

Small-scale Mushroom Production Unit for the Upliftment of Rural Economy and Women Empowerment in India: A Review

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Authors' contributions

This work was carried out in collaboration among all authors. Author AD designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors SP and MMR managed the analyses of the study. Author MMR managed the literature searches. All authors read and approved the final manuscript.

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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. One such plan is to set up a small-scale mushroom production unit which requires by-products of the agricultural farm as input and occupy less agricultural land space. 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

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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 superfood. Mushroom cultivation can also be a way to empower the rural women, provide additional income for the sustenance of farming families and tackle the problem of lack of nutritional requirement of the rural people. Rural women are the most productive workforce in the economy, raising the need to strengthen and improve their socio-economic status. A low-cost small-scale mushroom production unit 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.

Keywords: Small-scale mushroom production; rural economy; women empowerment; socio-economic status; agro-allied sector; farm women; information poverty.

1. INTRODUCTION

India is a country predominated by the rural areas and as per the Census 2011, a total of 68.8 per cent of the population and a total of 72.4 per cent of the human workforce resides in rural areas [1]. The projection of population also showed that India will carry on to be predominated by the rurals up to the year 2050 and preceding which it will be overtaken by the urban [2]. It is generally observed that there is an unplanned migration of rural people to the urban area primarily for better economic opportunities which as a result inflict a scathing pressure on the urban amenities which in turn subjects these rural migrants to work under low wages and live in cruddy, unhygienic, and impoverished conditions. Therefore, in the sight of this unplanned migration of rural people to urban areas and to embellish the socio-economic settings, there is an urgent requirement of setting up strategies to bolster the rural economy and creation of employment opportunities in the rural background. In addition to this, the upliftment in economic conditions of rural communities is also imperative to reduce the incongruity in per capita urban and rural income that has stayed high consistently. Thus, there is a significant requirement of higher growth in the rural economy in comparison to the urban economy in our country.

Another important issue that has emerged in the recent past is women empowerment. It is being surmised that the economic empowerment of women will have a way in the country's development process and hence the contention is of paramount importance. Women are thought by the reformers, thinkers, and social scientists as a major factor in national development [3]. India is a country of confutations. At one side, women are being worshipped as goddesses

without whose blessings a work cannot be initiated and at another side, they are kept in the boundaries of four walls depriving them of their true independence. The rural women are far less literate than the rural men in our country as there is a negative behaviour of the family towards the education of a girl child or them as a whole. The major portion of women residing in rural areas not only suffer from economic poverty but also from the "information poverty". They are the crucial and constructive workers in our national economy, but there has been statistical biased by underestimation of rural women role in the developmental process [4]. Even though the women work for more time span than the men and dispense consequentially in the income of the family, they are not recognized as productive labours [5]. They remain as a muted force who struggle to fulfil their household duties from dawn to dusk.

2. 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 [6]. 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 [7].

3. 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 has now spread its shadow from north to south and east to west region of India [8]. 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 [7,9]. 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 [7,10]. Many commercial companies are aspiring to familiarize the 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 [6,7]. Presently, more

than 85 per cent of the total mushroom production is of white button mushroom followed by the oyster mushroom.

4. DIFFERENT DIMENSIONS OF MUSHROOM, ITS CULTIVATION AND TRADE IN INDIA

Mushroom is generally defined as the fleshy, spore-bearing fungal body which is produced typically above the ground surface or its source of food (substrate). There are different meanings to the word "mushroom" among different people residing in different countries [11]. They were regarded as the "food of gods" by the Romans in the ancient era and Greeks believed them as a source of strength for the warriors in military warfare [12]. Mushrooms are widely used among the world population as a food item [13,14] and are very often considered as luscious and nutritive food [15]. They contain a distinct range of nutrients and various other natural phytochemicals which possesses an extensive array of health and nutritional benefits [16], which includes healing of wounds, enhancement of immunity, and retardation of tumours [17,18]. In recent studies, the medicinal mushrooms have shown very promising and encouraging results in their trails against HIV/AIDS having people in Africa [19]. There are more than 2000 reported species of fungi which are edible in the world and out of which India has the availability of 200 species. From all these species, only eight are utilized in the cultivation process among the countries for commercial purposes among which are *Agaricus bisporus* (European or White-Button mushroom), *Pleurotus* spp. (Oyster or Tropical mushroom), *Volvariella* spp. (Paddy straw or Chinese mushroom), *Lentinus edodes* (Shiitake mushroom), *Calocybe indicus* (Milky mushroom), and *Flammulina velutipes* (Enokitake mushroom) [20].

