

Documentation of Indigenous Knowledge on Mushroom Cultivation

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ABSTRACT

Mushroom cultivation in India is being practised for the last four decades. During this period, mushroom growers have amended several scientifically proven mushroom cultivation practices suiting to their own needs. The collection and documentation of such locally adopted practices is very important from view point of their validation and further refinement. Thus, the present study was conducted by involving 400 established mushroom growers, and research/extension personnel using mailed questionnaire and structured interview schedule. A total of 10 ITKs were collected on different aspects of button, oyster and paddy straw mushrooms. Majority of the collected ITKs were on button mushroom, while only a few on oyster and paddy straw mushrooms. The ITKs viz., pasteurization of button mushroom compost without injecting steam, use of burnt rice husk as casing material for button mushroom, mushroom growing in mud houses and thatched / sarkanda sheds, cooling system of thatched shed/pakka house, spray of urea and English wishkey (alcohol) on mushroom beds, bunker system and under stacking aeration system for button mushroom compost preparation, flat floor method of oyster mushroom cultivation and traditional outdoor and indoor methods of paddy straw mushroom cultivation were collected. These ITKs need to be validated and refined through experiments, experts opinion and scientific literature.

Key words: Indigenous technical knowledge, mushroom cultivation, button mushroom, paddy straw mushroom, oyster mushroom.

INTRODUCTION

Since time immemorial, the indigenous knowledge exists in the world. It is based on experiences of local people, tested over centuries and transferred from one generation to another. The rural people particularly in under developed areas fulfill their day-to-day requirements through self generated knowledge, prevailing belief and practices. Every community is blessed with a few key persons having rich indigenous knowledge. It survives with them and when they die, the traditional wealth is also lost for ever. Hence, the documentation of indigenous knowledge becomes very much essential.

Documentation of indigenous knowledge is a safeguard towards protection of traditional knowledge (intellectual property) from infringement as it happened in cases of granting patents on Basmati rice, Neem and Haldi in foreign country. The present study is an attempt to collect and document the indigenous knowledge in the field of mushroom cultivation as much information is not available on this aspect even in the documents brought out under NATP for documentation of ITKs in agriculture and related areas.

METHODOLOGY

The study was confined to all the major and minor mushroom growing states as mushroom growers are scattered all over the country. An exhaustive list of regular mushroom growers was prepared with the help of primary and secondary resources of information. Similarly, research and extension personnel were also taken into consideration.

Keeping in mind the objectives of the study, a structured interview schedule and mailed questionnaire was constructed incorporating the existing tools and measuring devices.

This open ended structured questionnaire was sent to 140 established mushroom growers to collect ITKs directly from the users/generators. Similarly, a mailed questionnaire was sent to 253 research and extension personnel to collect ITKs prevailing in their respective area of operation. A few mushroom growers were also interviewed with the help of structured interview schedule in the states-Haryana and Himachal Pradesh. Thus, the data was collected from a total of 400 persons.

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Description of indigenous knowledge about mushroom cultivation

Pasteurization of button mushroom compost without injecting steam

Scientifically, preparation of button mushroom compost by short method of composting involves two phases. The phase-II in this process is termed as pasteurization and conditioning. The purpose of phase-II of composting is to make the compost free from harmful micro-organisms and selective for mushroom mycelial growth. Generally, phase-II is completed in 5-7 days in a specially designed insulated room called pasteurization tunnel, equipped with blower & boiler for manipulation of composting conditions.

A good number of mushroom growers preparing compost by short method of composting, did not inject live steam generated by boiler to manipulate the conditions of compost inside the pasteurization chamber. They maintain required conditions (temperature) by managing the air circulation with the help of a blower. They utilize the self generated heat of compost to achieve the pasteurization. The rationale of growers behind this ITK is to reduce the cost of compost production as boiler operation utilizes a lot of fuel for steam generation. By adopting this ITK, expenditure on boiler operation can be reduced to a great extent.

Use of burnt rice husk as casing material for white button mushroom cultivation

Peatmoss is an ideal casing material for button mushroom cultivation, but in India, it is not available in sufficient quantity. Hence, other alternate materials like farm yard manure (FYM), spent mushroom compost and coirpith which are available in plenty, have been recommended by the researchers and these are practically in use. Out of these, FYM is the most commonly used casing material applied in different combinations with soil. Keeping in view the availability and cost of quality FYM, mushroom growers of Punjab, Haryana, Himachal Pradesh and Delhi have amended the recommended casing formulations at their own over the years. On the other hand, the burnt rice husk (a waste of rice mill) is available in plenty and free of cost in these states. The seasonal mushroom growers have reinvented indigenous burnt rice husk based casing formulations is mixing it with FYM or soil in 1:1 or 1:2 or 2:1 ratios. The large mushroom growers with controlled environment conditions are using it with FYM and coir pith in 1:2:2 ratio.

