

STATUS AND SCOPE OF MUSHROOM CULTIVATION IN HARYANA- CONSTRAINTS AND FUTURE OUTLOOK

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ABSTRACT

Agaricus bisporus (white button mushroom), being a temperate mushroom was initially grown only in the hilly regions of India, particularly Himachal Pradesh and Kashmir, under seasonal conditions. Seasonal cultivation of this mushroom was introduced in North-Indian plains including Haryana in 80s. Since, then the state has achieved a tremendous increase in mushroom production with current production of more than 10,000 tonnes per annum. Though the production technologies for *Agaricus bisporus*, *A. bitorquis* (button mushroom), *Pleurotus* spp. (oyster mushroom), *Calocybe indica* (milky mushroom) and *Volvariella volvacea* (paddy straw mushroom) have been developed, yet all these mushrooms could not achieve the commercial status except white button mushroom (*A. bisporus*). This mushroom is cultivated in India under both controlled and natural conditions. Even though, centralized facilities have been developed in some parts of the state to provide spawn and pasteurized compost, the quality of spawn, low and variable productivity and lack of industries involved in post-harvest processing/ value addition are the problems faced by many growers.

Keywords: seasonal cultivation, button mushroom, oyster mushroom, milky mushroom, paddy straw mushroom

Indian agriculture is known for its multi-functionalities of providing employment, livelihood, food, nutritional and ecological securities. Mushroom production leads to the bioconversion of agro-residues into nutritious food. India produces about 600 million tonnes of agricultural byproducts, which can profitably be utilized for the cultivation of mushrooms [1]. Currently, we are using 0.04% of these residues for producing around 1.2 lakh tons of mushrooms of which 85% is button mushroom. India contributes about 3% of the total world button mushroom production [2]. In the wake of increasing population, increase in awareness about health benefits of mushroom and changing food habits, the demand for various mushrooms is likely to increase sharply. Mushroom cultivation can contribute in achieving nutritional and social security along with promotion of value addition, canning and export industries also. Some of the mushrooms like oyster, paddy straw and milky mushroom have simple cultivation technology. The cultivation methods for these as suited to Haryana conditions have also been standardized. Mushroom being rich in protein is considered very important particularly for people of Haryana as majority of its population is vegetarian. The cultivation of mushroom has been adopted in the recent years by the farmers of Haryana because the economic returns are much higher compared to other agriculture crops and has great scope because of the proximity to Delhi.

The results presented are based on different studies of seasonal mushroom farms undertaken in Haryana. The 34.9% of the total investment is on fixed inputs while 65.1% is on variable inputs. In the fixed investment, major share is spent on construction of mushroom sheds. In the variable costs, maximum proportion is spent on labour (28.09%) followed by that on straw (14.96%) and bran (8.96%). A perusal of studies revealed that net returns per kg of mushroom produced was ₹ 9.50 on an average selling price of ₹ 30.00 per kg. Since benefit cost ratio over variable cost, total production cost and total cost were greater than the mushroom production is a highly profitable proposition. Mushroom produced in the state is sold in Delhi market through commission agents and is also sold directly either to the processing firms or the traders. But these are not transparent and the farmers remain at the receiving end. The marketing cost of mushroom is quite high and costs such as washing, weighing, packing etc have necessarily to be made by the farmers. The major marketing costs are commission charges (41.05%) and transportation (36.52%). These charges can be rationalized through collective efforts of farmers and government. Mushroom growers also pointed out the unauthorized charging of commission fee for selling their mushroom from designated 'farmers sheds' where they are not supposed to pay any commission charges. Direct marketing of mushroom by farmers to processing firms and traders also involves manipulative and unethical practices by these like reduction in predetermined contract price on flimsy excuses of quality and delay / even default in payments. When prices are low, they do not purchase from the contracted farmers. Keeping in view, the farmers vulnerability, they have to put joint or group efforts and these may or may not be formal but should be the practical ones. The quality at

