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Mushroom technology as new food resource for rural development

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Abstract : Over the past 25 years, new natural drugs have been approved for the treatment of human diseases. Natural products play a very important role in the process of discovery and development of drugs, including the treatment of chronic diseases such as cancer. For hundreds of years, medical mushrooms are used as decoctions and essences and are applied ad alternative medicine in Korea, China, Japan and Eastern Russia. Geologically, mushrooms existed on the earth even before man appeared on it as evidenced from the fossil records of the lower cretaceous period. Thus anthropologically speaking, there is every possibility that man used the mushrooms as food when still a food gathered and hunter on the chronology of Cultural Revolution. Mushrooms offer tremendous applications as they can be used as food and medicines besides their key ecological roles. They represent as one of the world's greatest untapped resources of nutrition and palatable food of the future. Mushrooms had long been used for medical and food purposes since decades. It is new increasingly recognized that correct diet, controls and modulates many functions of human body and consequently participates in the maintenance of state of good health, necessary to reduce the risk of many diseases. Mushrooms have a great nutritional value since they are quite rich in protein with an important content of essential amino acids and fiber. The dietary fiber present in *L.edodes* (Shiitake) consists of soluble and insoluble structures. In the water-soluble are found the β-glucans and proteins. In the non soluble fraction, salts are extracted only with acids or alkalis and found the polyuronide (acidic polysaccharide), hemicelluloses, β-glucan chains with heterosaccharide, lignin and chitin. They also provide a nutritionally significant content of vitamins (B1, B2, B12,C, D and E). Numerous mushrooms and their ingredients have been known to be beneficial to the skin and hair. The representative ingredients are as follows: phenolics, polyphenolics, terpenoids, selenium, polysaccharides, vitamins and volatile organic compounds. These compounds show excellent antioxidant, ant-aging, anti-wrinkle, skin whitening and moisturizing effects, which make them ideal candidates for cosmetics products. Present review is aimed to discuss the high nutritional and therapeutic potential of mushrooms and their applications as functional foods or as a source of nutraceuticals for maintenance and promotion of health and life quality.

Key words: Mushrooms, functional foods, bioactive compounds, ant-aging, antioxidant nutritional, cosmeceuticals and therapeutic agents

INTRODUCTION

A mushroom is the fleshy, spore bearing fruiting body of fungi, typically produced above ground, on soil, or on its food source, mostly in forests. It is perhaps the most well-known and documented edible forest product[1]. The word mushroom means different things for different people in different countries[2]. Therefore the term is used to describe the fleshy fruiting bodies of some Ascomycota. These gills produce microscopic spores that help the fungus spread across the ground or its occupant surface.

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Mushrooms are considered as "god's food" by the Romans. The Greeks regarded them as providing strength for worriers in battles. Mushrooms are mysterious, cultural, traditional and legendary. Cultivation of saprophytic species such as Oyster mushrooms and shiitake has grown rapidly in recent decades.[3] Mushrooms have been widely used as foods[4,5] and very often as delicious and nutritious foods.[6] For example, The Pharaohs prized mushrooms as delicacy food[7] and valuable resources for medicines as well.[8] More than thousands of mushroom biodiversity present in nature, our ancestors, biologists, and scientists have isolated approximately 100s of mushroom species that have a unique combination of nutrition that improves our health. The commonly cultivated mushrooms are button mushrooms, oyster mushroom, paddy straw mushroom, milky mushroom, portobello mushroom, and shiitake mushrooms. The consumption of mushrooms by humans is an age-old practice. However, in recent days mushroom has become a part of every continental dish because of its good taste, flavor and nutritional value.

Mushroom cultivation is increasing day by day and becoming more popular because it is not only meets the deity requirements but also adds to the income especially of growers with insufficient land. It is playing a vital role in helping rural community make stronger their livelihoods. It is well organized income for change of agricultural wastes like hey, paddy straw etc. into precious protein and making added profits as well as reduce unemployment. It is considered to be a very fascinating hobby for the person who is unemployed or retired. Mushroom growing is one agricultural activity in which women can play a vital role without sacrificing their household responsibilities. In present scenario, mushroom cultivation faces fewer difficulties. Cultivation is also independent of weather, and can recycle agricultural by products as compound substrate which, in turn, can be used as organic mulch in growing other horticultural crops, including vegetables.[9] A small quantity of spawn planted in a suitable growing medium it is amazing that within a six weeks, it grow into a profitable crop inside a room, where no other crop can be grow. However, mushrooms have more uses in present time than any other food crops. It is carried out indoor in room, basement, shades, garage etc., which should be well ventilated. The commonly cultivated mushrooms are button mushrooms, oyster mushroom, paddy straw mushroom, milky mushroom, Portobello mushroom, and shiitake mushrooms. The consumption of mushrooms by humans is an age-old practice. However, in recent days mushroom has become a part of every continental dish because of its good taste, flavor and nutritional value.