The rationale behind using burnt rice husk based casing formulations are its low cost, availability in abundance and quality of mushroom harvested from it. Burnt rice husk based casing formulations possess lower water holding capacity, higher porosity, poor nutrition status and less adhesiveness. Because of these rationales, burnt rice husk formulations have become popular in Punjab, Haryana, Delhi and Himachal Pradesh.

Mushroom growing in mud houses

Scientifically, mushroom growing is recommended in Pakka houses with proper ventilation facility. But in rural areas of Himachal Pradesh, several seasonal mushroom growers raise mushroom crop in mud houses with wooden false ceiling or wood supported mud roof or RCC slab. The rationale behind using such structures is that the optimum temperature is maintained very easily as these are made up of very thick mud wall (2 feet) and temperature once raised or lowered inside the house remains as such for longer period. Secondly, during summer season, these mud houses are cooler than pakka houses.

Mushroom growing in thatched / sarkanda sheds

A large scale seasonal mushroom growing is a part time activity in rural Haryana. Mushroom growers erect bamboo structure of different dimensions in their fields and thatch them with sarkanda and sometimes with paddy straw instead of sarkanda. Inside the shed, they erect three tier bamboo structure for preparing mushroom beds. The size of shed varies from place to place and as per the requirement of the grower. It is a traditional system of button mushroom cultivation in Haryana and it is still prevailing due to low cost of cultivation. Except bamboo, other materials are available almost free of cost in the region. After taking a full crop of button mushroom, they dismantle the structures and bamboos are stalked in the field for reuse in the next season.

Cooling system of thatched shed/pakka house for mushroom cultivation

Mushroom growers in Delhi and Haryana provide indigenous cooling system to their thatched sheds with the help of a perforated pipe connected with elevated water tank or water lifting pump. According to this system, all the sides of thatched shed are covered with jute gunny bags and a perforated pipe is fitted on the upper side of it. It is then connected to source of water. The water drops emerging from perforated pipe fall directly on gunny bags and bring down temperature inside the shed. This system works on the principle of water evaporation.

Such system also works in pakka mushroom house and is very common. In pakka mushroom house, jute gunny bags are hanged outside the windows and walls, and are kept moist by sprinkling of water. Evaporation of water from gunny bags gives cooling effect inside the house. This system helps mushroom growers in taking the second mushroom crop during the month of February as during this month the temperature starts rising on the off set of winter season.

Spray of urea and wine (alcohol) on mushroom beds

This practice is being practiced by a few mushroom growers in Kurukshetra and Sonapat districts of Haryana. They spray very low concentration of urea on mushroom beds for harvesting heavy flush of button mushroom during extreme winter season. Similarly, triple refined english wine/distilled whisky is sprayed in low concentration (300ml/50 lt water) on mushroom beds to get better and heavy flush. Scientific community has recommended spray of low concentration urea on oyster mushroom bags but it has not been tried on button mushroom. According to mushroom growers, use of these chemicals helps in raising the bed temperature by 2-3 °C and stimulates pinheads formation during extreme winter. This ITK is being used in place of scientifically recommended practice- spray of Veradix-II.

Bunker system for compost preparation.

This ITK (Indigenous bunker system) is in fact a reinvention done by a mushroom grower of village Molo, Distt. Solan (HP). It is a modification in existing bunker system of compost preparation by indoor method. The reinvented bunker system's aerated floor is made of bricks net attached with a portable ordinary blower (1hp, 1400 rpm) instead of iron-slatted floor and powerful fixed blower recommended in scientifically developed bunker. The platform is covered by polythene sheet fixed on a steel angle structure. The pre-wetted compost material is stacked over this platform upto 5-5.5 feet height and forced air is injected by blower @ 8-10 hrs/ 24hrs initially at regular interval depending upon the temperature of the compost pile to create aerobic condition and raise the temperature of the compost. Forced air injection is reduced to 6-7hrs/ 24hrs at a later stage. Turning is given at alternate day followed by shifting of material into the second bunker. After three complete turnings, compost is shifted into bulk chamber for pasteurization on 10-11th day of composting. Compost is kept in the pasteurization chamber for seven days for pasteurization and conditioning. Compost preparation using this method takes total 20 days including four days of pre-wetting process.

