

Editorial

Mushrooms: Immunity boosters and income generators

Mushrooms are achlorophyllous macrofungi without leaves, stems and roots but are still cultivated abundantly all over the globe and witnessing white revolution with world production of 43 million tons in 2020-2021. There are thousands of species of macrofungi commonly called as mushrooms, which may include edible, non edible, medicinal, poisonous and miscellaneous species. The edible and medicinal mushrooms are now widely recognised, consumed and used as herbal medicine to boost the human immunity against biotic stresses including Covid-19 crisis. Lot of awareness are being created world-wide for production and consumption of mushroom world over in the present days including in India. The production of mushroom in India has reached to 2,25,000 tons with per capita consumption of only 25g as against 4-22kg of mushrooms by many countries of the world. Earlier, cultivation of mushroom was dominated only by button, oyster, paddy straw and milky mushroom but now production technology of several edible and medicinal mushrooms have been developed and standardised in India. There is thus a very strong need to diversify mushroom species for cultivation in India having suitability for varying climatic conditions, rich in nutritional and medicinal values and have commercial potentiality.

Mushroom is a health food and very much required in Indian diet in view of prevailing large undernourishment and malnourishment problems compared to other parts of the globe. Out of 17 Sustainable Developmental Goals (SDGs) set by UNO, nutrition is placed at the heart of all SDGs and it has been estimated that with expense of every 1 US \$ in nutrition, we earn 16 US \$. The nutritional status of Indian population is extremely poor. India is at 94th position in Global Hunger Index (GHI, 2020) out of 107 countries of the world. In Hunger and under nutrition, India is at 65th position out of 79 countries of the world (IFPR Report). Global Nutrition Report says that, 1/3rd of the world's under nourished children are in India. It has 1/4 of the world's hungry children and 20.8% children are physically under developed. One million children of less than 5 years of age die due to undernourishment. It has 34.7% of the undernourished people. World Health Organisation report says that 70% women and 50 % pregnant women in India are anaemic and 35.6% of women suffer from chronic energy deficiency, indicated by a BMI below 18.5. Ensuring food and nutritional security is thus a real challenge for India which can be achieved with the production and consumption of highly nutritious food like mushroom which is considered to be an ideal food for both flexitarians and vegetarians. The nutritional values of mushrooms are in between the plants and animals based on which it is designated as a 'mycomeat'. There is thus a very strong need to work on different mushroom species as per existing climatic conditions of the region and expand their production in India not only to ensure food and nutritional security but also the income, employment and livelihood security in rural India.

There is shift in consumption of mushroom from processed to fresh mushroom. Many countries of the world earlier consumed canned or processed mushrooms but the trend is now changing towards consumption of fresh mushrooms. In eighties, button mushroom was ruling the world but now many other species like shiitake, oyster and black ear mushrooms are grown in abundance followed by button. Similarly, the trend in consumption of mushroom as food and medicine is increasing rapidly with development of production technology for several edible, medicinal and mycorrhizal mushrooms. For instance, a good success has been achieved by ICAR-Directorate of Mushroom Research, Solan (H.P.) in the production technology of *Morchella esculenta*, an ascomycetous, mycorrhizal and highly prized fungus. Similarly, there has been good success in the production technology of *Termitomyces microcarpus* at AICRP (Mushroom), Dept. of Plant Pathology, IGKV, Raipur (CG). Lots of sincere efforts are being made in the production technology of several other edible/medicinal/mycorrhizal mushrooms in India

e.g. *Schizophyllum commune*, *Hericium erinaceus*, *Grifola frondosa*, *Cordyceps militaris*, *Ganoderma lucidium* etc. which is a good indication for the expansion of mushroom industry and their consumption in India.

Naturally growing mushrooms in India still need to be investigated for their huge nutritional, pharmacological and commercial potentials and required to be explored for income, employment and livelihood generation in rural areas. It is collected by the local gatherers during most favourable months of the year and its availability is more when weather favours but it is less under unfavourable conditions. Under favourable conditions, when the supply is more than demand, then it fetches very less price in the market and local gatherers get very less than what they deserve. Hence, the role of processing of wild edible mushrooms which are grown naturally in plenty during congenial climatic conditions comes in. They spoil quickly during monsoon season when the humidity in the atmosphere is high and they themselves have more water content resulting in fast deterioration of mushroom. During monsoon season, it is very important to extend the shelf life of wild mushrooms. Sincere efforts are therefore required to preserve, conserve and extend the shelf life of mushrooms by proper processing and packaging them in good packaging materials to prolong their life so that it can be used during off season. State/Central government should help the forest dwellers in dehydration of naturally growing mushrooms which are very expensive. This can be done by supplying cheap solar dryers with battery back up to the SHGs/FIGs so that their shelf life can be extended for six months to one year.

