushrooms have different lignocellulolytic enzyme profiles. This demonstrates the impressive capacities of mushrooms for ‘biosynthesis’, which is different from ‘photosynthesis’ by green plants. The species of mushroom



fungi not only can convert the agricultural and forestry lignocellulosic wastes through solid fermentation technology into a high quality protein consumed directly in the form of the mushroom fruiting body, but also can convert food processing biomass wastes, e.g., soybean wastes using submerged culture, into fungal protein or “mycomeat”. Soybean waste materials (slurries) are generated in large quantities during the processing of soybean mild and “tofu” (bean curd), which are popular foods in many countries now and are, in some places, discarded without treatment thereby constituting an environmental pollutant. In addition, mushrooms and their mycelia can provide nutraceutical and pharmaceutical products.

The following statements summarise the significance of mushrooms in our drive towards alleviating poverty, enhancing human health, and arresting environmental degradation:

1. Mushrooms can convert lignocellulosic waste materials into a wide diversity of products, which have multi-beneficial effects to human beings, e.g., as food, health tonic, and medicine, as feed, as fertilisers and for protecting and regenerating the environment. In addition, mushroom cultivation can positively generate equitable economic growth. The tropical regions, particularly, have a wet and warm climate and have an abundant supply of agricultural wastes. These materials are resistant to natural biological degradation because they contain mainly cellulose, hemicellulose and lignin. Mycelia of mushrooms can excrete enzyme complexes which can directly attack/degrade these components of lignocellulosic materials. Therefore, mushrooms can use these wastes as nutrients for their growth and in the process become food and medicine for human consumption.
2. Mushrooms are relatively fast growing organisms. Some tropical mushrooms can be harvested and consumed within 10 days after spawning. By the use of different varieties, mushrooms can be cultivated year round. They can be cultivated by using primitive farming techniques in rural areas or by using highly industrialized technologies in the urban and periurban communities.
3. Mushroom cultivation can be labour intensive. Thus the activity can generate new jobs, especially in tropical or less developed countries.
4. While land availability is usually a limiting factor in most types of primary production, mushroom cultivation requires relatively little space. Actually they can be stacked using shelf like culture systems.

Benefits of Oyster Mushroom Growing

There are many remarkable ecological advantages in the cultivation of edible fungi. One major advantage is the efficient re-integration of agricultural residues such as horse and chicken manure, cereal straw, bagasse and others. The spent mushroom substrate can then be used either as animal feed or as compost for application in farm fields. The cost of oyster mushroom cultivation varies according to regions and the specific type of cultivation, but generally, the growing of oyster mushroom is less expensive than that of other cash crops. The major reason for this is it requires little space and inexpensive raw materials. Oyster mushroom cultivation is economically efficient for the farmers of other crops, who do not have to buy the raw materials for substrate and can use low cost structures of mushroom cultivation on seasonal basis. Table 3 would provide a view on the cost-benefit relationships of oyster mushroom cultivation in India.



Table 1, Cost Benefit Relationship of Oyster Mushroom Cultivation in India

Growing methods	Production Cost (USD)	Yearly production (tons)	price per kg* (USD)	Values of sales(USD)	Earning rate
Traditional hut Growing with Purchase raw-Materials	6,383.06	27.37	1.1	30,107	45.58%
Traditional hut Growing with their Own raw materials	12,364.78	27.37	1.1	30,107	58.94%
Seasonal growing with purchased raw materials	6,832.34	11.4	0.95	10,830	36.91%
Seasonal growing with their own raw materials	5,156.81	11.4	0.95	10,830	52.38%

Source: Jomo Kenyatta University of Science and Technology.

As the above table depicts, some growers are growing mushrooms with purchased raw materials, while others are growing mushrooms with their own raw materials. If the substrate materials are from the owner's own fields, maximum profits can be attained. To obtain the maximum benefits mushroom farmers in rural areas. The Indian agencies involved in the promotion of oyster mushroom growing are using rural youth. This particular aspect holds good for all developing nations in which rural youth are migrating to industrialized cities in search of employment.

Table 2, Cultivation Aspects of Various Species of Oyster Mushroom.

Species grown or collected	Substrate material used	Regions (states)	System of temperature cultivation	Cultivation period	Growing
Pleurotus Ostreatus	Paddy straw, paddy husk, Wheat bran	Southern India particularly niligiri hills	Poly bags cylindrical blocks	The whole year	12-25 ^o c
Pleurotus sojar-caju	Paddy straw, Bagasse, wheat brain	Southern India	Poly bags, Pressed blocks	June to February	22-35 ⁰ c
Pleurotus Florida	Paddy straw, wheat straw, baggasse, wheat bran.	Off-season in northern India(Goa, Maharashtra parts of Gujarat)	Poly bags and poly blocks of cylindrical shape	June to February	20-32 ⁰ c
Pleurotus spp.	Paddy straw, wheat straw,	Goa, Maharashtra	Poly bags and poly blocks	June to march	22-35 ⁰ c

Source: Vihiga Mushroom Producers Organization .