5. STATUS OF FARM WOMEN AND THEIR CONTRIBUTION

Form the archaic era, women are known to execute crucial processes in the sustenance of basic life support systems such as land, water, flora, and fauna. Continuing to the belief, rural women are also known to play an important role in the development of agriculture and its allied field through crop and livestock production, horticulture and its post-harvest operations, fisheries, mushroom production, bee-keeping etc. Furthermore, rural women are also

employed in other agri-based allied enterprises such as animal husbandry, floriculture, post-harvest processing, value-addition, fruit preservation, goatery, fisheries, rabbit rearing, poultry etc. 46.31 per cent of the total 106.77 million agricultural labourers are rural women indulged in all these agricultural activities but their role and work goes invisible in statistics [21] and it is less conjecturable that they will secure propitious outcomes for themselves in household decision-making process [22]. According to the UNDP Report, 67 per cent of the world's total work is done by women but only a marginal 10 per cent of the global earning is attained by them and an utterly insignificant 1 per cent of the global property is owned by them [23]. An expedient approach for the empowerment of women is thought to be by the entrepreneurship development. As from ancient times, agriculture has been the prime dimension of the rural economy and rural employment, rural women empowerment can be achieved by the adoption of agricultural enterprises at individual and/or community level [24]. The incorporation of agro-allied sectors in the composition of output and occupation is considered as a potential source of economic growth and transformation in the rural and total economy.

6. SMALL-SCALE MUSHROOM PRODUCTION UNIT AS A CATALYST FOR THE UPLIFTMENT OF RURAL ECONOMY AND WOMEN EMPOWERMENT

In India and other developing countries like us where the majority of the rural agrarian population is composed of marginal and landless farmers, mushroom production can be a significant enterprise for employment and income generation. Mushroom production is a remunerative and profitable small enterprise for rural households having the low income [25] and it is able to provide part-time and/or full-time employment to urban, rural, and marginal population of in many developing countries [26]. The unemployment is recently increasing to a much higher magnitude in both the developing and the developed countries which leaves us with the option of self-employment as the only way to sustain the rural economy and the national economy as a whole. The cultivation of mushroom will help to reduce the vulnerability of rural people to poverty and bolster up their livelihood through fructification of a nimble source of nutritious food and reliable income [27]. Mushroom is an indoor crop which is light-

independent and does not require any fertile land for its cultivation. In addition to this, it can be grown on a small scale and does not require any substantial monetary investments [28], thus making it a potential candidate for improvement of the socio-economic condition of farmers, farming community, rural youth, and solving the problem of unemployment for both the literate and illiterate people from rural and urban communities and most especially rural women.