competitive price is the key to success and farmers have to make an assertive shift from 'production mode' to 'production with quality mode' by applying latest production and marketing techniques. Vertical integration of agriculture and food markets from farm to firm is the best way to achieve efficiency and serve the interest of each stakeholder in the chain i.e. the farmer, the processor, the retailer and the consumer. There is no organized assistance available for marketing of mushrooms in India. Every export-oriented unit has its own individual arrangement for marketing, and the mushrooms are preserved in brine and canned in large containers of 3-5 litres (or bigger) capacity for export. A long-term strategy has to be developed to help the industry.

As India itself is a big market, vigorous extension activities are required to make the people aware of mushrooms, which can help in developing domestic market. This is the key of success of Chinese mushroom industry as they consume more than 80% of mushroom produced by them. Mushroom revolution is going to happen as a result of the improved productivity as well as vast increase in the number of environment controlled and seasonal growing units. The share of the button mushroom is bound to decline with more and more specialty mushrooms becoming available for seasonal cultivation. With the increased production, there is every likelihood that an organized mushroom marketing channel is established. A significant quantity of mushrooms is likely to be utilized for production and consumption of the value added products, as compared to present trend of fresh mushroom utilization. The venture will also be designed and directed towards complete recycling of the agro-wastes for production of food (mushroom), feed (cattle feed), fuel (biogas) and fertilizer (organic manure).

Majority of the farmers are cultivating mushrooms only during particular seasons. Farmers in the plains of North India cultivate white button mushrooms during winter only and stop the mushroom cultivation during summer and dismantle their temporary growing houses. It is also paradoxical to note that India is largely a tropical country and we mainly cultivate temperate mushroom. The tropical and sub tropical mushrooms like oyster (*Pleurotus* spp.), paddy straw (*Volvariella* sp.), milky (*Calocybe* sp.), reishi (*Ganoderma* sp.), wood ear (*Auricularia* spp.) etc. are not cultivated on a larger scale. Hence, the continuous cultivation of different mushrooms depending on the season is certain to increase the economic returns of the mushrooms growers. Round the year cultivation assumes much significance especially for rural livelihood security.

Button mushroom compost is prepared using variety of base materials like wheat straw, paddy straw, sugarcane bagasse, chicken manure, various cakes and brans, as per their availability in different regions of the country. In major parts of Haryana wheat straw is widely used whereas in some parts, paddy straw is used which is available in abundance. Poultry manure, an important component meeting the nitrogen needs, is available throughout the state and is used mostly in short method of composting. Growers following long method of composting generally use chemical fertilizers in place of poultry manure for balancing the nitrogen requirement in the compost. Poultry manure is a carrier of nematodes and competitor moulds and hence, is not preferred for unpasteurized compost. Haryana farmers have successfully adopted low cost technologies developed by Haryana Agriculture University (involving thatched structures, bed cultivation and prolonged cropping using compost prepared by long method) for seasonal cultivation and contribute over 10,000 tons of mushrooms annually.

The cultivation technique of white button mushroom requires an indoor temperature between 15 to 25 °C i.e. 22-25 °C (vegetative growth) and 14-18 °C (fruiting). In North India it can be grown conveniently during October to February under natural conditions. The compost is prepared by mixing various raw materials (wheat/paddy/brassica straw) in specific proportions either by long or short method of composting. Since preparation of compost by short method requires specialized unit which is not feasible for small and marginal farmers; hence, only long method, which takes 28 days is being used. The wheat straw can be replaced by paddy or brassica straw depending on the formulae to reduce the cost of cultivation. For spawning, spawn is available in polypropylene bags. For casing, generally, a mixture of FYM and garden soil/ field soil is used. But a mixture of burnt rice husk and garden soil/ field soil (1:1) has been found to be cost-effective. As burnt rice husk needs no sterilization, only garden/field soil is sterilized. Temperature around 25 °C till 1 week after casing is most desirable and subsequently temperature should be 14-18 °C and relative humidity of 80-90% (maintained by spraying water) in the mushroom house during entire fruiting period. Mushroom is picked in button stage; and for marketing generally packaging is done in polythene bags containing 200 g mushrooms and few holes are made in the packets to avoid condensation of the moisture in the bags.