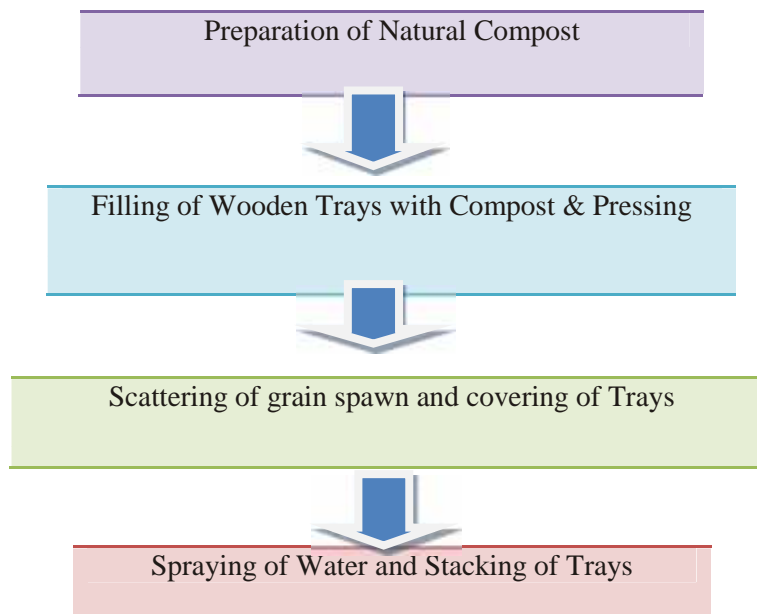


The oyster mushroom has various species and each has its own characteristics. Therefore, each geographic region in India chooses the appropriate species for its climate and environment. In addition, the substrate materials used and growing methods are also different according to species and regions.

Manufacturing process - Process of Cultivation

For successful cultivation, careful attention has to be paid to three aspects viz. good compost, reliable spawn and right temperature during growing period or else partial or complete failure of the crop may result. Natural compost is prepared from horse dung and wheat or barley straw. Some quantity of chicken manure and 3 kgs urea per ton of compost may be added. Compost preparation is very crucial and advice from an expert may be taken. Mushrooms are grown in wooden trays or boxes of 100 cm x 50 cm x 15 cm. They are filled well with the compost and pressed firmly leaving 3 cm clear space on top of the tray. The grain spawn is scattered on the surface of the compost which is then covered with a thin layer of compost. After that the trays are covered with old newspaper sheets and water is sprayed to provide humidity. The trays are then stacked vertically. At a temperature of around 24 – 25⁰ C white cottony mycelium spreads and permeate through the compost. It takes around 12 to 15 days for the complete spawn running. Ultimately, the surface of the compost is covered with half to one inch level of casing soil. It is sterilized to kill insects, nematodes and molds. The casing soil is spread over plastic sheets and treated with formalin and stirred frequently for a week to remove formation fumes. After casing, the temperature has to be maintained at 24 – 25⁰ C for 3 days after which it must be lowered to 18⁰C. Thus, batches of trays must be arranged in such a way that there is a regular daily production. The process flow chart is as follows:

Process of Cultivation



Profile of the Palakkad District

Palakkad, the district of Kerala is a multifarious district known for its history, natural resources, standard of education, tourist destinations and more over due to its rapid development in every field of economic development. Palakkad district is situated in the south west coast of India bounded on the north by Malappuram in the east by Coimbatore of Tamilnadu, in the south by Thrissur and in the west by Thrissur and Malappuram districts. It lies between 10'21 and 11'14 North latitude and 76'54 East longitude. The total geographical area of



the district is 4480 sq. k. m representing 11.53 per cent of the state's geographical area. The forest land per cent covers 136257 hectares. According to 2011 census, total population of Palakkad is 2,810,892. This shows an increase of 7.39 percent in 2011 compared to figures of total Kerala population. As per 2011 census, density of Palakkad district per square km is 627. Male and female were 1360,067 and 1,450,825 respectively. Sex ratio of girls in Palakkad district per 1000 boys was recorded 1067. In 2011 census, data of Palakkad district regarding child under 0-6 age were also collected. There were total 288,366 children under age of 0-6 and among them; male and female were 146,419 respectively. Child sex ratio as per census 2011 was 962. Children's proportion in total population was around 8.42 percent. In education sector, Palakkad district is having an average literacy and female literacy of 92.27 and 84.99 percent respectively. In all there were total 2,232,190 literate in 2011 census, compared to 1,938,818 literates of 2001 census.

The study is conducted in Mundur panchayat which is located in Palakkad district. Mundur panchayat, in the east by Puthupariyaram panchayat, in the south by Parali panchayat and in the west by Kongad panchayat is 30.04 sq.k.m. It consists of 18 wards. The total population of the panchayat according to the census of 2011 is 31373. The number of male is 15593 whereas the number of female is 15780. The density of population of the panchayat is 787. Male and female literacy were 90.23% and 91.5% respectively.