Mushrooms are rich in several phytochemicals and multi nutrients which are essential for the growth, development, protection and immunity of the human body. Mushrooms are the only natural source of Vitamin D among the vegetables for the vegetarian diet. It is highly rich in minerals (particularly sodium and potassium), crude fibres, vitamins, proteins and carbohydrates but low in fat and sugars and considered as a low calorie food which is most ideal for the patients suffering from diabetes, blood pressure and hypertension. Mushroom protein (22-32%) is highly digestible because of the presence of all essential amino acids required for the growth of human body. Pulses and cereals are the main ingredients of the vegetarian diet which are proficient in proteins and carbohydrates respectively but some of the essential amino acids which are neither present in pulses nor in cereals are predominantly present in mushrooms. As a result, its digestibility index is more and suitable for the patients suffering from constipation. The amino acid score of mushroom is at par with that of milk and meat. Mushrooms have varieties of protein bound short/long chain polysaccharides, tryterpenoids, ganoderols, ganoderic acid etc. which enhances the immunity of human body by overall amplification of the immune defense system, thereby protecting the body from viral, fungal, bacterial and other infections by imparting anti microbial effects. Due to presence of polysaccharides and other bioactive compounds in edible/medicinal mushrooms, they have anti-tumor activity which attracted the attention of the scientists world over to work on different health benefit effects of mushrooms. These biologically active compounds have been identified, characterised and commercially exploited for varying health benefits against varieties of pathogenic microbes using latest biotechnological and bio medical engineering tools/techniques. It has given a new ray of hope and can be explored as herbal medicines/pharmaceutical drugs and agrochemicals. It can be a multi-million dollar business.

Mushroom is capable of transforming rural life in to prosperity as has been learnt from China. It has the capacity to mobilise about 12 crores migrant labourers as a source of income generating venture. It can target the people from low income group to enhance their income and provide business opportunities. There are several successful examples of mushroom spawn production, mushroom crop production, mushroom processing & value addition and mushroom marketing now available in India which needs to be replicated throughout the country as a sole source or additional source of income. The youths of rural, urban and peri-urban areas of India may be sensitised, motivated and convinced to take up mushroom activities in a small to large scale so that they may become job providers rather than job seekers. In sixties, one ha of land was to feed two people but in 2021 onwards, one ha of land has to feed five or more people. Thus, we have to evolve, develop or innovate highly profitable business models which requires less land, less infrastructures, low technical know how, environment friendly, and

double or triple the income in a year or so which is conceptualised by the Hon'ble Prime Minister of India. These can be mushroom spawn production activity. India still do not have the fully mechanised and automated mushroom spawn laboratory which can produce the quality spawn in time and make it available to all those who wish to grow varieties of mushrooms. The young researchers or science graduates or post graduates may adopt this challenge of establishing the good mushroom spawn laboratory in different locations of the country and fulfil the needs of the local growers. The demand of the spawn is still more than its supply in India; hence identification of suitable cheap substrates for production of quality solid or liquid spawn for timely availability following all the national or international spawn standards is the need of the hour. There is a very strong need to diversify and standardise the production technology of different mushroom species depending upon the prevailing climatic conditions and availability of cheap resources so that the production cost may be minimised and profit may be maximised. In order to enhance shelf life of mushroom during transit and export, it is essential to study and validate different processing and preservation technologies suited well to Indian conditions which will be necessary in order to explore the commercial potentiality for export of mushrooms to different countries of the world. It is the era for serving of ready to eat food, readymade food, nutritionally fortified foods or value added food to the consumers depending upon their taste and nutritional requirements. This area is still untouched and needs a varieties of interventions from the researchers in development of mushroom based fortified or value added food products so that the demand can be increased in order to enhance consumption and improve nutritional and medicinal status of the Indian population.

Prof. M.P.Thakur

Dean, Faculty of Agriculture
Indira Gandhi Krishi Vishwavidyalaya
Raipur -492 012 ,Chhattisgarh, India
Email:mp_thakur@yahoo.com

