Review Article

Mushroom cultivation for Increasing income and sustainable development of small and marginal farmers

Abstract

India is popularly known as an agriculture driven nation, since the majority of its population is employed in agriculture, thus, making agriculture backbone of the Indian economy. Agriculture is an engine of growth and poverty reduction in the majority of developing nations. Strengthening rural people, directly and indirectly, contributes to nations' development. As in India, the rural population mostly comprises of marginal and landless farmers, there is a need for a low cost and maximum profit plan to enhance both their income as well as socio-economic status. Mushroom cultivation is a minimum input maximum output venture proving to be an additional source of income. The vegetarian population residing in the urban areas of our country has now accepted mushrooms in their diet because of its nutritional values so the mushroom produced from the nearby rural areas has a good market of selling their products easily and at a good price. Thus, the mushroom is a boon to both producer and consumer giving it the status of super food. Mushroom cultivation can also be a way to empower the rural peoples, provide additional income for the sustenance of farming families and tackle the problem of lack of nutritional requirement of the rural people. Rural unemployed peoples are the most productive workforce in the economy, raising the need to strengthen and improve their socio-economic status. Mushroom cultivation round the year can generate income through the sale of spawns, in addition to the sale of fresh mushroom in a sustainable approach by utilizing farm by-products as their raw material.

INTRODUCTION

Mushroom is one of the most diverse organisms on earth and since primitive times have played a vital role in human welfare. A mushroom is the fleshy and spore-bearing fruiting body of a fungus and belongs to the class Basidiomycetes under the order Agaricales in fungal classification, typically produced above the ground on soil or on its food substrate. It has been universally used as a food and medicine by different civilizations since ancient time due to its delicious taste, flavor, dietetic qualities and several medicinal properties. Mushrooms are being grown on commercial scale in many parts of the world. Wildly, 20 species of mushroom are grown in the country, of which 5-6 are poisonous; and the recommended species for cultivation are oyster (Pleurotus spp.) and white button mushroom (Agaricus bisporus) Milky mushroom(*Calocybe indica*) are more popular mushroom. **Bhatia, and Mohammed, 2007)**. The fresh mushroom contains about 85-90% moisture, 3% protein, 4% carbohydrates, 0.3-0.4% fats and 1% minerals and vitamins as well as some medicinal properties like lowering blood cholesterol level, defense against cancer and invigorating hair growth **(Dey *et al.*, 2020).** Agriculture is the main strength of Indian economy and with variety of agricultural crops grown today. We have achieved food security by producing over 273.6 million tons of record food production. However, our struggle to achieve nutritional security is still on. Under these circumstances mushroom farming has been identified as a suitable and most profitable enterprise since per unit productivity of mushroom is several folds high than any other crop **(Halpern and Miller, 2002).** These are ideal tools for converting agricultural waste into protein rich non-conventional food items. Krishi Vigyan Kendras established under the aegis of CCS Haryana Agricultural University Hisar in Haryana are playing a significant role in technology assessment, refinement, front line demonstrations and transfer of technology in the farmers, farm women and extension personnel in their respective districts. The major emphasis of these centers is to enhance the production and productivity as well as to generate household income and employment of rural youth through several vocations. Thus attempt was made for skill development among rural women in the field of mushroom farming so that they could start their own entrepreneurial units using low cost thatched houses. Hence MVN University, School of agriculture is growing different edible mushroom to solving the unemployment and malnutrition problem in rural masses of Palwal and also lead to rural development by increasing income and

self employment particularly among women folk who constitute 70% of total women's population (**Singh and Sidhu, 2014).**

