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Impact of skill development residential training on mushroom production & processing technology in Bihar

¹Ram Prawesh Prasad, ²RPK Ray and ¹Dayaram

¹Advance Centre of Mushroom Research, RPPCAU, Pusa, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

²Department of Basic Science & Humanities, RPCAU, Pusa, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

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Corresponding Author: Ram Prawesh Prasad

Abstract

Mushroom cultivation is an eco-friendly, low-cost, and land-independent enterprise that offers significant opportunities for income generation, employment, nutritional security, and sustainable livelihood, particularly for small and marginal farmers, rural women, and unemployed youth. The present study assessed the impact of mushroom production technology training conducted at the Advance Centre of Mushroom Research, Dr. Rajendra Prasad Central Agricultural University (RPCAU), Pusa, Bihar. A total of 175 participants (84 men and 91 women) attended three seven-day residential training programmes during August–September 2024. Knowledge levels were assessed through pre- and post-training evaluations using a structured questionnaire. The results revealed substantial improvement in participants' knowledge across all components of mushroom production, particularly in suitable substrate selection (92.0%), mushroom types (89.14%), compost preparation (86.28%), spawn production (80.57%), and nutritional benefits (78.28%). More than half of the trainees were landless (50.85%), indicating the suitability of mushroom cultivation as a livelihood option without requiring agricultural land. Participants recommended greater emphasis on practical training, timely supply of quality spawn, training manuals in Hindi, financial support, and improved market linkages. The study concludes that systematic skill development programmes significantly enhance knowledge and adoption of mushroom production technology, thereby promoting entrepreneurship, income generation, nutritional security, and sustainable rural development.

Keywords: Mushroom cultivation, skill development, residential training

Introduction

Poverty, malnutrition and unemployment are the basic problems prevailing in rural India. The poor farmers- “the producer of food” are still under fed and under nourished leading to malnutrition mainly due to their low family income. Due to small land holdings, their agricultural land cannot provide the complete food security and year-round employment. All these problems can be partly tackled if mushroom cultivation is promoted as it capable to provide nutritious food, income as well as employment.

Mushroom Production, a component of diversification in an agriculture, may open a new vista for the promotions of agricultural entrepreneurs, new avenue of livelihood, cheaper nutritional source, additional income and eco-friendly adoptable technology for unemployed rural masses migrant worker and weaker sections of society. Many efforts were made to uplift the economy of above groups and encouraging results were obtained. The mushroom production is a low-cost intervention (Kheti Bina Khet Ke). Hence, the unemployed youth and weaker section of the society can utilize agro waste for mushroom production for income generation and avoid the environmental pollution, besides, protection from malnutrition and chronic diseases. Other hand these mushroom (Oyster, Button, Milky and Paddy

Straw) are used as vegetable in food and Shiitake, Shitake, (Lion's mane), Ganoderma, *Auricularia* and *Pholiota* are medicinal mushroom and used as medicinal mushroom and used as medicine in other countries (China and Japan) as nutraceuticals & Pharmaceuticals. No work has been done in India on these medicinal mushrooms. The technology for round the mushroom cultivation under natural condition have been developed and dissemination in Bihar. The adopted mushrooms are oyster, button, milky, paddy straw, shiitake and hericium mushroom (medicinal mushroom) which resulted the mushroom production Bihar is the number 1 mushroom producing state with a production of around 35.6 thousand tonnes and 11% share in total production figure. Second to that is Odisha with around 34.5 thousand tonnes of production followed by Maharashtra (32.5 thousand tonnes), Uttar Pradesh (23.4 thousand tonnes), and Uttarakhand (22.4 thousand tonnes) under natural condition as climatic condition of Bihar is most suitable for round the year mushroom production (10-38°C). Mushroom production technology opened new avenue of livelihood, cheaper nutritional and medicinal source, additional income and eco-friendly adoptable technology to unemployed rural masses and weaker sections of society (SC&ST).

Training plays a pivotal role for enhancing the competence of

extension functionaries through diffusion of innovations at actual workplace (Meena and Singh, 2012) ^[2]. Transfer of technology is main obstacle in realizing agricultural potential in India (Singh *et al.*, 2014) ^[13].