In India, there is only three kinds of mushrooms are specially cultivated in rural areas, which are as following:-

1. Button mushroom (*Agaricus bispores*)
2. Straw mushroom (*Voluariella uoluacea*)
3. Oyster mushroom (*Pleurotus sajor-caju*)

The major focus has been given on the production of button mushrooms in India, even though the productivity, yield potential, quality, and medicinal aspects make oyster mushrooms more challenging. These mushrooms are a good quality source of non-starchy carbohydrates and medium quantity of proteins, minerals and vitamins.[10] The content of protein differs from 1.6 to 2.5%. Oyster mushrooms are rich in vitamin C, B complex, and mineral salts, which is necessary to the human being.[11]

Table.1 Mushroom species and their corresponding cultivation med

Growing Medium	Mushroom Species
Rice straw	Straw (Volvariella), Oyster (Pleurotus), Common (Agaricus)
Cotton waste from textile industry	Oyster (Pleurotus), Straw (Volvariella)
Sawdust	Shiitake (Lentinus), Oyster (Pleurotus), Lions Head or pom pom (Hericium), Ear (Auricularis), Ganoderma (Reishi), Maitake (Grifolia frondosa), Winter (Flammulina)
Oil palm waste	Straw (Volvariella)
Bean straw	Oyster (Pleurotus)
Cotton straw	Oyster (Pleurotus)
Banana leaves	Straw (Volvariella)
Sawdust-rice bran	Nameko (pholiota), Ear (Aurcularis), Shaggy Mane (Coprinus), Winter (Flammulina), Shiitake (Lentius)
Cotton seed hulls	Oyster (Pleurotus), Shiitake (Lentius)

This article is going to focus on cultivated mushrooms. The objectives of this paper are to describes the fast growth of the mushroom economy and provide

useful knowledge of the technological innovation and dissemination for rural development. The information used in this paper is more based on existing literature.

The Oyster mushroom is a member of the genus Pleurotus, commonly known as "Dhingri" in India. It has got its name "oyster" from the resemblance of its fruiting bodies to sea oyster shells that come in different colors (white, cream, grey, pink and yellow). Some countries such as China, Italy and the USA are leaders in oyster mushroom production and China alone produces 85% of all (*Pleurotus* spp.) that are grown worldwide. Oyster mushrooms are decomposer of wood and vegetable residues. At present India produces annually 10,000 tons of this Oyster mushroom. It is popularly grown in the states of Orissa, Karnataka, Kerala, Maharashtra, Andhra Pradesh, Madhya Pradesh, West Bengal and in the North-Eastern States. Oyster mushrooms are rich sources of protein (1.6-2.5%- fresh weight, 20-30% protein-dry weight), vitamin C and vitamin B complex, potassium, sodium, phosphorus, iron, and calcium. The protein quality of oyster mushrooms is considered higher than that of fruits and vegetables. Oyster mushrooms contain beta-1,3/1,6-glucan which stimulate the immune system and mevinolin which is important in lowering cholesterol level. The oyster mushroom is used fresh, dried, canned or in powder form.

Although there is no great demand in the national market, it is easy to sell the small produce by the growers. The international demand is so huge that it is difficult for a small grower to meet. There is a need to develop a chain of producers so that the production from different farmers could be collected and supplied to the international market as per export standards. Cultivation of edible mushrooms is one of the most economically viable processes for the bioconversion of lingo-cellulosic wastes. *Pleurotus* spp. can easily be grown by rural women with minimum efforts. 'Dhingri' is grown in northern plains from October to March when temperature ranges between 22-28°C. High labour-land ratio and an alarming rate of population growth may pose a threat to our food security in the very near future. The situation has led to a decrease in labour wages pushing the community to below the poverty line. Oyster mushroom cultivation is considered as an alternative source of income to uplift the living standards of poor farmers and also to add high-quality protein in their daily diets to eradicate malnutrition problems.

CONCLUSION AND DISCUSSION

Mushroom cultivation has been described as the most versatile and prolific agriculture and forestry venture all over the world. Growing evidence shows that mushroom growth has great potential in many other countries, particularly in developing countries. Approximately 14,000 described species of the 1.5 million fungi estimated in the world produce fruiting bodies that are large enough to be considered as mushroom.[12] Mushroom cultivation can provide employment in both the semi-urban and rural areas. Mushroom cultivation will improve the socio-economic condition of farmers, families and solve employment problems of both literate and illiterate, especially women. Mushrooms could be an important sector for our future agriculture and forestry. Huge quantities of vide varieties of organic waste are generated from agriculture, forestry and food processing. Bio-innovation is very important for mushroom cultivation and so is the technological dissemination. Technological development can largely increase production capabilities and even significantly reduce the costs. Mushroom cultivation is an effective bioconversion technology of transforming wastes and woods into potential valuable resources. Mushroom cultivation could also be an important part of sustainable agriculture and forestry.

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