Mushroom cultivation is a women-friendly pursuit and is an agricultural enterprise which can be taken up by them in their leisure periods without renouncing their household liabilities [29]. A promotion of mushroom cultivation enterprises would relieve the pressure on land, increase the supply of food, provide nutritional security, and lead to status upliftment of women by generating additional income [30]. As per a study conducted in Kurukshetra, Haryana; almost 50 per cent of the trained landless rural women belonging to schedule caste adopted the small-scale mushroom production activity after the Krishi Vigyan Kendra organized a training programme. It provided them with additional income and made them an integral part of the socio-economic developmental process [31]. Almost 60 per cent of the farm women socially accepted the mushroom production model in Rudapur, Aurangabad after a training programme was organized by Krishi Vigyan Kendra, Daleep Nagar [24]. This enterprise can be taken up on a part-time basis as little maintenance is required for mushroom cultivation and can provide women employment in semi-urban and rural areas [3]. In a similar trend, a 54.44 per cent adoption level of scientific cultivation of oyster mushroom was observed in Bhatni, Salempur, and Bhatparrani blocks of Deoria district [32]. Mushroom production training to the rural farm women in Patna, Bihar also showed an acceptance level of 61 per cent as it aided to their economic empowerment along with an increase in their knowledge regarding the intricacies of technology which would lead them to empower the next generation of farm women [33]. An NGO, Dhristee while working in Korba city of Chattishgarh brought about changes in livelihood and fortune of rural women by helping them to take up mushroom cultivation through self-help groups [34]. Women have the innate ability to become a micro-entrepreneur only if this ability of theirs' is ignited and harnessed through training and providing them with the confidence to take up the job. Through this entrepreneurship, they would be able to handle the monetary affairs

directly and affirm their legitimate position in the family and in the society. The cultivation of mushroom is proved to be one such micro-enterprise which has a potential for monetizable output even from the utilization of agricultural waste additionally being women-friendly. Small scale mushroom production units can play an influential role in the sustenance of rural economy through its contribution to nutrition and food security, additional income and employment generation, national and regional trades, and expiating opportunities for the processing and value addition enterprises attached to mushroom production like pickling, drying, chips etc.

7. ECONOMICS OF LOW-COST SMALL SCALE MUSHROOM PRODUCTION UNIT

The economics of a low-cost small-scale unit for the production of Oyster mushroom that was given by Yadav, 2016 [35] is taken into consideration with monetary values of the fixed and variable assets as per the present market. The area of a single unit is also narrowed down from 250 square feet to 100 square feet keeping in mind the landscape available for the small and marginal farming families in the rural community of India. The cost estimates of one such single unit are provided as below:

Table 1. Cost estimate of the fixed assets

(A) Cost of raw materials for making one unit of 10' X 10' X 10'			
Materials	Quantity	Rate (Rs)	Total cost (Rs)
Bamboos (12 foot long and 3-inch width)	15 pieces	120 piece ⁻¹	1,800
Bamboos (10 foot long and 2.5-inch width)	16 pieces	100 piece ⁻¹	1,600
Thatched coconut or palm branches	37 pieces	10 piece ⁻¹	370
Paddy Straw	100 kg	5 kg ⁻¹	500
Polythene sheets	10 kg	70 kg ⁻¹	700
Ropes	2 kg	300 kg ⁻¹	600
Subtotal			Rs 5,570.00

Price of each commodity is as per the present market rate

Table 2. Cost estimate of the variable assets

(B) Cost of raw materials for compost (100 kgs) per unit			
Materials	Quantity	Rate (Rs)	Total cost (Rs)
Paddy or Wheat Straw	50 kg	5 kg ⁻¹	250
Chicken manure	30 kg	2 kg ⁻¹	60
Wheat Bran	3 kg	10 kg ⁻¹	30
Gypsum	10 kg	10 kg ⁻¹	100
Polythene mushroom bag	45 pieces	2 piece ⁻¹	90
Subtotal (B)			Rs 530.00
(C) Cost of other materials and labour per crop cycle			
Casing soil	15 kg	1	15
Spawn	1 kg	70 kg ⁻¹	70
Labour	1 or 2	*	*
Miscellaneous	-	-	500
Subtotal (C)			Rs 585.00
Subtotal (B+C)			Rs 1,115.00

** Labour cost is not considered as the model is for farm women and rural families; Price of each commodity is as per the present market rate*

Table 3. Economic analysis of a single unit

Economics	
Fixed Assets (A)	Rs 5,570.00
Cost of raw materials and labour (B+C)	Rs 1,115.00
Mushroom production per unit #	160 kg
Income by selling @ Rs. 90/kg #	Rs 14,400.00