Both the production systems viz., seasonal and controlled environment growing are in practiced. Environment controlled growing of button mushrooms may not be fully successful in our country if implemented as such without bringing in necessary modifications needed for Indian conditions. The following aspects that need attention are: development of environment

friendly composting process and shortening composting period by total indoor/single phase and use of microbial consortium etc; eco-friendly methods of pasteurization and standardisation of growing houses for optimum yields especially for low cost structures; improved casing materials, having easy and uniform application qualities; mechanization, as in future manual operations will become costlier.

Cultivation of oyster mushroom (locally known as Dhingri) in Haryana has tremendous potential, which is yet to be fully harnessed. Its cultivation technology is very simple as no special compost preparation and casing is needed. During the year many crops can be taken. Its production is more than the white button mushroom. It can be consumed fresh as well as can be sun dried for future use. Milky mushroom; due to its robust size, milky white colour, flavour and long shelf life has attracted attention of both consumers and prospective growers. Its nutritive value is also at par with other edible mushroom. The cultivation method is similar as that of oyster mushroom, except that it requires casing. For promotion of these, efficient low-cost region-specific growing systems and species for seasonal and round-the-year commercial cultivation should be developed and use of spent substrate for recycling as manure or cattle feed may be promoted [3].

Diversification of mushroom portfolio in the state and the country is required for round-the-year cultivation of different mushrooms to ensure environment and employment sustainability. Promotion of medicinal mushrooms *Ganoderma lucidum* and *Grifola frondosa*, which are very popular medicinal mushrooms and have great demand in the international market is also necessary. These can be cultivated under natural conditions on small as well as industrial scale.

Spawn acts as the seed, and is the most crucial input for successful cultivation of mushroom and there only two government institutes involved. However, in India the spawn industry is an un-organized venture and needs research support in the years to come so that it may attain quality standards and competitiveness comparable to multi-national companies. Development and enforcement of spawn standards in the country should be done at the earliest in the interest of mushroom growers.

Mushroom like other crops are also attacked by different diseases, insect-pests which affect the quality and yield. So, in the interest of mushroom growers researchers should pay attention to the following: Use of botanical pesticides, bio-control agents genetic resistance to manage diseases and pests. Development of quick diagnostic tools for detection of nematodes infestation, and standards for residual toxicity of chemicals used by the mushroom industry.

Increased productivity demands proper post harvest infrastructure to enhance shelf life and marketability. Mushrooms are delicate and highly perishable in nature. Short shelf life of mushroom poses unique problems in packaging, marketing and preservation of mushrooms. The retail packaging for fresh marketing is highly crude and is done in hand sealed polypropylene bags [4]. Similarly, canning in tin cans for button mushrooms and sun drying for other mushrooms are the most common methods of preservation employed. The aspects which have to be given greater attention are; low cost drying technology for the domestic and state-of-the-art technology for international market, modified atmosphere packaging and controlled atmosphere packaging, use of recyclable and biodegradable packing material, reduction in blanching losses during canning, development of low cost freeze-drying and IQF technologies; and ready-to-cook recipes, value-addition and product diversification to cover pharmaceutical, cosmetic and fast food industries.

The spent mushroom substrate (SMS) left after final crop harvest is a matter of concern as it creates various environmental problems including ground water contamination and nuisance. As mushroom production is increasing, so is the SMS generation, which calls for alternative management of this waste. Fortunately, SMS has many positive attributes still left for its potential uses. The material has been found to be a good nutrient source for field and horticultural crops because of its nutrient-status.

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