PRESENT STATUS OF MUSHROOM IN INDIA

Even though the cultivation of mushrooms had been started in other parts of the world many centuries ago, the origin of its cultivation in India is comparatively recent. The first attempt of mushroom cultivation is known as that by Thomas and his colleagues in Coimbatore by trying to cultivate Paddy straw mushroom. The first scientific attempt to cultivate Button mushroom is credited to the Government of Himachal Pradesh in collaboration with ICAR under the scheme "Development of Mushroom Cultivation in Himachal Pradesh" in 1961 which was later taken up as an enterprise by the progressive farmers of Himachal Pradesh and Jammu and Kashmir in the late 1960s **(Vibha, 2017; Siddiqui and Fatima, 2017)..**The cultivation of mushroom spread to other hilly areas of Uttar Pradesh and Tamil Nadu in the early 70s. It was adopted by the farmers of Haryana, Uttar Pradesh and Punjab in the late 70s and early 80s as a seasonal crop. The country's capital Delhi and the economic capital Mumbai together formed a big market for the utilization of fresh mushrooms to the magnitude of 10 to 12 tonnes per day. Today one of the biggest units of mushroom cultivation in India is located in Madras. There are very result-oriented with exhilarating figures of mushroom trade in India at the present time. The corporate houses have set up many export-oriented units encompassed with advanced technology and machinery throughout the country for enhanced mushroom production. In the past decade, there has been a many-fold increase in mushroom production in India **(Prakasam, 2012).**

PRESENT SCENARIO OF MUSHROOM CULTIVATION IN THE DIFFERENT STATES OF INDIA

There was spread of white button mushroom from Jammu and Kashmir and Himachal Pradesh to all over the country after 1980. A remarkable improvement in the production scenario has been witnessed as mushroom cultivation hasnow spread its shadow from north to south and east to west region of India (**Sharma et al., 2017**). The production of mushroom alone in Himachal Pradesh has crossed 8000 tonnes ever since the two commercial-oriented units have been

established at Paonta Sahib and Nalagarh which jointly produce 4500 tonnes per annum of the total . Many of the cold storages in Punjab has been transformed into the units for production of mushroom. The medium-sized commercial units at Hissar, Kalka, Panipat, and Gurugram has a total production of 8000 tonnes of fresh mushrooms from Haryana **(Karthick and Hamsalakshmi, 2017)**. Many commercial companies are aspiring to familiarizethe production of mushrooms in Madhya Pradesh. Upon being introduced into Chattisgarh, oyster mushroom is being cultivated in the tribal areas around the Raipur in particular with a production of more than 1500 tonnes on an annual basis. In Gujarat and Rajasthan, the cultivation of white button mushroom is on an experimental basis but the cultivation of oyster mushroom has been taken up by the cultivators. In Bihar and Jharkhand, small scale mushroom enterprises are well functional and are under progress. In Maharashtra, the cultivation of mushroom is confined to Mumbai and Pune with 8000 tonnes production on annual basis and 12- 15 tonnes annual production is from one export oriented unit in Panaji, Goa (**Zadrazil et al., 1992).** Presently, more than 85 per cent of the total mushroom production is of white button mushroom followed by the oyster mushroom.

Cultivated Species and Varieties of Mushroom in India

At present, four types of mushrooms viz., the button mushroom (Agaricus bisporus), the Oyster mushroom (Pleurotus spp.), the paddy straw mushroom (Volvariella spp.) and the milky mushroom (Calocybe indica), have been recommended for round the year cultivation in India. Button, oyster, milky and paddy straw mushrooms are cultivated in different parts of the country, as per temperature profiles during different seasons. **(Singh and Sidhu, 2014).** Two-three crops of button mushroom are grown seasonally in temperate regions with minor adjustments of temperature in the growing rooms, while one crop of button mushroom is raised in the northwestern plains of India seasonally. Oyster, paddy straw and milky mushrooms are grown seasonally in the tropical/sub-tropical areas. **(Singh et al.,2008).** The cultivation methods for these sub-tropical/tropical mushrooms and others like Lentinula, Flammulina, Auricularia, Agrocybe, Stropharia, Macrocybe, Hericium, Ganoderma, etc. have also been standardized at different research institutes, universities and primarily at the Directorate of Mushroom Research, ICAR, Govt. of India. **(Dhar and Sharma, 2009).**