Average of one crop cycle

Table 4. Gross margin, net profit and Benefit-Cost Ratio (BCR) per unit

For the first cycle or year	
Total Fixed Cost	Rs 5,570.00
Total Variable Cost	Rs 1,115.00
Total Cost	Rs 6,685.00
Total/Gross Revenue	Rs 14,400.00
Gross Return/Profit	Rs 7,715.00
Gross Profit Margin	53.57%
Benefit-Cost Ratio (BCR)	1.15
For the second cycle or year onwards	
Total Variable Cost	Rs 1,115.00
Total Additional Cost**	Rs 1,000.00
Total Cost	Rs 2,115.00
Total Revenue	Rs 14,400.00
Gross Return/Profit	Rs 12,285.00
Gross Profit Margin	85%
Benefit-Cost Ratio (BCR)	5.8

***Includes the cost of shed repairment and miscellaneous works*

With an even smaller unit of the low-cost oyster mushroom production unit which would be suitable for the marginal and small farm families and the rural women to be able to handle all the package of practices. This model showed a gross return of ₹ 7,715 in the first cropping cycle and of ₹ 12,285.00 from the second cycle onwards with a BCR of 1.15 and 5.8, respectively. This additional income can be wholly generated in the free time of the rural women and/or by rural families. This would help to sustain the importance of farm women in their families while adding up to their economic status as a whole. The economic sheet present in this review is only for the mushroom yield and the return could be enhanced more by the stakeholders by producing the mushroom spawn and value addition of the produce.

8. IMPACT ON THE RURAL ECONOMY AND WOMEN EMPOWERMENT

There are various impacts of this small-scale low-cost mushroom production unit on the rural economy as well in empowering the farm women. Various aspects of these impacts have been discussed below:

Gain in Knowledge: The exposure to the cultivation of mushroom and its sub-components of the rural people leads to sufficient gain in the knowledge base in regard to its food value, different kinds of mushroom, composting of mushroom, spawning or filling, casing, fruiting, harvesting, and pooling of harvested produces. This will result in the improvement of skills and

knowledge proficiency of the rural people, rural youth, and rural women. The exposure to these knowledge bases would thus help in the upliftment of rural economy and the national economy as a whole [30,31,36].

Change of attitude: There would be a change in the attitude among the rural men and women towards the cultivation of mushroom. There is general negativity related to the production of mushroom in the Indian rural people and it is not well accepted as a source of food. Through these low-cost small-scale production units, the rural population may take up this enterprise and also acquire it in their food habit. These changes in the attitude are expected to come through this technique [30].

Gross Margin and Benefit-Cost Ratio (BCR):

The gross return in first cropping cycle was ₹ 7,715.00 with an average benefit-cost ratio of 1.15 while from the second cycle onward it increased to around ₹ 12,285.00 with a benefit-cost ratio of 5.8. Thus, it can be concluded that the low-cost small-scale mushroom unit is highly profitable and the average return which is fetched by selling freshly produced mushroom in the nearby cities adds to the income diversity of the farming families and/or the women. Similar returns were seen by Singh, et al. [33] in their study.

Change in the Standard of Living of Rural Households:

The low-cost small-scale mushroom enterprise can be taken up as the subsidiary source of income with the least technological and economic investments with an

appreciable net profit. This net profit will add on to the income of the rural households and will lead in the upgradation of their standard of living and especially to the rural women it will serve as an engine for the upliftment of their status in the family and ultimately their empowerment [29].

Health Benefits: Mushrooms have good nutritive and medicinal values. They have a good content of dietary fibres which prevents diabetes, constipation, hypertension, obesity, arteriosclerosis and colon cancer. The vitamin B and D present in them prevents diseases such as beriberi, rickets, corneal vascularization etc which are caused due to the deficiency of these vitamins. They have certain medicinal properties and works as immune-modulator, liver protectant, anti-diabetic, anti-viral, and anti-fibrotic agents [37-40]. Through all these properties, the mushroom can serve as the agents of good health for the rural people which in turn means that the workforce generated by them will always be in its prime state and contribute to the rural economy.