Improved agricultural technologies even when as technically sound is of limited value if they are not accepted by the farmers. New agricultural technologies developed and transferred by the conventional research and extension efforts, have not been adopted uniformly by the farmers operating under widely varying agro-climatic and socio-economic environments when adequate attention is not paid to the agro-climatic and socio-economic milieu in which the farmers operate (Kumar *et al.*, 2012) ^[1]. In Bihar crop productivity trends have been below the Indian average for most cereal crops, and far below their potential yield, even after Bihar's fertile land and water resources. About 85 percent of the farmers are small and marginal but sharing only 50 per cent of the land. The 80% of operational farm holdings in India as well as in the eastern India is less than one hectare. Integrated farming system is a reliable way of obtaining high productivity with substantial nutrient economy in combination with maximum compatibility and replenishment of organic matter by way of effective recycling of organic residues/wastes etc. obtained through integration of various land-based enterprises. (Kumar *et al.*, 2012) ^[1] The Indian Council of Agricultural Research (ICAR) has been responding to the contemporary challenges and other issues of Indian agriculture through various initiatives. Indian Council of Agricultural Research (ICAR) has established Advance Centre of Mushroom (ACMR) & All India Co-ordinated Research Project on Mushroom (AICRP on Mushroom) in the country to Cultivation practices of different edible & medicinal mushrooms. Nutraceutical values of mushrooms. Processing and value addition of different edible mushrooms. Entrepreneurship opportunities through mushroom cultivation. To conduct survey for naturally occurring wild edible mushrooms with a view to identify and catalogue the edible species as well as for exploring possibilities of promising strains. To evaluate the promising and high yielding strains received from Directorate of Mushroom Research, Chambaghat, Solan (HP) stock for regional adaptability. To carry out multi-location trial for finalization of standard production techniques for increasing yield of different edible mushrooms. To explore possibility of selection of cheaper agro waste available locally for substrate, compost and casing. To supply good quality spawn to the mushroom growers. Popularization of mushroom cultivation on large scale through trainings and demonstration. Commercial production of button mushroom. take the latest agricultural technologies to the farmers and end users by making provisions for multidisciplinary team of scientists in each Agricultural University/ KVKs & government official. As an institution, University/ KVK & other government offices are playing strategic role in technology back-stopping, knowledge management and advisory to various stake holders like farmers, farm women, rural youths and extension personnel. Training and demonstration are integral part of Advance Centre of Mushroom Research RPCAU, Pusa. Advance Centre of Mushroom Research RPCAU, Pusa playing an important role in encouraging rural farmers and farm women to take up

simple and quick income generating enterprises from where they can earn additional income. Cultivated mushrooms have now become popular all over the world. Mushroom cultivation can directly improve livelihoods through economic, nutritional and medicinal contributions. Mushroom is a popular food due to their special flavour, nutritive value and medicinal properties. Mushrooms are a good source of vitamin B, C and D, including niacin, riboflavin, thiamine, and folate, and various minerals including potassium, phosphorus, calcium, magnesium, iron and copper. (Shahi *et al.*, 2018) ^[4]. However the gap between technology developed/released and the technology disseminated/adopted is quite wide (Singh and Shekhar, 2015) ^[7]. Training courses aim at enhancing adoption and diffusion of innovations. Some of the outcomes envisaged for any training programme were gain in knowledge, gain in skill acquired and ultimately in more adoption and integration among farming community. An important indicator of the impact of training programme is the extent, to which they have adopted the package of practice of mushroom cultivation technology. Mushroom production has become one of few enterprises which rural women of Bihar has adopted in big way both at household level and as commercial enterprise as a source of income generation after the proper dissemination of technology through AICRP on mushroom under ACMR, RPCAU, Pusa As of today, there are limited research studies conducted to evaluate performance of AICRP on mushroom in order to analyze quality of working and ultimately impact on farming community. Therefore, the attempt was made to assess the Impact of Mushroom Production Technology Training on Knowledge and adoption of Rural Youth.

Materials and Methods

1. Selection of Participants

The training program on mushroom production targeted farmers, farm women, and rural youth interested in self-employment. The study took place at Advance Centre of Mushroom Research of Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar. A total of 175 trainees, including 84 men and 91 women, received training on mushroom production cultivation & processing technologies during August 2024 to September 2024 in seven days residential training (three batches) from 20-26 August 2024, 03-09 September 2024 and 24-30 September 2024.

2. Collection of Data

A questionnaire was developed to gather general information and background details of the participants, including their land holding. Prior to the training program, a pre-evaluation test was conducted to assess the participants' existing knowledge levels regarding cultivation techniques, spawn preparation, substrate preparation, marketing, preservation, value addition, and other related aspects. The training program provided comprehensive instruction on various aspects of mushroom production. Following the completion of the training course, a post-evaluation was conducted to evaluate the knowledge acquired by the trainees and the effectiveness of the training.