Under stacking aeration system

A progressive mushroom grower of district Solan (HP) has developed indigenous under stacking aeration system for compost pile during phase-I of composting. He prepares 40-50 tons of compost at a time. In order to maintain proper aeration in the compost pile (size 70 X 22 X 6 feet) during phase-I, he has fitted perforated plastic pipes (2.5"dia) in the cemented floor of compost yard widthwise at two feet interval. The outer ends of the pipes are closed, while the inner ends are connected longitudinally at 90° to a pipe of one feet diameter at one side of composting yard. This main big pipe (air feeder) is also closed at the outer end and is connected with a high pressure blower (2900 rpm) on other end. This system forcefully inserts air in the compost pile from bottom to top and creates aerobic conditions for the growth of micro organism in the compost. During the initial stage (till 36 hrs), fresh air is provided @ 20 min / hour and thereafter it is reduced to 10 min/ hr. Generally, one perforated pipe is fitted longitudinally in the cemented platform, on which compost material is stacked by keeping the pipe in the middle of the stack. The device substitutes the requirements of a bunker system. Compost pile is turned on alternate days and total three turnings are given. Filling in the pasteurization chamber is done at fourth turning. Phase-II of composting (pasteurization and conditioning) is carried out for the next 5-7 days. Compost preparation using this method takes total 17-18 days including pre-wetting process. This method produces homogenous and better quality compost in shorter duration. Compost prepared in this manner gives near about 20 % button mushroom yield (20 kg fresh mushroom/ qt compost).

Flat floor method of oyster mushroom cultivation

This ITK is in operation in Sidhi district of MP and being practiced by 20 % mushroom growers of the area. In this method, first layer of one inch thickness of fine sand is spread on the cemented floor. Over this layer, 2nd layer of half inch thickness of sterilized/disinfected vermicompost is applied. Third layer of pasteurized or sterilized paddy straw is put over the 2nd layer and spawn is mixed. An another layer of pasteurized/sterilized paddy straw is laid over third layer and spawned. Finally, the bed is covered with clean polythene sheet. The rationale behind this method is that sand and vermicompost help in maintaining the temperature and humidity during summer season. It gives higher mushroom yield and good quality crop.

Traditional outdoor and indoor methods of paddy straw mushroom cultivation

In Khurdha, Puri, Dhenkanal, Balasore, Cuttack, Sambhalpur and other coastal districts of Orissa, coastal districts of Andhra Pradesh and Chhattisgarh, farmers grow paddy straw mushroom outdoor in orchards of coconut, banana, cashew, teak and mango by using traditional bed cultivation method on raised bamboo platform or under roof prepared with coconut leaves. Farmers prepare paddy straw bundles of 1.5 to 2.00 feet length and 750 to 1000 gm weight, tied at one end. These bundles are dipped in water containing bavistin @ 100 gm / 2000 litre water in a cemented tank for 8-10 hours. After 8-10 hours of dipping, the bundles are placed on the clean surface to leach out excess water. Then, the first layer of bed is prepared by opening and spreading three bundles horizontally on the bricks supported bamboo platform or shelves prepared with bamboo keeping the lower hard ends of bundles in one direction. This layer is spawned by placing paddy straw mushroom spawn at 6-8 places followed by covering of spawn with gram dal powder. Over this layer, second layer from another three bundles is prepared keeping the lower hard ends of bundles in opposite direction to that of first layer bundles. Spawning is done in a similar manner. One more layer from three bundles is put over the second layer and spawned similarly. Finally, one bundle is opened and spread evenly on the top of the bed. Such prepared beds are covered with plastic sheet and left as such for next 5-6 days. During this period, beds are watered by sprinkling little quantity of water only, if need arises and kept covered till mushrooms start appearing from all sides of the bed. Mushrooms are harvested at egg stage. One bed of 8-10 kg dry paddy straw produces about 1-1.2 kg fresh mushroom in 15 days cropping cycle. The cost of preparation of a bed comes about Rs. 22/- and the produce is sold @ Rs. 50-60/ kg. The farmer gets net profit Rs. 28-30/bed in 15 days time.

CONCLUSION

Mushroom cultivation is practiced in both rural and urban areas of our country as a source of livelihood. During the process of adoption, and informal experimentations, several reinventions have taken place as full fledged cultural practices. In the present attempt of documentation, such indigenous mushroom cultivation practices were collected from mushroom growers and facilitators. Indigenous technical knowledge on mushroom cultivation viz. pasteurization of button mushroom compost without injecting steam, use of burnt rice husk as casing material for button mushroom, mushroom growing in mud houses and thatched/sarkanda sheds, cooling system of thatched shed/pakka house for mushroom cultivation, spray of urea and English wiskey (alcohol) on mushroom beds, bunker system and under stacking aeration system for button

mushroom compost preparation, flat floor method of oyster mushroom cultivation, and traditional outdoor and indoor methods of paddy straw mushroom cultivation were recorded from the Northern, Central and Eastern states of India. These ITKs need to be validated through experimental trials, secondary sources and experts. Apart from these ITKs, there is a strong need to collect ITKs on edibility and medicinal uses of locally available wild mushroom species in the different regions of the country.

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