9. CONCLUSION

From all the above-stated assessment, it can be concluded that the low-cost small-scale mushroom production unit can help to bolster the rural economy and provide empowerment of the rural women. The inclusion of mushroom in their daily diet will supplement additional nutrition to the rural people thus, would help them in living a healthy and prosper life. The health benefits from mushroom would mean that the labour force is always in its prime condition and in turn be an additional benefit for the rural economy upliftment. The additional income from these units will have positive impacts on the economic condition of farm women residing in rural areas as it is a women-friendly enterprise. Apart from this, a healthy woman of a family means that they can take care of the family and fulfil their responsibilities more efficiently thus would lead to their status upliftment in the house as well in the society. All these together will serve as an agent of empowerment of rural women. These low-cost small-scale mushroom production units could also serve as machinery for providing self-employment in rural backgrounds and add to the rural economy. In brief, it can rightly be said that these units would work as a machinery for the elevation of rural economy and empowerment of rural women through reduction of poverty and improvement in the lifestyle of the rural population.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Aayog NI. Changing structure of rural economy of India implications for employment and growth. National Institution for Transforming India, Government of India; 2017.
2. Desa UN. World urbanization prospects, the 2011 revision. Population Division, Department of Economic and Social Affairs, United Nations Secretariat; 2014.
3. Nigmare SS, Fule UW, Chore VP. Empowerment of rural women through agriculture. International Journal of Researches in Bioscience, Agriculture and Technology; 2016.
4. Bhattacharyya A. Rural women in India: The invisible lifeline of rural community. 2015;10:2015.
5. Pankajam G, Lalitha N. Women empowerment and rural development programmes Gandhigram experience. Empowering Rural Women: Issues, Opportunities and Approaches, The Women Press, Delhi. 2005;44-5.
6. Rai RD, Dhar BL, Verma RN. Advances in mushroom biology and production. In Indian Mushroom Conference. 1997; 1997:(No. 589.2 I53).
7. Karthick K, Hamsalakshmi H. Current scenario of mushroom industry in India. International Journal of Commerce and Management Research. 2017;3(3):23-6.
8. Chadha KL. Mushroom scenario in India. Mushroom Research. 1994;3(1).
9. Anonymous. Solan has mushroom city tag, yet Himachal lags behind three states in production. The Tribune; 2019.
10. MSME. State industrial profile of Haryana 2015-2016. MSME Development Institute. Government of India; 2016.
11. Chang ST, Miles PG. Mushroom biology—A new discipline. Mycologist. 1992;6(2): 64-5.
12. Zhang Y, Geng W, Shen Y, Wang Y, Dai YC. Edible mushroom cultivation for food security and rural development in China: Bio-innovation, technological dissemination and marketing. Sustainability. 2014;6(5): 2961-73.
13. Falconer J, Koppell CR. The major significance of 'minor' forest products. The