To assess the trainees' knowledge, a set of 20 questions related to mushroom production, nutrient content, different

mushroom products, storage, Value addition harvesting and marketing were used. The deviation or gain in knowledge

was calculated by comparing the scores obtained in the pre- and post-training knowledge tests.

$$\text{Deviation/gain in Knowledge} = \frac{\text{Post evaluation score} - \text{Pre evaluation score}}{\text{Total respondents}} \times 100$$

3. Preparation of Subtracts

wheat straw, wheat seeds, potato, Agar, Agar plates, Sprit Lamp, polythene bags, cooking utensils, spawns and polythene sheets were the materials used for mushroom spawn and cultivation.

Results and Discussion

Socio-economic profile: The participants exhibited variations in their socio-economic status, including education, occupation, landholding, and annual income, as shown in Table 1. The findings indicated that 52 percent of the participants were female, while 48 percent were male. The age range of the participants was up to 18 years, with the majority (46.28%) falling in the 31-40 age group (33.14%), followed by those below 30 years (46.28%) and above 40 years (20.57%). In terms of caste, 43.42 percent of the participants belonged to the Backward Caste, followed by the SC/ST (24%). Regarding education, 05.57 percent had completed senior secondary level education, 32.57 percent

were matriculate and 14.28 percent held Graduates. In relation to occupation, 33.71 percent were farming backgrounds., 21.41% from business, 12.57 percent came from a housewife and only 16.5 percent were from the service class but majority were 28.57 percent students most curious. Additionally, it was observed (Table 1) that some participants (23.43%) had small landholdings, with a few (13.71%) falling under the small farmers category. Mostly, 50.85 percent of the participants were landless, indicating that mushroom farming does not require significant land, making it attractive for landless farmers to supplement their family income. The socio-economic factors influencing the adoption of mushroom cultivation did not exhibit consistent relationships with each other. Age was found to have no significant association with the adoption of mushroom Production.

Impact of Skill Development Training on Mushroom Production

Table 1: Socio-economic profile of trainees undergone mushroom production training (n=175)

Sl. No.	Particular	Trainees attended Mushroom cultivation	
		Frequency	Percentage
1.	Gender		
	Male	84	48
	Female	91	52
2.	Age		
	Up to 18 yr	81	46.28
	31-40 yr	58	33.14
	Above 40 yr	36	20.57
3.	Caste		
	SC/ST	42	24
	Backward caste	76	43.42
	Others	57	32.57
4.	Education		
	Primary	23	13.14
	Middle	41	25.14
	High School	57	32.57
	Intermediate	15	8.57
	Graduate	25	14.28
	Others	14	08
5.	Occupation		
	Farming	59	33.71
	Business	37	21.14
	Service	29	16.57
	Housewife	22	12.57
	Student	50	28.57
6.	Landholding		
	Landless	89	50.85
	Small (1-2 ha)	41	23.43
	Semi medium (2-4 ha)	24	13.71
	Medium (4-10 ha)	13	07.43
	Marginal (10 ha)	06	03.43
	Large (>10 ha)	02	01.14

Reasons for Participation: The participants' motivations for undergoing the training were ranked in order of perceived importance. As shown in Table 2, 35.43% of the respondents joined the training course to pursue the skill of mushroom growing to self-employed, 27.43% to adopt the skill of mushroom growing to self-employed, 3.43% wanted to learn mushroom growing techniques for self-consumption. These

findings align with similar results reported by Kaur (2016) ^[6], The 14.86% few participants to learn about developed value added products from mushroom indicating that the majority of participants joined the training course with the intention of adopting mushroom cultivation as an enterprise and increasing their knowledge level.

Table 2: Reasons of participation in training programme in mushroom Production (n=175)

Sl. No.	Reason	Frequency	Percentage	Ranking
1.	Just to know about mushroom growing	62	35.43	I
2.	To adopt the skill of mushroom growing to self employed	48	27.43	II
3.	To teach fellow farmers about mushroom growing	33	18.85	III
4.	To learn about developed value added products from mushroom	26	14.86	IV
5.	To learn about mushroom growing techniques for self-consumption	06	3.43	V

Increase in Knowledge Level

Pre-exposure and post-exposure scores were calculated for all sub-components of mushroom production (Table 3). In the pre-evaluation test, participants' knowledge ranged from 04.8% regarding mushrooms casing to 69.71% profitability in mushroom cultivation. Post-evaluation training scores for various practices ranged from 38.86% in marketing of mushroom and their products to 98.28% in the choosing profitability in mushroom cultivation. It was observed that the pre-training knowledge scores were unsatisfactory for all aspects of the training program. However, participants demonstrated a more satisfactory knowledge score in all aspects after the training. Significant knowledge gain was recorded in sub-components such as nutritive value, optimum growing conditions, types of mushrooms, suitable substrates, importance of casing, quality spawn production, harvesting methodologies, marketing channels, preservation techniques, and mushroom recipes.