Table 1: Temperature requirements of some important mushrooms

S.N.	Scientific name	Common name	Spawn run	Temperature requirement (oC) Fruiting
01	*Agaricus bisporus*	White button mushroom	23-25	14-16
02	Auricularia spp.	Black ear/ Wood ear mushroom	20-30	20-30
03	*Lentinula edodes*	Shiitake mushroom	22-27	15-20
04	*Pleurotus eryngii*	Kabuli Dhingri	18-22	14-18
05	*P. flabellatus*	Dhingri (flabellatus)	25-30	22-26
06	*P. florida*	Dhingri (Florida)	25-30	18-22
07	*P. sajor caju*	Dhingri	5-32	22-26
08	*Vovlariella volvacea*	Paddy straw/ Parali mushroom	32-34	28-32
09	*Calocybe indica*	Milky/ Dudhiya mushroom	25-30	30-35

Source: Shirur, 2011

Fig 1: Photographs of important mushrooms

MATERIAL METHODS

The group B.Sc. Agriculture students from MVN University , Palwal got forty days training from Krishi Vigyan Kendra, Midcola (Haryana) under the supervision of Principal scientist Dr. D.V. Pathak HAU Hisar Agriculture University. Students gets benefited by the interventions as facilitated by Krishi Vigyan Kendra, like mushroom cultivation trainings, demonstration, farm advisory service for Button, Oyster and Milky mushroom production, value addition and marketing of these products. The spawn of mushroom, chemical, net bags, polythene bags and other accessories were provided to students. The objective of the group was to income generation and sustainable development of small and marginal farmers through Mushroom cultivation and its value addition to achieve nutritional stability at village level for consumer.

PROGRESS MADE

The group of students approached the university to establish the mushroom cultivation unit for production of various types of seasonal mushroom. School of Agriculture MVN University, take an initiative to develop mushroom cultivation laboratory as well spawn room and various type of seasonal mushroom are growing such as *Calocybe indica, Agaricus bisporus,* and *P. sajor caju* these days. Students are receiving good prize for mushroom and it's value added products by selling it to different enterprises. Department organized various training program on mushroom cultivation for the unemployed youth, women's and Farmers. People of various villages are engaged with farming along with animal husbandry. They are happy with starting of mushroom production unit because of good demand of fresh mushroom and its value added products during festive and marriage seasons. So farmers are a happy with getting good prices of their products. Consumers are satisfied with the superior quality of fresh mushroom and its other products. From the findings it may be concluded that mushroom production through scientific and technical support it may raise the extra income of the rural youths and farm women.

Future prospects

India has tremendous potential for mushroom production, and all commercial edible and medicinal mushrooms can be grown. There is increasing demand for quality products at

competitive rates both in domestic and export markets. To be successful in both domestic and export markets, it is essential to produce quality fresh mushrooms and processed products devoid of pesticide residues and at competitive prices. It is also important to commercially utilize the compost left after cultivation for making manure, vermi compost and briquettes for additional income and the total recycling of agro-wastes. Mushrooms can make an important contribution to the livelihoods of rural and peri-urban dwellers, through food security and income generation, and mushrooms can make a valuable dietary addition through their protein and micronutrient contentsas well as their medicinal properties. Mushroom cultivation can represent a valuable small-scale enterprise option.

Growing mushrooms also helps to avoid some of the challenges facing collectors of wild fungi, including species identification, obtaining access and permits for collecting, and practicing sustainable harvesting. Cultivation is also independent of weather, and can recycle agricultural by-products as composted substrate which, in turn, can be used as organic mulch in growing other horticultural crops, including vegetables. Mushroom cultivation is highly compatible with a variety of other traditional agricultural and domestic activities, and can make a particularly important contribution to the livelihoods of the disabled, of women and the landless poor who, with appropriate training and access to inputs, can increase their independence and self-esteem through additional income generation.

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