- local use and value of forests in the West African humid forest zone. FAO, Roma (Italia); 1990.
14. Gilbert FA, Robinson RF. Food from fungi. *Economic Botany*. 1957;11(2):126-45.
 15. Vinceti B, Termote C, Ickowitz A, Powell B, Kehlenbeck K, Hunter D. The contribution of forests and trees to sustainable diets. *Sustainability*. 2013;5(11):4797-824.
 16. Cheung PC. The nutritional and health benefits of mushrooms. *Nutrition Bulletin*. 2010;35(4):292-9.
 17. Chang ST. World production of cultivated edible and medicinal mushrooms in 1997 with emphasis on *Lentinus edodes* (Berk.) Sing, in China. *International Journal of Medicinal Mushrooms*. 1999;1(4).
 18. Dai YC, Yang ZL, Cui BK, Yu CJ, Zhou LW. Species diversity and utilization of medicinal mushrooms and fungi in China. *International Journal of Medicinal Mushrooms*. 2009;11(3).
 19. Chang ST. The world mushroom industry: trends and technological development. *International Journal of Medicinal Mushrooms*. 2006;8(4).
 20. Chauhan SK, Sharma PG. A study on production potential economic viability and marketing system of varied size mushroom units in Himachal Pradesh; 2015.
 21. Pradhan D, Sadangi BN. Improving child care practices for the families of women agricultural labourers. *Kurukshetra*. 2008;36-39.
 22. Sen A. Rural development and women empowerment; 2007. Available:<http://agropedia.iitk.ac.in/content/rural-development-and-women-empowerment>
 23. Singh I, Kumari U. Rural development and women empowerment. *Kurukshetra*. 2007;55(5):3-8.
 24. Awasthi N, Sahu A, Sahu RP. Mushroom production for economic empowerment of rural women in district Rama Bai Nagar, Kanpur. *Advances in Social Research*. 2015;1(1):31-33.
 25. Lelley J. Growing edible mushrooms-Still a generally neglected opportunity. *Gate*. 1988;4:30-4.
 26. Ferchak JD, Croucher J. Prospects and problems in commercialization of small scale mushroom production in South and South East Asia. In: *Proceedings of Second International Conference on Mushroom Biology and Mushroom Products*. 1996;321-329.
 27. Rachna RG, Sodhi GP. Evaluation of vocational training programmes organized on mushroom farming by Krishi Vigyan Kendra Patiala. *Journal of Krishi Vigyan*. 2013;2(1):26-9.
 28. Chadha KL, Sharma SR. Mushroom research in India-history, infrastructure and achievements. In: *Advances in Horticulture*. Malhotra Publishing House, New Delhi. 1995;13:1-29.
 29. Shahi V, Shahi B, Kumar V, Singh KM, Kumari P. Impact study on mushroom cultivation for micro entrepreneurship development and women Empowerment. *Journal of Pharmacognosy and Phyto-chemistry*. SP4. 2018;1-4.
 30. Manju, Varma SK, Rani S. Impact assessment of mushroom production for rural women. *Rajasthan Journal of Extension Education*. 2012;20:78-80.
 31. Singh J, Chahal VP, Rathee A, Singh K. Economic empowerment of Scheduled Caste (SC) landless rural women through mushroom cultivation: A case study. *African Journal of Agricultural Research*. 2014;9(52):3811-5.
 32. Kumari AR, Singh DP, Singh A, Laxmikant, Kumari M. Adoption level and constraints in scientific mushroom cultivation among rural women. *International Journal of Current Microbiology and Applied Sciences*. 2018;7:1280-1287.
 33. Singh BD, Verma M, Kumar R, Gupta PC, Aditya. Economic empowerment of rural farm women through mushroom production – A case study of Patna district, India. *International Journal of Current Microbiology and Applied Sciences*. 2018;7(5):348-351.
 34. Elango J. How mushroom cultivation is changing the fortunes of women in rural India. *The Better India Blog*; 2017. Available:<https://www.thebetterindia.com/89391/how-organisation-use-mushroom-cultivation-empower/>
 35. Yadav S. A pilot study of rural entrepreneurship development through cultivation and processing of oyster mushroom (*Pleurotus sajorajju*). *International Journal of Current Research and Academic Reviews*. 2016;4(4):132-136.
 36. Celik Y, Peker K. Benefit/cost analysis of mushroom production for diversification of income in developing countries. *Bulgarian*

- Journal of Agricultural Science. 2009; 15(3):228-37.
37. Wasser SP, Weis AL. Medicinal properties of substances occurring in higher basidiomycetes mushrooms: Current perspectives. International Journal of Medicinal Mushrooms. 1999;1(1).
38. Wasser SP, Weis AL. Therapeutic effects of substances occurring in higher Basidiomycetes mushrooms: A modern perspective. Critical Reviews™ in Immunology. 1999;19(1).
39. Gunde-Cimerman N. Medicinal value of the genus *Pleurotus* (Fr.) P. Karst. (*Agaricales* sl, Basidiomycetes). International Journal of Medicinal Mushrooms. 1999;1(1).
40. Ooi VEC. Medicinally important fungi. In: Van G. (Edt). Science and Cultivation of Edible Fungi. Balkema. 2000;41-51.

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