Furthermore, it was noted that after the training, 92% of the respondents showed improved knowledge of suitable

substrate, while 89.14% exhibited enhanced knowledge of different types of mushrooms (Table 3). In addition, 86.28% of the respondents demonstrated increased understanding of the preparation of compost during mushroom production training. Conversely, 80.57% of the trainees exhibited deviations in knowledge regarding mushroom spawn production, while 78.28%, 62.85%, and 58.28% deviated in knowledge of Nutrition and health benefits, Harvesting methods, and Self-Growing options, respectively. Based on these findings, it can be concluded that participants successfully acquired knowledge after exposure to the mushroom production training. These results align with the findings reported by (Singh *et al.*, 2010) ^[8] Impact of the training by knowing the adoption status of mushroom enterprise by the trainees, the problems faced by them in adoption of this enterprise and economic impact of adoption growers.

The satisfactory gain in knowledge can be attributed to the participants' educational backgrounds and their keen interest in the subject matter.

Table 3: Gain in knowledge after training with respect to different components (n=175)

Sr. No.	Parameter	Pre- training (%)	Post- training (%)	Change in knowledge
1.	Preparation of compost	15 (12)	166(94.85)	151(86.28)
2.	Choosing of suitable substrate	12 (9.6)	173(92)	161(92.00)
3.	Importance of casing	06 (4.8)	96(84.85)	90(51.43)
4.	Self-Growing	23 (18.4)	125(71.44)	102(58.28)
5.	Different types of mushrooms	09 (7.2)	165(94.28)	156(89.14)
6.	Nutrition and health benefits	22 (17.6)	159(90.86)	137(78.28)
7.	Preparation of spawn	13 (10.4)	154(88)	141(80.57)
8.	Harvesting methods	07 (5.6)	117(66.86)	110(62.85)
9.	Uses by different mushroom recipes	16 (12.8)	98(56)	80(45.71)
10.	Preservation techniques	10 (08)	112(64)	102(58.28)
11.	Profitability in mushroom cultivation	122(69.71)	172(98.28)	50(28.57)
12.	Marketing options	08 (6.4)	68(38.86)	60(34.28)

Suggestions given by the trainees

The suggestions offered by the trainees for further improvement of the training course are presented in table 4. The results showed that more importance to practical classes (96.57%), the regular supply of quality spawn by University/ KVKs/ /Agriculture Department (83.42%) and Practical manual on mushroom growing to be provided in Hindi. (75.43), organizing more practical classes and linkages with

different marketing channels (56%), were the main suggestions. Besides these suggestions, 72 percent of the respondents felt that financial assistance through banks and other government offices should be provided for mushroom production and processing and 67.42 percent respondents also gave stress on exposure visits to mushroom growers/entrepreneur's units.

Table 4: Suggestions given by trainees after training

S. No.	Suggestion	Frequency	Percentage	Ranking
1.	More importance should be given on practical classes	169	96.57	I
2.	Quality spawn to be supplied on time by nearby KVK/ Agri department / University	146	83.42	II
3.	Practical manual on mushroom growing to be provided in Hindi.	132	75.43	III
4.	Help to get financial assistance through banks and other Govt. offices	126	72	IV
5.	Exposure visits to mushroom growers/ entrepreneur's units.	118	67.42	V
6.	Linkage with different marketing channels	98	56	VI
7.	To focus on value addition	74	42.28	VII
8.	Readymade supply of compost along with spawn	47	26.85	VIII
9.	Publicity of nutritional benefits in rural and urban areas for increasing consumption of mushrooms	49	28	IX
10.	Training on disease control is needed	36	20.57	X

Conclusion

In conclusion, the study demonstrates that participants achieved a significant gain in knowledge through their exposure to training. Mushroom production proves to be an enterprise that does not heavily rely on land availability, allowing even landless farmers to generate additional income through mushroom cultivation. The awareness and training provided on mushroom production facilitated income and employment generation, nutrient supplementation, and profitable marketing opportunities among the participants.

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Declaration

The authors declare no conflict of interest.

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