Summary and conclusion

Both primary and secondary sources have been explored for data collection. Primary data has been collected using interview schedule and through personal interviews. The secondary data has been collected from journals, magazines, book, and websites.

In India agriculture play an important role in industrial development and international trade. Agriculture has been the primary occupation of the people in India right from the days of early civilization. It is not only an occupation; it is a mode of life which for centuries has shaped the thoughts and outlook of millions of people.

Mushroom cultivation is of recent origin in India. It is mainly cultivated on the hills as it requires low temperature for its growth; however with the advent of modern cultivation technology it is now possible to cultivate this mushroom seasonally under uncontrolled conditions and throughout the year by employing environmentally controlled conditions. There are two main varieties of mushroom viz. button type and oyster. Oyster mushrooms are easy to cultivate and process and do not require huge investment. Commercial production of edible mushrooms bio-converts the agricultural, industrial, forestry and household wastes into nutritious food (mushrooms). Indoor cultivation of mushrooms utilizes the vertical space and is regarded as the highest protein producer per unit area and time-almost 100 times more than the conventional agriculture and animal husbandry. This hi-tech horticulture venture has a promising scope to meet the food shortages without undue pressure on land.

Kerala state is blessed with a diversity of climate and is rich in its natural flora and diversity of crops cultivated. Mushrooms are known for their high quality protein and the same in fresh mushrooms is twice as high as that of vegetables. Modern mushroom cultivation produces more protein per unit area and gives higher productivity than any other form of agriculture.

Mushrooms are also a good source of iron, potassium and phosphorus in addition to folic acid, an ingredient known for enriching the bloodstream and preventing deficiencies and the changing food habit, increasing health consciousness have led to a gradual increase in demand of fresh and processed mushrooms among urban and rural consumers. However such products must suit the taste and choice of common buyers. So this study has attempted to evaluate the problems faced by the mushroom cultivators and to analyse the cost of production, growth rate and price trends in oyster mushroom production.



Mushrooms can serve as food, as tonic and as medicine. A regular intake of mushrooms can make us live longer and always look younger. They are biota characterized by wonder. It rise up from lignocellulosic wastes, yet they became so bountiful and nourishing. One of the most significant benefits of mushroom cultivation is their ability to create a pollution free and friendly environment.

On examining the socio-economic condition of oyster cultivators in Mundur panchayat, the following are the main findings of the study.

1. From the analysis it is clear that 54.2% of the respondents are self employed.
2. 61.5% of the respondents have the income level of Rs.5000-10000 per month and only 12.8% of them earn an income level of above Rs.15000 per month.
3. It is clear from the analysis, 34.3% of the respondents savings are in the form of micro finance.
4. Majority (61.4%) of the respondents has their own land and only 8.6% of them have both own and leased land.
5. 42.9% of the respondents have an experience upto 10-15years in entire oyster production
6. 41.4% of them are having 4-6years experience in seed rearing process alone.
7. 60% of the respondents depend on well for their irrigation.
8. Most 71.4% of the respondents cultivate in below 2 acres of land only 7.2% cultivate in more than 4 acres.
9. Majority 51.4% of the respondents purchase seeds from within the state and rest of 48.6% purchase seed from other states like Tamil nadu.
10. On the basis of existing price of fertilizer, about 47.2% of respondents incurred cost ranging between Rs.3000-4000 per month and only 8.6% incurred cost ranging above 5000.
11. Most of respondent sell their products at local price and through shops.
12. Majority 44.3% of the consumers are middle income groups.

Oyster mushroom cultivators as well as the seed cultivators are facing various problems.

- It is found that 42.8% of the members are facing the problems of virus, fungus and germ in the production.
- In the case of marketing; 41.4% of the members are facing the non-availability of market for their product.
- It is clear that majority (42.9) of the respondents are not aware about fungus, 25.7% lacks knowledge regarding in cultivation.

As consumers become more aware of the additional culinary characteristics offered by a variety of mushrooms, demand for oyster mushrooms will increase. The development of improved technology to cultivate each species more efficiently will allow the consumer price to decline. At the same time, product quality should increase, thus furthering demand. However, research is needed to extend the shelf life of these mushrooms and to improve consistency of production. Production of various species of *Pleurotus* allows growers to take advantage of the many colors of the fruiting body for marketing purposes.

Mushroom production being an indoor activity, labour intensive and high profit venture provides ample opportunities for gainful employment of small farmers, landless labourers, women and unemployed youth. In future, the ever-increasing population, depleting agricultural land, changes in the environment, water shortage and need for quality food products at competitive rates are going to be an important issue. To meet these challenges and to provide food and nutritional security to our people, it is important to diversify the agricultural activities in areas like horticulture.

Therefore, promotion of mushroom cultivation shall meet the nutritional needs and provide livelihood to landless poor.



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